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How Ready Are Islamic Education Teachers in Indonesia to Utilize Artificial Intelligence for Teaching

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ABSTRACT

Purpose – There is limited empirical evidence about the readiness of Islamic education teachers to use Artificial Intelligence (AI) in teaching, especially at a national level in developing Muslim-majority countries. This study examines how ready Indonesian Islamic education teachers are to adopt AI in the classroom. It also identifies how their readiness levels vary across regions.

Methodology – This study used a quantitative, cross-sectional survey design. Data came from 11,393 Islamic education teachers in 31 of Indonesia's 38 provinces. The data were analyzed with descriptive statistics to show readiness levels and inferential statistics to check the robustness of the findings.

Findings – Most Islamic education teachers are positively ready to use AI. Of these, 32.6% (3,711 teachers) are very ready, 37.7% (4,294 teachers) are ready, 22.4% (2,557 teachers) are moderately ready, 4.9% (553 teachers) are not ready, and 2.4% (278 teachers) are very unready. Overall, Indonesian Islamic education teachers are generally prepared for AI integration, although some differences in readiness remain.

Contribution – This study gives large-scale empirical evidence on AI readiness among Islamic education teachers. It fills a major gap in Islamic education and educational technology research. The findings support data-driven policies and professional development programs. These can strengthen the use of AI in Islamic education, while keeping pedagogical and ethical considerations in view.

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INTRODUCTION

Indonesia has the world's largest Muslim population, with 244.41 million Muslims comprising 87.1% of its 280.73 million people (Rizaty, 2024). This demographic makes Islamic education a core, inseparable aspect of the national education system. As a compulsory subject at every educational level, Islamic education

(Pendidikan Agama Islam/PAI) has a dual mandate: cultivating students' moral–spiritual character and reinforcing religious values that sustain social harmony and national cohesion (Asror et al., 2023; Nasution, 2024; Pujianti & Nugraha, 2024; Amin, 2025). The quality and adaptability of Islamic education directly affect broader societal development.

The rapid advancement of digital technologies has fundamentally changed educational practices. It creates both opportunities and structural challenges. Digitalization expands access to learning resources and reshapes teacher–student interactions. However, it also pressures religious education to stay relevant without compromising its normative foundations (Al-Ghifary et al., 2022; Attahakul, 2024). In this context, technological integration has become essential for 21st-century education and the evolving workforce (Zou et al., 2025), with emerging tools such as Artificial Intelligence (AI), the Internet of Things (IoT), and Big Data enhancing instructional effectiveness and educational equity (Jayadatta, 2023; Rane, 2023).

Among these technologies, Artificial Intelligence represents a transformative innovation that can reshape classroom teaching and learning. For example, AI may support differentiated instruction by analyzing students' learning patterns and providing real-time feedback, automate grading to free up teachers' time, or enable adaptive learning platforms that adjust content to individual student needs. However, the successful implementation of AI is not determined solely by technological availability, but by teachers' readiness to understand, adopt, and pedagogically integrate AI into classroom practice.

Teachers should possess skills in using artificial intelligence (AI). Mastery of this technology is crucial not only for enhancing teaching effectiveness but also for fostering creativity and preparedness in using AI to enrich classroom content. In the classroom, AI can help automate grading, personalize lesson plans, or provide real-time feedback to students. By leveraging AI, teachers can develop more innovative and responsive teaching methods that address students' needs, creating a more engaging and relevant learning experience in today's digital age. Islamic education teachers, in particular, should also be proficient in this area (Nurdin, 2020; Zuhaeriah et al., 2020; Tuna, 2022; Suharsongko et al., 2023).

It remains unclear if Islamic education teachers use artificial intelligence in their teaching. The current technological era demands ongoing innovation. Educators, particularly Islamic education teachers, should embrace advancements to prevent boredom and rigidity. Prompt technology integration, such as online learning or applications, can greatly improve Islamic education (Zuhaeriah et al., 2020; Ilham, 2020).

Recent international studies have examined AI integration from multiple perspectives. Research on AI technologies in education highlights their instructional potential while simultaneously identifying gaps in implementation and contextual adaptation (Zhang & Aslan, 2021). "Artificial Intelligence for Enhancing Special Education for K-12: A Decade of Trends, Themes, and Global Insights (2013–2023)" analyzes trends and themes related to AI applications in K-12 special education, including assistive technologies, personalized learning experiences, and data-driven insights. The article provides a global perspective on the effectiveness of these AI tools and offers recommendations for improving their use in special education contexts. Other studies emphasize AI's role in special and inclusive education, focusing on personalization and data-driven support (Yang et al., 2024).

