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DEEP LEARNING BASED ISLAMIC RELIGIOUS EDUCATION: OPPORTUNITIES, CHALLENGES, PEDAGOGICAL IMPLICATIONS IN DIGITAL AGE

Annotation. *In the digital age, Islamic Religious Education (PAI) in Indonesia faces the dual challenge of preserving traditional spiritual values while adapting to the technological competencies required by the 21st century. Rapid digitalization necessitates a pedagogical shift from passive instruction to dynamic, technology-mediated engagement. This study aims to comprehensively analyze the implementation of deep learning-based PAI methods through a qualitative library research approach, synthesizing academic literature from 2015-2025. It focuses on exploring how deep learning technologies, specifically AI driven personalization and immersive tools, can transform student learning experiences, deepen religious understanding, and foster Islamic character formation. The practical importance of this work lies in identifying actionable strategies to overcome critical barriers such as infrastructure limitations and teacher hesitation. Scientifically, it addresses the gap between theoretical constructivism and the actual application of Artificial Intelligence in religious pedagogy. The study's primary value is the development of a novel conceptual framework that positions technology not as a replacement for the teacher but as a «cognitive partner» in spiritual development. It contributes to the field by offering a roadmap for policymakers to integrate deep learning without compromising the sanctity of religious transmission, ensuring that PAI remains relevant and effective for the modern Muslim learner.*

Keywords: *deep learning, Islamic religious education, educational technology, personalized learning, Islamic character, artificial intelligence in religion, pedagogical innovation.*

Introduction

Islamic Religious Education (PAI) constitutes a fundamental component of the Indonesian education system, designed to shape the character, morals, and spirituality of students based on Islamic values. In a digital era characterized by rapid technological advancement, the education system faces significant pressure to adapt to 21st century learning needs, which demand approaches that are more innovative, interactive, and student centered. The relevance of this topic is underscored by the urgent need to harmonize traditional spiritual pedagogy with modern cognitive demands.

However, a review of existing literature reveals a significant disconnect between current technological capabilities and PAI practice. Traditional approaches to PAI

described by predecessors are frequently teacher centered, focusing on the rote memorization of religious texts with insufficient emphasis on meaning or practical application. While models like the *Kuttab* still emphasize the priority of *Adab* (etiquette) before knowledge [1], recent scholarship in technology has predominantly focused on the digitization of teaching materials (conventional e-learning) or social media usage in *da'wah*. There is a notable lack of research regarding the implementation of «Deep Learning», defined here as both a pedagogical approach emphasizing profound understanding and as Artificial Intelligence technology enabling personalization.

This existing gap creates a problem situation: PAI instruction risks becoming obsolete if it cannot leverage advanced algorithms for theological personalization and adaptive character formation. The integration of deep learning technology into PAI becomes highly relevant as an endeavor to create learning experiences that are meaningful and aligned with contemporary demands.

Given the nascent stage of AI adoption in Indonesian religious schools, a robust theoretical framework is required to guide implementation before widespread empirical trials can be effectively conducted. This study provides that necessary conceptual scaffolding.

Consequently, this study aims to comprehensively analyze the implementation of deep learning based PAI methods. This research is significant as it merges technological innovation with Islamic education, filling a critical gap in the literature by proposing an integration model that positions technology not merely as a tool, but as a cognitive partner. By exploring the impact of deep learning on religious comprehension and character formation, this work offers a novel contribution to the field, providing practical recommendations for effective and sustainable implementation in Indonesia’s unique educational landscape.

Materials and methods

Research Design and Progress

This study employs a qualitative library research approach (*literature review*) to comprehensively analyze the intersection of Artificial Intelligence and Islamic pedagogy. The research progress followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) conceptual flow: (1) Identification of records via database searching; (2) Screening of titles and abstracts; (3) Eligibility assessment of full texts against inclusion criteria; and (4) Inclusion of studies for qualitative synthesis.

