

Analysis of the Needs, Readiness, Strategies, and Challenges of Islamic Boarding Schools in Implementing AI in the Learning Curriculum

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Abstract

Islamic boarding schools play a central role in shaping competitive human resources in the digital era. However, the implementation of artificial intelligence in the learning curriculum at pesantren still faces various complex challenges, such as limited technological infrastructure, educator readiness, and supportive academic policies. These challenges raise questions about the extent of the needs and readiness of pesantren to adopt AI as part of the learning system. This research aims to analyze the needs and readiness of pesantren in implementing AI in the learning curriculum. The research method used is a literature study with a qualitative approach. The research results show that the need for AI implementation in Pesantren education is very urgent. This is primarily related to the enhancement of educators' competencies in digital literacy, the provision of supportive infrastructure, and the development of curricula that align with Islamic values. Educators in pesantren environments generally have a limited understanding of AI, and most do not yet have the skills to integrate this technology into the learning process. Meanwhile, from an infrastructure perspective, there are still many limitations in access to technological devices and stable internet networks. Moreover, some pesantren administrators are concerned that AI could shift traditional values in the Islamic education system, leading to resistance to change. The conclusion of this study shows that although the demand for AI in Pesantren education is very high, the level of institutional readiness is still limited, both in terms of teaching staff, infrastructure, and policies.

Keywords: AI, Islamic Boarding Schools, Curriculum, Institutional Readiness, Islamic Education.

Introduction

In an era of technological disruption marked by the rapid development of artificial intelligence (AI), the global education system is required to undergo substantial transformation¹. AI is no longer merely considered a technological innovation; it has become a strategic instrument in learning, educational decision-making, student performance analysis, and data-driven curriculum development². In developed countries, the implementation of AI in the education system has brought significant changes in creating personalized, flexible, and needs-based

¹ Miftah Hur Rahman Zh et al., "Needs Analysis of Development Fbo Media as a Support for Blended Learning in Al-Qur'an Hadits Lesson," *Jurnal Pendidikan Agama Islam Al-Thariqah* 9, no. 1 (2024): 16–32.

² Kashif Ahmad et al., "Data-Driven Artificial Intelligence in Education: A Comprehensive Review," *IEEE Transactions on Learning Technologies* 17 (2023): 12–31.

learning experiences for students³. Ideally, all educational institutions, including Islamic Boarding School as the oldest and most deeply rooted Islamic educational institutions in Indonesia, should participate in this wave of transformation to prepare a generation of Muslims who are not only religious and ethical but also possess digital competence and critical thinking skills as a foundation to face the challenges of the 21st century⁴.

However, the reality on the ground shows a significant gap between that ideal and the implementational reality in the environment of Islamic boarding schools⁵. Most Islamic Boarding School in Indonesia are still grappling with complex internal challenges, ranging from limited technological infrastructure, low digital literacy among educators and students, the absence of a digitalization-based curriculum let alone AI, to cultural resistance against things deemed capable of shifting traditional values⁶. In many cases, the digitalization of education in Islamic Boarding School is still limited to the use of learning aids such as educational videos or presentation applications, without any systemic and substantial integration of AI-based technology into the planning, implementation, and evaluation processes of learning⁷. This shows that the utilization of AI in Islamic Boarding School education has not yet reached a mature implementation stage, and it can even be said to be far from the ideal stage.

This condition certainly has significant implications. The unpreparedness of Islamic boarding schools in addressing AI-based technological advancements is not only a technical or administrative issue but can also lead to systemic lagging of these schools in the national education system⁸. As a result, Islamic Boarding School as an Islamic educational institution that has historically played a strategic role in shaping the nation's character, is at risk of losing its relevance in facing the increasingly digital and knowledge-differentiated dynamics of society⁹. Moreover, if there is no thorough analysis and strategy, the integration of AI could actually lead to internal resistance among the administrators and educators of the Islamic Boarding School, who are concerned about the erosion of spiritual values and classical scholarly traditions that have long been the hallmark of the Islamic Boarding School¹⁰. The

³ Aditi Bhutoria, "Personalized Education and Artificial Intelligence in the United States, China, and India: A Systematic Review Using a Human-In-The-Loop Model," *Computers and Education: Artificial Intelligence* 3 (2022): 100068, <https://doi.org/10.1016/j.caeai.2022.100068>.