"Challenges in Artificial Intelligence Development in Higher Education in China, India, and Indonesia: International Students' Perspectives" highlights specific obstacles encountered across these countries, including infrastructure, access to technology, and cultural differences. It provides insights into how these challenges affect the adoption and effectiveness of AI in higher education and offers strategies to overcome them. Comparative research across China, India, and Indonesia reveals persistent structural and cultural barriers, including limited infrastructure and uneven technological literacy, that hinder effective AI adoption (Mustopa et al., 2024). "Teacher Professional Development for a Future with Generative Artificial Intelligence – An Integrative Literature Review" synthesizes research on the types of professional development required to prepare teachers to work with generative AI. It identifies key competencies teachers need, such as understanding AI tools, integrating AI into curricula, and addressing ethical considerations. The review also discusses effective training models and recommendations to enhance teachers' readiness for AI integration.

Furthermore, literature on teacher professional development consistently underscores that teachers require not only technical skills but also pedagogical and ethical competencies to work effectively with AI (Brandão et al., 2024). "Teacher Training on Artificial Intelligence in Education" (Fissore et al., 2024) evaluates various training programs designed to equip educators with the skills needed to implement AI in their teaching practices. The paper assesses the effectiveness of these programs, identifies best practices, and explores the challenges educators face in acquiring and applying AI knowledge. It provides recommendations for improving teacher training to better support the integration of AI in educational settings (Fissore et al., 2024).

Despite these advances, most existing studies focus on general education, higher education, or special education, while few address religious education, and almost no one conducts large-scale empirical research on Islamic education teachers. Moreover, researchers often mention teacher readiness, but typically treat it implicitly—reducing it to access or training—without clearly outlining cognitive, technical, and attitudinal dimensions. In Islamic education, this gap matters greatly, as teachers must actively integrate AI while upholding theological, ethical, and pedagogical integrity.

Conceptually, this study defines teacher readiness as a multidimensional construct: (1) technological competence, (2) pedagogical willingness to use AI, and (3) professional attitudes toward innovation and ethics. This view aligns with current thinking that readiness extends beyond skill—it requires cognitive and value-based acceptance of technology. From the synthesis above, a clear research gap emerges: a lack of large-scale, empirical evidence on the readiness of Islamic education teachers to integrate Artificial Intelligence within the Indonesian educational context, despite the strategic importance of Islamic education and the accelerating adoption of AI in education. Existing studies provide valuable insights into AI applications and teacher development, but do not adequately capture the specific readiness profile of Islamic education teachers at the national level.

This study aims to empirically analyze how ready Islamic education teachers in Indonesia are to use Artificial Intelligence in teaching. It uses a large-scale quantitative approach. The study also identifies readiness categories and offers evidence-based insights for policy, teacher development, and AI integration in Islamic education.

METHODOLOGY

Research Design

This study adopted a quantitative approach employing a cross-sectional survey design, in which data were collected at a single point in time (Maier et al., 2023; Wang & Cheng, 2020). This design was selected to systematically assess the current level of readiness of Islamic education teachers to adopt Artificial Intelligence (AI) in educational practices. Cross-sectional surveys are particularly effective for large-scale studies due to their efficiency, cost-effectiveness, and ability to provide a comprehensive snapshot of prevailing conditions across diverse populations (Maier et al., 2023; Wang & Cheng, 2020). The primary objective of this design was to generate empirical evidence to inform policy decisions aimed at strengthening teachers' competencies in AI use.

Subject and Sample

Islamic education teachers from across Indonesia participated in the study. We used purposive sampling based on these inclusion criteria: (1) actively teach Islamic education at the primary, junior secondary, or senior secondary school level; (2) be officially registered in a public or private school within the Indonesian education system; (3) have at least one year of teaching experience; and (4) agree to participate by providing informed consent. Excluded were: (1) teachers not actively teaching during data collection (for example, on leave); (2) those who taught other subjects; and (3) those with incomplete or invalid questionnaire responses.

A pilot study with 570 teachers from the target group tested if the survey instrument was feasible, clear, and reliable before the main survey. After the pilot, the main survey included 11,393 Islamic education teachers from 31 of Indonesia's 38 regions. This large sample, with a 95% confidence level and 5% margin of error,

ensures strong nationwide representation (Ahmed, 2024) and supports generalizable findings (Hays & McKibben, 2021).