⁴ Riadul Muslim Hasibuan, "Sistem Pendidikan Pondok Pesantren Salafiyah Di Era Modern (Pergumulan Antara Tradisionalisme Dan Modernisasi Dalam Sistem Pendidikan Pondok Pesantren Syekh Muhammad Dahlan Aek Hayuara Sibuhuan Kabupaten Padang Lawas Provinsi Sumatera Utara)," *Pekan Baru: Universitas Islam Negeri Sultan Syarif Kasim Riau*. (Universitas Islam Negeri Sultan Syarif Kasim Riau, 2013), [uri:%09http://repository.uin-suska.ac.id/id/eprint/2538%0A](http://repository.uin-suska.ac.id/id/eprint/2538%0A).

⁵ Miftahul Huda, "Strengthening Religious Moderation Through the Core Values of Islamic Boarding School Education," *Al-Hayat: Journal of Islamic Education* 8, no. 1 (2024): 59, <https://doi.org/10.35723/ajie.v8i1.458>.

⁶ Asep Ikhwan Awaluddin, *Sudah Siapkah Pendidikan Kita Memasuki Era Society 5.0* (EDU PUBLISHER, 2020).

⁷ Intan Zakiyyah, "Penggunaan Teknologi Digital Dalam Pembelajaran Pendidikan Agama Islam Perspektif Total Quality Management (Studi Kasus Islamic Development Network Dan Bina Qur'ani)," 2025.

⁸ Rizqi Daffa Nur Qoriah, Lestari Budianto, and Fachry Maulana Al Hidayat, "Ai Integration In Islamic Boarding Schools: Perspectives From Teachers," in *International Seminar On Islamic Education & Peace*, vol. 4, 2024, 15–29.

⁹ Margi Wahono et al., "The Role of Social Capital of Islamic Students (Santri) in Facing the Impacts of Globalization: A Case Study at Buntet Islamic Boarding School," *Society* 11, no. 2 (2023): 377–97, <https://doi.org/10.33019/society.v11i2.591>.

¹⁰ Biqih Zulmy, "Integritas Sistem Pendidikan Nasional Dengan Sistem Pendidikan Pesantren Di Madrasah Wustho Karangsucu Pondok Pesantren Al Hidayah Karangsucu Purwokerto" ((Master's thesis, Institut Agama Islam Negeri Purwokerto (Indonesia), 2021).

potential conflict between the values of digital modernity and traditional religious values has become one of the crucial issues that cannot be ignored in this context¹¹.

In that framework, it is important to conduct a needs analysis and a readiness analysis of Islamic boarding schools in implementing AI into the learning curriculum. The needs analysis serves to map out the requirements of the Islamic Boarding School in supporting AI-based digital transformation, ranging from infrastructure, human resources, curriculum content, to appropriate pedagogical strategies¹². Meanwhile, a readiness analysis is needed to measure the extent to which the Islamic Boarding School has internal capabilities, both in terms of technical, managerial, and cultural readiness to accept this change¹³. The synergy between these two approaches becomes crucial because it will provide a realistic and applicable roadmap for Islamic Boarding School to innovate technology-based curricula without having to abandon their Islamic identity and distinctive characteristics.

Several previous studies have indeed attempted to address the issue of the transformation of Islamic education in the context of digitalization. For example, Abdul Aziz (2017) in his research on the digitalization of Islamic Boarding School shows that the majority of Islamic Boarding School are still at the stage of using simple digital tools and have not yet reached systemic technology integration, let alone AI¹⁴. Hanafi et al. (2021) studied the readiness of Islamic Boarding School in the digital era and found that many Islamic Boarding School still do not have a structured and sustainable education digitalization strategy¹⁵. Research conducted by Siregar (2024) that examines changes in learning methods at Islamic boarding schools during the COVID-19 pandemic shows that the adoption of technology was only emergency-based and not supported by adequate technology and digital pedagogy training¹⁶. Meanwhile, Anggadwita et al. (2021) examined the potential use of AI in Islamic education, but their focus was more on higher Islamic educational institutions, not Islamic Boarding School as traditional entities¹⁷. Lastly, Maulida (2021) highlighted the low digital literacy of students and the cultural challenges of Islamic Boarding School in accepting technological innovations, but did not relate it to the context of an AI-based curriculum¹⁸.

¹¹ Afdhal Afdhal, "An Examination of Traditional Customs in Minangkabau Leadership Tradition: Continuity and Changes in the Modern Era," *Publicus: Jurnal Administrasi Publik* 1, no. 2 (2023): 119–34, <https://doi.org/10.30598/publicusvol1iss2p119-134>.

¹² Elihami Elihami et al., "Data-Driven Approaches in Islamic Quality Management and Education Technology for Advancing Sustainable Development Goals," *Jurnal Pendidikan Progresif* 14, no. 3 (2024): 1599–1616.

¹³ Samsul Arifin et al., "Kiai's Transformative Leadership in Developing an Organizational Culture of Islamic Boarding Schools: Multicase Study," *AL-ISHLAH: Jurnal Pendidikan* 16, no. 2 (2024): 2608–20, <https://doi.org/10.35445/alishlah.v16i2.5325>.

¹⁴ Abd Aziz, "Teknologi Pendidikan Islam," *Press STAI Darul Hikmah Bangkalan* 1, no. 1 (2017): 155.

¹⁵ Yusuf Hanafi et al., "The New Identity of Indonesian Islamic Boarding Schools in the 'New Normal': The Education Leadership Response to COVID-19," *Heliyon* 7, no. 3 (2021), <https://doi.org/10.1016/j.heliyon.2021.e06549>.

¹⁶ Kardina Engelina Siregar Kardina Engelina Siregar, "Islamic Boarding School Education in the Digital Era; Literature Review About Building a Relevant and Adaptive Curriculum," in *Proceeding: International Conference On Pesantren*, vol. 1, 2024, 46–62.

¹⁷ Grisna Anggadwita et al., "Empowering Islamic Boarding Schools by Applying the Humane Entrepreneurship Approach: The Case of Indonesia," *International Journal of Entrepreneurial Behaviour and Research* 27, no. 6 (2021): 1580–1604, <https://doi.org/10.1108/IJEBr-11-2020-0797>.

¹⁸ M Sukron Djazilan, Afib Rulyansah, and Jauharotur Rihlah, "Why AI Is Essential for the Future of Islamic Education: A Call for Ethical and Effective Implementation," *EDUKASIA: Jurnal Pendidikan Dan Pembelajaran* 5, no. 2 (2024): 201–16.

Although relevant, the weakness of those studies is the lack of a specific and in-depth approach to examining the needs and readiness of Islamic Boarding School in the context of an AI-based curriculum. Previous studies tend to be descriptive and partial, not integrating the analysis of needs and readiness simultaneously, and have not positioned AI as a transformational element in the design of Islamic education curricula in Islamic Boarding School. Moreover, the majority of studies do not specifically examine implementation strategies that align with the unique characteristics of Islamic Boarding School as educational institutions based on tradition and Islamic spirituality values.

The novelty in this research specifically aims to simultaneously and deeply analyze the needs and readiness of Islamic Boarding School in integrating AI into the learning curriculum. With this approach, it is expected to obtain a comprehensive and contextual picture of the opportunities, challenges, and strategies for curriculum transformation in Islamic Boarding School that are not only technologically compatible but also aligned with the principles of Islamic education. This novelty lies not only in the focus of the study on AI in the context of Islamic Boarding School but also in the dual analytical framework used to uncover the relationship between actual needs, institutional readiness, and relevant implementation models.

From the state of the art perspective, this research occupies an important position in the landscape of studies on the transformation of Islamic education in the digital era. This study targets the intersection between cutting-edge technological advancements (AI) and traditional value-based education systems (Islamic Boarding School), two domains that have often been in conflict. Thus, this research not only expands the academic discourse on AI in education but also offers practical contributions to the development of inclusive, adaptive, and future-oriented Islamic education policies. The integration of AI into the Islamic Boarding School curriculum, if designed and implemented wisely, will not only strengthen the competitiveness of Islamic Boarding School amidst global dynamics but also serve as an effort to modernize Islamic education while remaining rooted in universal spiritual and humanitarian values.

This research aims to thoroughly examine the needs and readiness of Islamic boarding school in implementing artificial intelligence (AI) technology into the learning curriculum. The main objective of this research is to comprehensively map various aspects that support or hinder the process of transforming the Islamic Boarding School curriculum towards AI-based digitalization. This includes an analysis of the condition of technological infrastructure, the competence of educators, institutional culture, as well as the direction and structure of the curriculum currently implemented. In addition, this research aims to provide conceptual and practical contributions to the discourse on the development of an Islamic education curriculum that is responsive to technological advancements, without neglecting Islamic values and local wisdom.

Methods

This research uses a qualitative approach with a literature study method to analyze the needs and readiness of Islamic boarding schools in implementing artificial intelligence into the learning curriculum. This approach was chosen because it allows researchers to deeply examine various concepts, policies, and practices of Islamic education related to digital transformation, particularly the use of AI technology in pesantren environments that have distinct characteristics, both epistemologically, culturally, and institutionally.