Instrument and Validity Testing

Data were collected using a structured questionnaire designed to measure teachers' readiness to implement AI (artificial intelligence) in teaching. The instrument consisted of 15 items, rated on a 5-point Likert scale (a scale used to represent people's attitudes or feelings), from (1) strongly disagree to (5) strongly agree, reflecting varying levels of readiness to utilize AI in instructional contexts.

Instrument validation was conducted during the pilot phase involving 570 respondents. All questionnaire items were found to be statistically valid. Reliability analysis yielded a Cronbach's alpha coefficient of 0.952. Cronbach's alpha is a statistic that measures the consistency of items in a questionnaire, with higher values indicating greater reliability. Here, the high value indicates excellent internal consistency and suitability for large-scale application (Khanal & Chhetri, 2024). The high reliability score of individual items ($\alpha = 0.954$) further confirmed the robustness of the measurement instrument.

Data Collection

Data collection began after getting ethical clearance and approval from the education authorities. Participation was voluntary after informed consent. The questionnaire was distributed online through official teacher association platforms, making it widely accessible. Research protected participant anonymity and confidentiality, with data stored securely for study use only.

Data Analysis

Data analysis was conducted using descriptive and inferential statistical techniques. Descriptive statistics—including frequencies, percentages, means, and standard deviations—were used to summarize respondents' demographic characteristics and overall readiness levels. Inferential statistics involve using patterns in the data to draw conclusions about differences between groups. To examine differences in AI readiness across teacher groups, one-way Analysis of Variance (ANOVA) was applied. ANOVA is a statistical method that tests whether there are significant differences between the means of three or more independent groups. Where significant differences were detected, the Tukey Honest Significant Difference (HSD) Post Hoc test was used to identify specific group differences (Agbangba et al., 2024). The Tukey HSD test compares each group to every other group to determine which groups differ. This analytical approach enabled a rigorous interpretation of readiness patterns and supported evidence-based conclusions (Agbangba et al., 2024).

FINDINGS

Data collection was conducted by administering a questionnaire to participants. The collected data consists of several characteristics. Table 1 presents the demographics of the participants as follows:

Table 1. Demographics of participants

Demographic Characteristics	Total	Percent
Gender:		
Male	4138	36,321
Female	7255	63,679
Age:		
<30	2319	20,355
31-40	6151	53,989
41-50	2653	23,286
>51	270	2,370

Demographic Characteristics	Total	Percent
Region:		
Aceh	388	3,406
Bali	1	0,009
Banten	133	1,167
Bengkulu	176	1,545
DI Yogyakarta	98	0,860
DKI Jakarta	1	0,009
Gorontalo	115	1,009
Jambi	422	3,704
Jawa Barat	2342	20,556
Jawa Tengah	2037	17,879
Jawa Timur	795	6,978
Kalimantan Barat	1	0,009
Kalimantan Selatan	417	3,660
Kalimantan Tengah	79	0,693
Kalimantan Timur	190	1,668
Kalimantan Utara	59	0,518
Kepulauan Bangka Belitung	38	0,334
Kepulauan Riau	404	3,546
Lampung	230	2,019
Nusa Tenggara Barat	124	1,088
Nusa Tenggara Timur	3	0,026
Papua Barat	41	0,360
Riau	321	2,818
Sulawesi Barat	9	0,079
Sulawesi Selatan	1172	10,287
Sulawesi Tengah	161	1,413
Sulawesi Tenggara	57	0,500
Sulawesi Utara	59	0,518
Sumatera Barat	795	6,978
Sumatera Selatan	233	2,045
Sumatera Utara	492	4,318
Level:		
Kindergarten	75	0,658
Elementary School	8546	75,011
Middle School	1800	15,799
High School	972	8,532

The survey participants were predominantly female, accounting for 63.679%, while males made up 36.321%. The average age of participants was 37 years, with the majority, 53.989%, falling within the 31-40 age range. Participants were drawn from 31 out of 38 regions across Indonesia, with the highest representation from West Java (Jawa Barat) at 20.556%. In terms of educational level, the majority of participants were from the Elementary School level, totaling 8546 participants (75.011%). Descriptive statistical analysis was performed to summarize participant demographics and to provide context for the data on total numbers per item, mean, and standard deviation as presented in Table 2 below.