The data sources in this research consist of secondary data collected from various academic literature, including national and international peer-reviewed journal articles, scientific books, government policy documents related to the digitalization of education and the development of pesantren, as well as reports from technology education institutions. Literature was collected through search engines and scientific databases such as Google Scholar, ScienceDirect, DOAJ, and Garuda using keywords such as "Islamic boarding schools and artificial intelligence," "digitalization of Islamic education," "AI readiness in education," and "technology-based pesantren curriculum."

The data analysis techniques used two main methods, namely content analysis and critical analysis. Content analysis is used to identify thematic patterns in the literature, such as the application of AI in learning, the readiness of teachers and institutions, digital infrastructure, and cultural challenges in the pesantren environment. Meanwhile, critical analysis is used to deeply evaluate the extent to which each piece of literature contributes to the understanding of institutional readiness and the relevance of AI application in the context of Islamic education. This approach also considers aspects of socio-cultural resistance, resource limitations, and ethics in the use of technology in the pesantren environment.

Results and Discussion

1. Existing Conditions Islamic Boarding School in the Implementation of Technology and AI Readiness

a. Technology Infrastructure

Most Islamic boarding schools, whether still in the developing stage or already advanced, face many limitations in infrastructure, such as inadequate computer laboratories and unstable internet connectivity, which have become major obstacles in the integration of learning technology. These findings align with the Technological Pedagogical Content Knowledge (TPACK) model developed by Mishra and Koehler, where technological infrastructure is a fundamental supporting element in the integration of pedagogical knowledge, content, and technology. Without adequate infrastructure support, teachers will struggle to build productive connections between lesson content, pedagogical strategies, and technological tools.

Study by Suyanto (2021)¹⁹ also shows that the limitations of technological infrastructure are one of the main hindering factors in the implementation of technology-based learning in traditional educational institutions. In the context of Islamic Boarding School, this limitation is not just technical, but also has implications for the limited frequency and intensity of digital media use in the learning process.

b. Human Resource Readiness and Digital Competence

The readiness of human resources is a crucial aspect in the process of digital transformation in education. This research reveals a significant disparity between senior teachers and the younger generation, both young teachers and students, in terms of digital literacy. Senior teachers, especially those with a religious education background, are not yet accustomed to digital approaches, even at a basic level such as using PowerPoint. On the other hand, there is interest and openness among students and young teachers towards

¹⁹ B Suyanto, "Tantangan Implementasi Kurikulum Merdeka Di Sekolah Perkotaan," *Jurnal Manajemen Pendidikan* 13(1), no. 1 (2021): 73-85.

the use of technology, including AI, but it has not yet been facilitated with adequate training programs.

This aligns with the theory of pedagogical digital competence, which emphasizes that a teacher's readiness to integrate technology is not only related to technical knowledge but also to a deep pedagogical understanding and adaptation to technology-based classroom dynamics²⁰. Then Study by Yanzhi Zhao, Mingsi Zhao, and Fengyu Shi (2023)²¹, also emphasizes the importance of institutional support in the form of structured training to improve technology literacy among educators Without systematic training, mastering AI, which requires an understanding of data, algorithms, and the ethics of technology use, will be difficult to achieve. Therefore, educational institutions such as Islamic Boarding School need a more structured and targeted strategy for enhancing human resource capacity.

c. Institutional Culture

The institutional culture in Islamic Boarding School, which emphasizes spiritual values and the exemplary nature of teachers, normatively tends to view technology with caution. Expression like "*AI cannot educate the heart*" reflect cultural resistance to technology that is perceived to potentially displace the central role of teachers in moral and character formation.

This phenomenon can be analyzed through the concept of cultural lag as proposed by Ying Li et al (2019)²², namely, the delayed adaptation of social and cultural systems to technological advancements. In the context of Islamic Boarding School, traditional values have not yet fully accommodated technological advancements productively, especially in defining the role of AI in learning without neglecting the dimensions of morality and spirituality.

However, the more progressive views of younger teachers indicate the potential for cultural transformation, as suggested by the *theory of institutional isomorphism DiMaggio & Powell* that changes within an institution often begin with micro actors who have higher exposure to external dynamics, in this case, global technology and educational innovation²³.

d. The Dialectic of Tradition and Modernity

The discourse on the integration of AI in Islamic Boarding School cannot be separated from the dialectic between tradition and modernity. As stated by RFBF Yasin and Mohd Shah Jani (2013)²⁴, Modernization in Islamic education must be carried out with a critical approach that does not strip away the core values of Islamic teachings. In this context, AI is not meant to replace the role

²⁰ Ika Mustika et al., *Menjadi Pendidik Ideal Abad 21* (Bayfa Cendekia Indonesia, 2024).

²¹ Yanzhi Zhao, Mingsi Zhao, and Fengyu Shi, "Integrating Moral Education and Educational Information Technology: A Strategic Approach to Enhance Rural Teacher Training in Universities," *Journal of the Knowledge Economy* 15, no. 3 (2023): 15053–93, <https://doi.org/10.1007/s13132-023-01693-z>.

²² Ying Li et al., "Enhancing the Adaptive Capacity for Urban Sustainability: A Bottom-up Approach to Understanding the Urban Social System in China," *Journal of Environmental Management* 235 (2019): 51–61, <https://doi.org/10.1016/j.jenvman.2019.01.044>.

²³ Arnout van de Rijt, "Microfoundations of Institutional Change," *Rationality and Society* 29, no. 1 (2017): 63–68, <https://doi.org/10.1177/1043463116685667>.

²⁴ RFBF Yasin and Mohd Shah Jani, "Islamic Education: The Philosophy, Aim, and Main Features," *International Journal of Education and Research* 1, no. 10 (2013): 1–18.

of teachers, but rather as a tool to support a more contextual and adaptive learning process to meet the needs of the times²⁵.

Therefore, it is important for Islamic Boarding School to build a technological narrative that is not contradictory to Islamic values, but rather strengthens the vision of integrative education as outlined in *maqāṣid al-syarī'ah*. The integration of AI can be directed to support the noble goals of Islamic education, such as the development of intellect (*ḥifẓ al-'aql*), the preservation of the soul (*ḥifẓ al-nafs*), and the enhancement of community welfare (*maṣlaḥah*).²⁶

2. Analysis of the Needs and Readiness Islamic Boarding School for AI Implementation in the Curriculum

This research reveals that many Islamic boarding schools show awareness and internal motivation to undergo digital transformation, but still face limitations in terms of infrastructure, human resources, and curriculum development. Efforts to implement artificial intelligence in the learning system require comprehensive needs mapping and context-based readiness strategies.

a. Infrastructure Needs

Mapping infrastructure needs shows a high urgency in the procurement of hardware and software, as well as the improvement of internet network quality as the main prerequisite for AI implementation. In the framework of the Technology Readiness Index theory, it is stated that the condition of Islamic Boarding School can be classified at the early stage readiness level, which is a condition where the institution has an interest in technology but is still limited by a lack of physical and technical resources²⁷.

Research conducted by Muhammad Nur Hakim and Achmad Anwar Abidin (2024)²⁸ shows that the success of technology integration in education highly depends on the availability of adequate facilities and ongoing technical support. In the context of Islamic Boarding School, the need for infrastructure is not merely technical but also involves equitable access and operational sustainability. Therefore, strengthening infrastructure becomes a fundamental prerequisite before moving on to the integration of advanced pedagogical technologies such as AI.

b. Human Resource Needs and Contextual Digital Literacy

The human resources aspect plays a central role in the technology adoption process. This research reveals show that educators are motivated to learn and adopt AI, but feel the need for gradual, locally-based training that

²⁵ Ivon Arisanti, Muhammad Kasim, and Budi Mardikawati, "Peran Aplikasi Artificial Intelligences Ai Dalam Mengembangkan Dan Meningkatkan Kompetensi Profesional Dan Kreatifitas Pendidik Di Era Cybernetics 4.0," *Innovative: Journal Of Social Science Research* 4, no. 1 (2024): 5195–5205.

²⁶ Aditya Aulia Rahman, "Peran Pendidikan Pesantren Dalam Meningkatkan Kecerdasan Emosional Santri (Studi Kasus Di Pondok Pesantren Nurul Hidayah Sotek)," *Al 'Ulum: Jurnal Pendidikan Islam* 21, no. 1 (2024): 155–62.

²⁷ Basharat Ali, Nazim Baluch, and Zulkifli Mohamed Udin, "The Moderating Effect of Religiosity on the Relationship between Technology Readiness and Diffusion of E-Commerce," *Modern Applied Science* (Doctoral dissertation, Universiti Utara Malaysia, 2015), <https://doi.org/10.5539/mas.v9n12p52>.