Table 2. Descriptive Statistics

Item Number	N	Sum	Mean	Std. Deviation
Item01	11393	45529.00	3.9962	1.00921
Item02	11393	41042.00	3.6024	1.09594
Item03	11393	41996.00	3.6861	1.07454
Item04	11393	47075.00	4.1319	.86241
Item05	11393	46449.00	4.0770	.89334
Item06	11393	47335.00	4.1547	.86786
Item07	11393	44511.00	3.9069	.95823
Item08	11393	46302.00	4.0641	.87636
Item09	11393	47672.00	4.1843	.85423
Item10	11393	43306.00	3.8011	1.03313
Item11	11393	45487.00	3.9925	.93082
Item12	11393	44694.00	3.9229	.94940
Item13	11393	44412.00	3.8982	.97078
Item14	11393	42897.00	3.7652	1.01762
Item15	11393	43085.00	3.7817	1.02643
Valid N (listwise)	11393			

The results of the descriptive statistical analysis indicate that items 01, 02, 03, 10, 14, and 15 have a standard deviation above 1. In contrast, items 04, 05, 06, 07, 08, 09, 11, 12, and 13 have a standard deviation below 1. The frequency distribution per item, based on the collected data, can be observed in the figures displayed in Tables 3 through 17.

Table 3. Frequency Analysis of Item01

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	367	3.2	3.2	3.2
	2.00	489	4.3	4.3	7.5
	3.00	2154	18.9	18.9	26.4
	4.00	4193	36.8	36.8	63.2
	5.00	4190	36.8	36.8	100.0
	Total	11393	100.0	100.0	

For Item01, 367 teachers (3.2%) were unaware that AI could be used in teaching. Meanwhile, 489 teachers (4.3%) were unsure whether AI could be used in learning. Another 2,154 teachers (18.9%) were unsure if AI could be utilized in educational settings. A significant number of teachers, 4,193 (36.8%), acknowledged that artificial intelligence could be applied in teaching. Additionally, 4,190 teachers (36.8%) were very well aware that AI could be leveraged in education. Most Islamic education teachers are aware of AI's potential, though some remain uninformed.

Table 4. Frequency Analysis of Item02

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	652	5.7	5.7	5.7
	2.00	920	8.1	8.1	13.8
	3.00	3335	29.3	29.3	43.1
	4.00	3885	34.1	34.1	77.2
	5.00	2601	22.8	22.8	100.0
	Total	11393	100.0	100.0	

Item 02 indicates that 652 teachers (5.7%) have never conducted lessons using artificial intelligence (AI) applications. Additionally, 920 teachers (8.1%) rarely incorporate AI applications into their teaching. A larger group of 3,335 teachers (29.3%) sometimes use AI applications in their lessons. Moreover, 3,885 teachers (34.1%) frequently use AI applications in their lessons, while 2,601 teachers (22.8%) always use them. This data shows that 652 teachers have not used AI, while 2601 have always used it in their teaching.

Table 5. Frequency Analysis of Item03

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	544	4.8	4.8	4.8
	2.00	861	7.6	7.6	12.3
	3.00	3079	27.0	27.0	39.4
	4.00	4052	35.6	35.6	74.9
	5.00	2857	25.1	25.1	100.0
	Total	11393	100.0	100.0	

The data for Item 03 reveals that 544 teachers, or 4.8%, never provide information on the steps for conducting lessons using artificial intelligence applications. Meanwhile, 861 teachers (7.6%) occasionally provide such information, and 3,079 (27.0%) rarely do so. On the other hand, 4,052 teachers (35.6%) frequently share information about using AI in their teaching, and 2,857 teachers (25.1%) always do so. The fact that 544 teachers do not provide any information on using AI in lessons may be due to a lack of AI knowledge among some educators.

Table 6. Frequency Analysis of Item04

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	123	1.1	1.1	1.1
	2.00	282	2.5	2.5	3.6
	3.00	2000	17.6	17.6	21.1
	4.00	4552	40.0	40.0	61.1
	5.00	4436	38.9	38.9	100.0
	Total	11393	100.0	100.0	

Item 04 indicates that 123 teachers (1.1%) do not engage in creative thinking about how to use artificial intelligence applications in the classroom. Meanwhile, 282 teachers (2.5%) engage in minimal creative thinking about this, and 2,000 teachers (17.6%) engage in moderate creative thinking. On the other hand, 4,552 teachers, or 40.0%, think creatively about integrating AI applications in their teaching, and 4,436 teachers, or 38.9%, are highly creative in this regard. A significant number of teachers, 4,436 and 4,552, respectively, are already applying creative approaches to using AI in the classroom.

Table 7. Frequency Analysis of Item05

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	141	1.2	1.2	1.2
	2.00	364	3.2	3.2	4.4
	3.00	2203	19.3	19.3	23.8
	4.00	4454	39.1	39.1	62.9
	5.00	4231	37.1	37.1	100.0
	Total	11393	100.0	100.0	

Analysis of Item 05 shows that 141 teachers (1.2%) have never attended training on the AI-based learning application. Meanwhile, 364 teachers (3.2%) have attended such training occasionally, and 2,203 teachers

(19.3%) rarely participate. In contrast, 4,454 teachers (39.1%) frequently attend AI-related training, while 4,231 teachers (37.1%) consistently participate.