²⁸ Muhammad Nur Hakim and Achmad Anwar Abidin, "Platform Merdeka Mengajar: Integrasi Teknologi Dalam Pendidikan Vokasi Dan Pengembangan Guru," *Kharisma: Jurnal Administrasi Dan Manajemen Pendidikan* 3, no. 1 (2024): 68–82, <https://doi.org/10.59373/kharisma.v3i1.47>.

does not conflict with Islamic values. This reflects the importance of a contextual digital literacy approach, which is technology literacy that takes into account the social, cultural, and religious backgrounds where the technology is adopted²⁹.

Research conducted by Chan Min Kim et al. (2013)³⁰ emphasizing that teachers' belief in the value and benefits of technology greatly influences its successful integration into learning. In the context of Islamic Boarding School, technology training conducted normatively and in accordance with religious law will be more accepted and encourage a positive attitude towards AI. This serves as an important foundation for formulating capacity-building programs that are inclusive, participatory, and tiered.

c. The Need for Curriculum Development and Value Integration

Curriculum transformation becomes a necessity in meaningfully adopting AI in Islamic Boarding School education. This research reveals show the need for AI integration not only as a learning aid but also as substantive material in strengthening 21st-century skills, without sacrificing the Islamic values that are the identity of Islamic Boarding School. This approach aligns with the concept of an integrative-transformative curriculum as developed by Azyumadi Azra and further developed in the context of Islamic Boarding School by Chan Min Kim et al. (2013)³¹, namely, the effort to harmoniously integrate Islamic sciences (*naqliyah*) and modern sciences (*aqliyah*) with a focus on empowering the community.

Furthermore, the orientation of the curriculum can be directed towards fulfilling the *maqāṣid al-syarī'ah* such as *ḥifẓ al-dīn* (protection of religion) and *ḥifẓ al-'aql* (protection of intellect) through an approach that accommodates AI as a means of developing common sense, logic, and critical thinking skills from an Islamic perspective³². For example, the use of AI in reading classical texts (*yellow book*) automatic translation, and adaptive learning to understand specific historical-religious contexts can become an integral part of the curriculum.

In this context, Islamic Boarding School can become a unique learning laboratory, where modern technology such as AI is absorbed and interpreted within the framework of Islamic ethics, rather than merely being mechanically transplanted from external systems.

3. Implementation Strategies and Challenges of AI Integration in Islamic Boarding School Curriculum

The strategy for implementing artificial intelligence (AI) in the Islamic Boarding School environment requires an approach that is not only technical but also socio cultural and theological. Islamic boarding school as an educational

²⁹ Shlomit Hadad, Abeer Watted, and Ina Blau, "Cultural Background in Digital Literacy of Elementary and Middle School Students: Self-Appraisal versus Actual Performance," *Journal of Computer Assisted Learning* 39, no. 5 (2023): 1591–1606, <https://doi.org/10.1111/jcal.12820>.

³⁰ Chan Min Kim et al., "Teacher Beliefs and Technology Integration," *Teaching and Teacher Education* 29, no. 1 (2013): 76–85, <https://doi.org/10.1016/j.tate.2012.08.005>.

³¹ Fitriyatul Hanifiyah Nasrodin, "Implikasi Integrasi Imtaq Dan Iptek Dalam Perkembangan Pendidikan Islam," *Fajar : Jurnal Ilmu Pendidikan Islam* 1, no. 1 (2021): 1–14.

³² Mardiani Pane and Hery Noer Aly, "Orientasi Dan Fungsi Kurikulum Dalam Pendidikan," *Journal on Education* 5, no. 3 (2023): 6165–71, <https://doi.org/10.31004/joe.v5i3.1388>.

institution based on Islamic tradition, requires a framework that is gradual, contextual, and adaptive to the values of the Islamic Boarding School. These findings indicate that the strategies implemented cannot be generic but must consider the internal characteristics of the Islamic Boarding School, the readiness of human resources, and the unique institutional dimensions.

a. Strategy for Implementing AI in the Islamic Boarding School Curriculum

The gradual implementation of AI aligns with the diffusion of innovations approach, which states that the adoption of technology in social institutions must pass through five stages: knowledge, persuasion, decision, implementation, and confirmation³³. In the context of Islamic Boarding Schools, these stages must be adjusted to the empirical conditions and local values that exist within them.

1) Preparation Phase (Education and Basic Technology Literacy)

The initial phase aims to build collective awareness about the benefits of AI and to correct any negative perceptions that may arise. As emphasized by Dinda Rizki Andini and Muhammad Sirozi (2024)³⁴, Resistance to technology is often rooted in ignorance and concern over changes in values. Therefore, education that combines basic digital literacy with Islamic values such as etiquette and digital trust becomes an important strategic foundation.

2) Intervention Phase (Applicative and Collaborative Training)

The intervention phase is marked by functional training tailored to the context of Islamic Boarding School. The practice-based and collaborative (peer learning) training strategy allows teachers to directly experience the process of integrating technology into learning. This training model aligns with the principles of situated learning theory, which emphasizes the importance of learning in real and social contexts³⁵.

The implementation of chatbots, automatic correction applications, and AI-based grade management is a feasible first step with a manageable level of complexity.

3) Implementation Phase (Curriculum Integration and Infrastructure Support)

This stage marks the operational phase of the curriculum transformation that incorporates AI as a learning aid and as 21st century literacy content. This integrative curriculum supports the use of AI in understanding classical texts (*turāth*) more efficiently, but still with guidance from teachers to ensure that the interpretation process remains contextual and theological. This model aligns with a value-based blended learning approach, which combines digital tools and direct pedagogical interaction based on Islamic values³⁶.

³³ Alan R. Weil, "Diffusion of Innovation," *Health Affairs* 37, no. 2 (2018): 175–175, <https://doi.org/10.1377/hlthaff.2018.0059>.

³⁴ Dinda Rizki Andini and Muhammad Sirozi, "Integrasi Kearifan Lokal Dalam Perencanaan Pengembangan Kurikulum Pendidikan Islam," *Jurnal Inovasi, Evaluasi Dan Pengembangan Pembelajaran (JIEPP)* 4, no. 3 (2024): 465–71.

³⁵ Hari Wibowo, *Pengantar Teori-Teori Belajar Dan Model-Model Pembelajaran* (Puri cipta media, 2020).

³⁶ Hasmiza Hasmiza, "Model Kurikulum Pendidikan Islam Di Era Digital: Mengoptimalkan Teknologi Untuk Pembelajaran Yang Inovatif," *Research and Development Journal of Education* 11, no. 1 (2025): 164–77.

b. Challenges of Implementing AI in the Islamic Boarding School Curriculum

Although there is a spirit of reform within the Islamic Boarding School, the challenge of AI integration cannot be ignored. The challenge is multidimensional, encompassing technical, cultural, and managerial aspects.

1) Technical Challenges and Infrastructure

The limited hardware, weak internet network, and the unavailability of supporting infrastructure are the main obstacles. The study conducted by Assefa et al (2024) in the context of developing countries shows that the success of digital transformation in education is greatly influenced by digital equity, namely equal access to technology³⁷. The disparity in facilities at Islamic boarding schools increases the risk of digital exclusion, especially for students who live in dormitories or come from less affluent families.

2) Cultural and Ideological Challenges

Resistance to AI is largely rooted in concerns about the displacement of the traditional role of teachers and the loss of the spirit of Islamic education. These concerns are valid both theologically and psychosocially, as explained by Ofiani & Mardalena (2024), who emphasize that Islamic education is not just a transfer of knowledge, but also *ta'dīb*, the process of internalizing etiquette³⁸. Therefore, internal theological dialogue is very important to ensure that AI is not positioned as a foreign entity, but rather as a *wasīlah* (a supportive tool) that upholds the *maqāṣid al-syarī'ah* in education.

3) Managerial Challenges and Internal Policies

The hierarchical and bureaucratic structure of Islamic Boarding School leadership presents a unique challenge in decision-making related to technological innovation. The lack of a specific budget allocation for technology development indicates the need for internal policy advocacy oriented towards long-term digital transformation. In this case, the school-based technology leadership strategy becomes important, namely encouraging proactive institutional leadership based on a clear digital vision.³⁹

One of the main studies relevant to this research The research conducted by Zawacki-Richter et al. (2024) in the springer journal also supports that argument. In a systematic review study of 146 articles on AI in higher education, it was found that the most widely used applications of AI are for automated assessment, chatbot-based learning support, and predicting student achievement. This research emphasizes the importance of a phased approach in adopting AI, starting with simple integrations that are easy for educators to understand and implement.. For pesantren, this can be translated through the use

³⁷ Yalalem Assefa et al., "Rethinking the Digital Divide and Associated Educational in(Equity) in Higher Education in the Context of Developing Countries: The Social Justice Perspective," *International Journal of Information and Learning Technology* 42, no. 1 (2024): 15-32, <https://doi.org/10.1108/IJILT-03-2024-0058>.