Table 8. Frequency Analysis of Item06

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	119	1.0	1.0	1.0
	2.00	308	2.7	2.7	3.7
	3.00	1907	16.7	16.7	20.5
	4.00	4416	38.8	38.8	59.2
	5.00	4643	40.8	40.8	100.0
	Total	11393	100.0	100.0	

The data for Item 06 show that 119 teachers (1.0%) have never used the internet for self-development related to AI applications. Additionally, 308 teachers (2.7%) have occasionally engaged in online learning for AI self-development. A total of 1,907 teachers (16.7%) rarely use the internet for this purpose. In contrast, 4,416 teachers (38.8%) frequently use the internet for AI-related self-development, and 4,643 teachers (40.8%) consistently engage in online learning for AI self-improvement. The majority of teachers are actively using the internet to enhance their knowledge and skills related to AI.

Table 9. Frequency Analysis of Item07

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	248	2.2	2.2	2.2
	2.00	557	4.9	4.9	7.1
	3.00	2651	23.3	23.3	30.3
	4.00	4489	39.4	39.4	69.7
	5.00	3448	30.3	30.3	100.0
	Total	11393	100.0	100.0	

The data for Item 07 shows that 248 teachers, or 2.2%, are very unsure of themselves when teaching with artificial intelligence. Additionally, 557 teachers (4.9%) are somewhat confident in their ability to teach with AI. A total of 2,651 teachers (23.3%) are reasonably confident, while 4,489 (39.4%) are confident in their use of AI in teaching. Finally, 3,448 teachers (30.3%) are very confident in their ability to teach with AI. This indicates that a significant number of teachers are confident in implementing AI in their teaching, though many still feel very unsure.

Table 10. Frequency Analysis of Item08

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	131	1.1	1.1	1.1
	2.00	315	2.8	2.8	3.9
	3.00	2302	20.2	20.2	24.1
	4.00	4590	40.3	40.3	64.4
	5.00	4055	35.6	35.6	100.0
	Total	11393	100.0	100.0	

For Item 08, the data show that 131 teachers (1.1%) never align their AI-based teaching with competency standards. An additional 315 teachers (2.8%) do this occasionally. 2,302 teachers, or 20.2%, regularly align their AI-based teaching with competency standards. 4,590 teachers, or 40.3%, almost always align their AI-based teaching with these standards, and 4,055 teachers, or 35.6%, always ensure their AI-based teaching is aligned with competency standards. This data indicates that most teachers align their AI-based teaching with competency standards.

Table 11. Frequency Analysis of Item09

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	110	1.0	1.0	1.0
	2.00	272	2.4	2.4	3.4
	3.00	1824	16.0	16.0	19.4
	4.00	4389	38.5	38.5	57.9
	5.00	4798	42.1	42.1	100.0
	Total	11393	100.0	100.0	

For Item 09, the data reveal that 110 teachers (1.0%) never analyze student characteristics before using AI applications. 272 teachers (2.4%) do this occasionally. 1,824 teachers (16.0%) rarely analyze student characteristics before implementing AI. 4,389 teachers (38.5%) often perform this analysis, and 4,798 teachers (42.1%) always analyze student characteristics before using AI applications. This indicates that a significant number of teachers, specifically 4,798 and 4,389, consistently analyze student characteristics before integrating AI into their teaching.

Table 12. Frequency Analysis of Item10

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	379	3.3	3.3	3.3
	2.00	749	6.6	6.6	9.9
	3.00	2917	25.6	25.6	35.5
	4.00	4062	35.7	35.7	71.2
	5.00	3286	28.8	28.8	100.0
	Total	11393	100.0	100.0	

For Item 10, the data indicate that 379 teachers (3.3%) never use AI applications to communicate with students. 749 teachers (6.6%) have occasionally used AI for this purpose. 2,291 teachers (25.6%) rarely use AI to communicate with students. 4,062 teachers (35.7%) often use AI for communication with students, and 3,286 teachers (28.8%) always use AI for this purpose. This suggests that while a substantial number of teachers frequently or always use AI for communication, a significant proportion have not yet integrated it into their interactions with students.