³⁸ Oktawini Ofiani and Mardalena, "Relevansi Pemikiran Pendidikan Jamaluddin Al-Afgani Dalam Konteks Pendidikan Islam Kontemporer," *NUR EL-ISLAM, : Jurnal Pendidikan Dan Sosial Keagamaan* 11, no. 1 (2024): 1-24, <https://doi.org/10.51311/nuris.v11i1.552>.

³⁹ Melissa A Brunson, *Technology Leadership Competencies for Elementary Principals* (Bowie State University, 2015).

of Islamic chatbots, automatic memorization correction applications, to AI-based grading systems that remain under the supervision of teachers.⁴⁰

The research by M Agus Salim and Riska Bayu Aditya (2025) titled "Integration of Artificial Intelligence in Islamic Education: Trends, Methods, and Challenges in the Digital Era." The findings indicate a significant increase in the use of artificial intelligence (AI) since 2018, with descriptive analysis methods being the most frequently used approach. The main topics widely discussed include the integration of AI in the learning of the Qur'an and Hadith, the development of AI-based learning media, and the digitization of Islamic manuscripts. The main challenges faced include limited technological infrastructure, ethical considerations, cultural sensitivity, and the technological gap between urban and rural areas.⁴¹

Then Research from Muslim academics is also beginning to fill this gap. One of them is a study by Umar Syamsudin (2025) titled Exploration of Artificial Intelligence (AI) in Increasing Student Collaboration in Digital-Based Islamic Education Learning. This study shows that AI has the potential to enhance student collaborative learning through personalized learning, quick access to learning resources, and the provision of simulations and visualizations. The collaborative learning process is carried out in three stages: planning, implementation, and evaluation. In the implementation stage, students are encouraged to work in groups through discussions, problem-solving, and projects, while being guided using AI such as chatbots, intelligent recommendation systems, and adaptive learning platforms. However, this research is still limited to descriptive analysis and narrow data, so further studies with a broader scope are needed, including technology infrastructure, types of AI used, and teachers' ability to manage it.⁴²

Conclusion

Based on the research conducted, it can be concluded that the implementation of artificial intelligence (AI) at the Islamic boarding school is still in the early stages with various quite complex challenges. However, this boarding school also shows great potential to move towards technology-based educational transformation if its implementation strategy is carried out appropriately and contextually. In general, the readiness of Islamic boarding schools to adopt AI is still hindered by various factors, especially the limitations of technological infrastructure, the low digital competence among educators, and the institutional culture that tends to maintain a traditional approach in the learning process. This becomes the main challenge that must be faced if Islamic boarding schools want to adapt to technological developments without losing their Islamic identity.

For that reason, serious efforts are needed to strengthen digital infrastructure, provide adequate training to educators and students, and reform the curriculum to integrate Islamic values with modern technology. This step must be

⁴⁰ Olaf Zawacki-Richter et al., "New Advances in Artificial Intelligence Applications in Higher Education?," *International Journal of Educational Technology in Higher Education* 21, no. 1 (2024): 32, <https://doi.org/10.1186/s41239-024-00464-3>.

⁴¹ M Agus Salim and Riska Bayu Aditya, "Integration of Artificial Intelligence in Islamic Education : Trends , Methods , and Challenges in the Digital Era" 3, no. 01 (2025): 74–89.

⁴² Umar Samsudin, "Exploration of Artificial Intelligence (AI) in Increasing Student Collaboration in Digital-Based Islamic Education Learning," *Al-Hayat: Journal of Islamic Educatio* 9, no. 1 (2025): 218.

accompanied by a gradual and adaptive approach, starting from strengthening basic digital literacy, developing collaborative and technology-based learning methods, to creating a learning ecosystem that can meet the needs of the times while maintaining Islamic spirituality. Another equally important challenge is the ideological resistance to the use of AI, which arises from concerns about the displacement of teachers' roles and the loss of the authority of Islamic values in education. Therefore, visionary and inclusive leadership in Islamic Boarding School is needed, capable of opening a dialogue between tradition and modernity, and encouraging the spirit of *ijtihad* in responding to the changes of the times.

With the right approach, Islamic boarding schools have the opportunity to become pioneers in the development of technology-based Islamic education models. AI can not only be utilized to enhance the effectiveness of learning but also as a tool to expand the reach of *da'wah* and empower the community more broadly. If integrated wisely, artificial intelligence can become a strategic tool in building a more relevant, holistic, and competitive Islamic education in the digital era, without neglecting the values of *maqāṣid al-syarī'ah* which are the main foundation of Islamic education.

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