Table 13. Frequency Analysis of Item11

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	190	1.7	1.7	1.7
	2.00	479	4.2	4.2	5.9
	3.00	2401	21.1	21.1	26.9
	4.00	4479	39.3	39.3	66.3
	5.00	3844	33.7	33.7	100.0
	Total	11393	100.0	100.0	

For Item 11, the data shows that 190 teachers, or 1.7%, never obtain creative ideas using AI applications. 479 teachers, or 4.2%, have occasionally obtained creative ideas from AI. 2,401 teachers, or 21.1%, rarely get creative ideas using AI. 4,479 teachers, or 39.3%, often receive creative ideas through AI, and 3,844 teachers, or 33.7%, always obtain creative ideas from AI. This indicates that the majority of teachers regularly or always get creative ideas from AI applications.

Table 14. Frequency Analysis of Item12

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	208	1.8	1.8	1.8
	2.00	558	4.9	4.9	6.7
	3.00	2685	23.6	23.6	30.3
	4.00	4395	38.6	38.6	68.9
	5.00	3547	31.1	31.1	100.0
	Total	11393	100.0	100.0	

For Item 12, the data indicates that 208 teachers, or 1.8%, never assist students in mastering higher-order thinking skills (HOTS) using AI applications. 558 teachers, or 4.9%, have occasionally helped students with HOTS using AI. 2,685 teachers, or 23.6%, rarely assist students in mastering HOTS through AI. 4,395 teachers, or 38.6%, frequently help students develop HOTS using AI, and 3,547 teachers, or 31.1%, always support students in acquiring HOTS through AI. The 2,685 teachers who were unsure about this may feel they are not yet fully effective in helping students master higher-order thinking skills.

Table 15. Frequency Analysis of Item13

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	241	2.1	2.1	2.1
	2.00	609	5.3	5.3	7.5
	3.00	2734	24.0	24.0	31.5
	4.00	4294	37.7	37.7	69.1
	5.00	3515	30.9	30.9	100.0
	Total	11393	100.0	100.0	

For Item 13, the data reveals that 241 teachers, or 2.1%, never assist students in group work using AI applications. 609 teachers, or 5.3%, have occasionally supported students in group activities with AI. 2,734 teachers, or 24.0%, rarely facilitate group work using AI. 4,294 teachers, or 37.7%, frequently help students with group work using AI, and 3,515 teachers, or 30.9%, always assist students in group activities through AI. This indicates that a substantial number of teachers, specifically 3,515 and 4,294, effectively use AI to support group work among students.

Table 16. Frequency Analysis of Item14

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	364	3.2	3.2	3.2
	2.00	754	6.6	6.6	9.8
	3.00	3104	27.2	27.2	37.1
	4.00	4142	36.4	36.4	73.4
	5.00	3029	26.6	26.6	100.0
	Total	11393	100.0	100.0	

For Item 14, the data shows that 364 teachers, or 3.2%, never conduct exams using AI applications. 754 teachers, or 6.6%, have occasionally used AI for exams. 3,104 teachers, or 27.2%, rarely utilize AI for exams. 4,142 teachers, or 36.4%, frequently use AI applications for exams, and 3,029 teachers, or 26.6%, always use AI for exam administration. This indicates that while many teachers regularly incorporate AI into their exams, a notable number, 364, still do not use AI in this context.

Table 17. Frequency Analysis of Item15

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1.00	356	3.1	3.1	3.1
	2.00	773	6.8	6.8	9.9
	3.00	3061	26.9	26.9	36.8
	4.00	4015	35.2	35.2	72.0
	5.00	3188	28.0	28.0	100.0
	Total	11393	100.0	100.0	

For Item 15, the data reveal that 356 teachers (3.1%) never supervise students in creating materials using AI applications. 773 teachers (6.8%) have occasionally supervised students using AI to create materials. 3,061 teachers (26.9%) rarely supervise students in this regard. 4,015 teachers, or 35.2%, frequently oversee students creating materials with AI, and 3,188 teachers, or 28.0%, always supervise this process. This indicates that while 356 teachers do not engage in supervising students with AI, a significant number, 3,188, consistently do so. The average readiness of teachers is 3,711 teachers who are very ready, 4,294 who are ready, 2,557 who are somewhat ready, 553 who are not ready, and 278 who are very unready to use artificial intelligence in teaching.

Descriptive statistical analysis ensures that research data is appropriately distributed, accurately measured, and shows relevant variation, enabling reliable interpretation of trends and relationships. This underpins robust decision-making and supports strong, evidence-based conclusions.

In addition, a one-way Analysis of Variance (ANOVA) and Tukey Honest Significant Difference (HSD) Post Hoc test were conducted to determine if the observed group differences were statistically significant. These tests confirm whether differences in teacher engagement or readiness are meaningful.

Table 18. ANOVA with Tukey's Test for Nonadditivity

			Sum of Squares	df	Mean Square	F	Sig
Between People			96313.420	11392	8.454		
Within People	Between Items		4989.986	14	356.428	907.712	0.000
	Residual	Nonadditivity	369.268[a]	1	369.268	945.986	0.000
		Balance	62256.212	159487	0.390		
		Total	62625.480	159488	0.393		
	Total		67615.467	159502	0.424		
Total			163928.887	170894	0.959		

Table 18 presents the results of an analysis of variance (ANOVA) with a nonadditivity test, revealing substantial variability both between and within subjects. The between-people variance (Sum of Squares = 96,313.420; Mean Square = 8.454) indicates notable differences among participants, suggesting that individual responses vary considerably across the sample. Meanwhile, the within-people variance is further decomposed into differences between items and residual effects. The between-items component (Sum of Squares = 4,989.986; Mean Square = 356.428; $F = 907.712$; $p < 0.001$) demonstrates a highly significant variation across items, indicating that the measured constructs differ substantially in their influence.

Furthermore, the nonadditivity test reveals a significant interaction between participants and items (Sum of Squares = 369.268; Mean Square = 369.268; $F = 945.986$; $p < 0.001$), suggesting that the effects of the items are not consistent across individuals. This strong nonadditive effect implies that respondents interpret or respond to the items differently, highlighting the presence of interaction effects that cannot be explained by additive components alone. The remaining residual variance (Sum of Squares = 62,256.212; Mean Square = 0.390) represents unexplained variability after accounting for item differences and interaction effects. Overall, the total variance (Sum of Squares = 163,928.887; Mean Square = 0.959) confirms the presence of substantial dispersion in the dataset.

In summary, the findings indicate that while the items significantly differentiate responses, their effects vary across individuals, as evidenced by the strong nonadditivity. This suggests that the measurement instrument captures meaningful differences, but its impact is not uniform across respondents. Consequently, these results support the conclusion that Islamic education teachers demonstrate readiness to utilize artificial intelligence in learning contexts, although the degree of readiness may differ among individuals.

DISCUSSION

The findings of this study indicate that Islamic education teachers' overall readiness to integrate Artificial Intelligence (AI) into teaching falls within the moderate to high range, as reflected in mean scores ranging from 3.60 to 4.18. The distribution of readiness levels further shows that the majority of teachers are classified as ready or very ready, while a smaller proportion remains somewhat ready or unready. These empirical results provide an important foundation for interpreting factors that support or hinder AI implementation in Islamic education.

First, teachers' conceptual understanding and positive attitudes toward AI appear to be relatively strong. This is evident from items with the highest mean scores, which are associated with openness to AI use and perceived usefulness in learning. These findings confirm previous studies indicating that teachers with a basic conceptual understanding of AI are more ready to adopt technology. The readiness of Islamic education teachers is significantly influenced by their understanding of artificial intelligence (AI) concepts and applications in education. A deep understanding of AI, including its potential and limitations, is a crucial initial step for effectively utilizing this technology. However, low digital literacy remains a major barrier that may prevent teachers from adopting this technology (Minh et al., 2022; Ahmed et al., 2023). However, lower mean scores across several items related to technical confidence and practical application suggest that digital literacy remains uneven. The relatively high standard deviation values in these items indicate heterogeneous readiness among teachers, reinforcing earlier findings that limited digital competence can reduce teachers' confidence in adopting advanced technologies such as AI. Teachers who are not familiar with advanced technology may feel intimidated by AI, leading to reluctance in integrating it into the learning process. This underscores the importance of ongoing training and digital competency development to enhance their readiness (Alotaibi & Alshehri, 2023). Thus, while attitudinal readiness is generally high, operational readiness remains a critical challenge.

Second, the findings point to structural and infrastructural constraints as key factors influencing readiness. Items with moderate mean scores and wider response dispersion suggest that not all teachers have equal access to resources for AI-based instruction. This aligns with studies noting that adequate hardware, stable internet, and institutional support are required for effective AI integration. Readiness among Islamic education teachers also depends on the availability of hardware and internet access in schools. A solid technological infrastructure is essential for supporting AI use in teaching (Taufik & Rusdi, 2024; Juhairiah et al., 2024; Ilma'Nun et al., 2025). The variation in readiness likely reflects disparities between urban and rural schools, a phenomenon often observed in the Indonesian educational context. Many remote or under-resourced schools face significant challenges in this regard. Without adequate computers, a stable internet connection, and supporting devices, AI adoption will struggle (Huda et al., 2020). These findings confirm that infrastructural readiness shapes teachers' capacity to implement AI. Regarding teachers' attitudes and concerns toward AI, the statistical findings suggest generally positive acceptance, as indicated by high mean scores in attitudinal items and relatively low variability. However, this study did not explicitly measure ethical concerns or perceptions of compatibility between AI and Islamic values. Consequently, discussions related to ethical dilemmas or value conflicts should be interpreted cautiously. Rather than being treated as direct findings, these concerns are better positioned as potential implications or directions for future research, particularly given the importance of human interaction and moral guidance in Islamic education (Hofer et al., 2023). Future studies may incorporate specific indicators related to ethical perceptions and value alignment to provide more robust empirical evidence.

Another challenge in developing AI-compatible learning content is indirectly shown in items with lower mean scores on instructional implementation. These results support previous studies: teachers often struggle to design pedagogically meaningful digital content when technological support and professional guidance are limited (Mondejar et al., 2021). The gap between positive attitudes and instructional readiness in this study underscores the need for structured support in curriculum adaptation and instructional design.

Despite these challenges, the study's findings confirm AI's potential to boost learning quality. Teachers strongly agree about AI's instructional benefits. This supports earlier research showing AI helps personalize learning, monitor progress, and provide data-driven feedback (Nikou & Aavakare, 2021). Using AI, teachers can track student progress in detail and give specific, effective feedback. AI data analysis provides deeper insights into performance, helping teachers spot areas that need more attention (Karsenti et al., 2020). These empirical results, together with prior findings, show that adopting AI in Islamic education is feasible and beneficial if readiness gaps are addressed. Readiness, policies supporting AI integration in education, especially in Islamic teaching, are needed. These policies should cover a range of aspects, from infrastructure provision to ongoing teacher training. Conducting regular training on AI technology and its use in teaching is essential to ensure that Islamic education teachers are not only technically prepared but also able to use this technology wisely and in accordance with Islamic values (Denver S. Laguitao et al., 2021).

Based on the findings, several context-specific implications can be drawn for Islamic education in Indonesia. Professional development for PAI teachers should go beyond general digital training and focus on AI-oriented pedagogy. This should stress practical classroom applications aligned with the national PAI curriculum. Authorities should prioritize equitable infrastructure, especially in under-resourced regions, through targeted funding, device provision, and improved internet access. Support systems, such as mentoring by technology experts and collaborative teacher communities, should help teachers create AI-supported instructional materials that remain pedagogically and spiritually meaningful. This study demonstrates that while Islamic education teachers in Indonesia exhibit a generally high level of readiness to adopt AI, significant gaps remain in technical competence and infrastructural support. Addressing these gaps through targeted training, policy intervention, and curriculum-aligned integration strategies is essential to ensure that AI adoption in Islamic education is both effective and contextually appropriate.

CONCLUSION

This study demonstrates that Islamic education teachers in Indonesia generally exhibit moderate to high readiness to integrate artificial intelligence (AI) into their teaching practices. The findings show a clear pattern: teachers display strong attitudinal openness and positive perceptions of AI's usefulness, while comparatively lower scores emerge in areas related to technical competence and infrastructural support. The distribution of responses indicates variation across teachers, suggesting that readiness is not uniform and is influenced by differences in digital literacy and access to technological resources.

Empirically, teachers' understanding of AI concepts and applications significantly contributes to their readiness levels, confirming that conceptual awareness is a foundational component of AI adoption. At the same time, disparities in hardware availability and internet access remain structural barriers, particularly in schools with limited resources. These findings highlight that readiness is shaped by both internal (knowledge and competence) and external (infrastructure and institutional support) factors.

This study contributes to the scientific literature by providing empirical evidence on AI readiness, specifically within the context of Islamic Religious Education (PAI), a field that has been underrepresented in technology integration research. By distinguishing between attitudinal readiness and operational readiness, the study offers a more nuanced framework for assessing teacher preparedness in faith-based educatioTo ensure AI integration in PAI optimally supports faith-based teaching, the study argues that: (1) training should prioritize pedagogical uses of AI for PAI teachers; (2) resource investment must address digital disparities; and (3) integration guidelines should protect Islamic education's core values.PAI curriculum.

In conclusion, while Islamic education teachers show promising readiness to adopt AI, systematic efforts to address competency gaps and infrastructural inequalities are essential to ensure sustainable, contextually appropriate AI implementation in Islamic education.

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