Data Collection and Material Description

Data sources were systematically collected from reputable academic databases, including Scopus, Web of Science, Google Scholar, and DOAJ. The search timeline focused on the decade of rapid AI advancement (2015–2025) to ensure technological relevance. The search strategy utilized Boolean operators with bilingual keywords

(English/Indonesian) such as: “Deep Learning in Islamic Education” AND “Artificial Intelligence,” “Personalized Learning” AND “PAI,” and “AI for Character Formation.”

The research material consists of 50 selected core documents (qualitative and quantitative terms), comprising peer reviewed journal articles (70%), conference proceedings (20%), and academic books (10%).

To meet the criterion of analyzing fundamental and new works by domestic and foreign scientists, this study critically reviews seminal contributions, including:

1. Foreign/Global Context: Works by Fullan et al. [2] on deep learning pedagogy and Bankins & Formosa [3] on ethical AI. These studies establish the global theoretical framework but often lack specific application to Islamic theology.

2. Domestic/Indonesian Context: Recent empirical studies by Purnama & Ulfa [4] on digital Qur'an memorization tools; Sulaiman [5] on blended learning models; Damayanti & Supriyanto [6] on Project Based Learning effectiveness; and Faisal [7] on adaptive learning systems.

3. Theological & Ethical Discourse: Critical analyses by Ahmed [8] and Zuhri [9] regarding AI and Fatwas, and Fathurrahman & Huda [10] on generative AI risks.

Analysis of Works and Research Gaps

An analysis of these 10+ fundamental works reveals a significant gap: while foreign scholars provide robust technological frameworks, they often neglect the spiritual dimension of *Adab*. Conversely, domestic studies often focus on *digitization* (e-learning) rather than *intelligence* (AI adaptation). This study fills that gap by synthesizing these two distinct bodies of knowledge into a unified integration model.

Data Analysis Method

Data analysis utilized content analysis techniques [11] envying three stages: (1) Open Coding to identify raw themes (e.g., «infrastructure», «personalization»); (2) Axial Coding to relate categories (e.g., linking «AI tutoring» to «student engagement»); and (3) Selective Coding to construct the final conceptual framework. This rigorous method allows for a deep interpretation of text data to identify recurring themes and construct a validated framework for integrating deep learning into PAI curricula.

Results and discussion

Theoretical Framework of Deep Learning in Islamic Religious Education (PAI)

Constructivism in the Digital Age: From Passive Reception to Active *Ijtihad*

A synthesis of contemporary educational theory suggests that the integration of deep learning technologies into Islamic Religious Education (PAI) represents a fundamental shift in pedagogical philosophy, moving from behaviorist transmission models to constructivist engagement. Our analysis of the literature indicates that in traditional PAI settings, instruction has historically skewed towards the passive reception of dogma, where the teacher (*Muallim*) serves as the sole repository of truth. While this method preserves

the integrity of transmission (*Sanad*), our findings suggest it increasingly struggles to engage the «digital native» generation who are cognitively wired for interactivity.

This study identifies Constructivism as the critical theoretical bridge between Islamic education and Artificial Intelligence. Unlike previous frameworks that viewed technology merely as a delivery mechanism, constructivism posits that knowledge is not acquired but constructed by the learner through interaction. In the context of Islamic pedagogy, this aligns powerfully with the concept of *Tafakkur* (deep reflection) and the spirit of *Ijtihad* (independent reasoning). The learner must not merely memorize the text but internalize it to derive meaning applicable to their specific lived reality.

Vygotsky's (1978) social development theory is particularly relevant when analyzing AI-mediated PAI. Vygotsky emphasized the role of the «More Knowledgeable Other» (MKO) in the Zone of Proximal Development (ZPD). Our synthesis reveals that in a digital PAI environment, deep learning systems function as a scalable, pseudo-MKO. Unlike a human teacher who cannot simultaneously address the distinct ZPD of 40 students, an AI tutor can recognize when a student struggles with the abstract concept of *Qada and Qadar* versus a linguistic struggle with Arabic syntax. The system instantly provides scaffolding to bridge the specific cognitive gap. Crucially, this study argues that this technological scaffolding does not replace the human teacher's role in spiritual mentorship (*Suhba*) or the transmission of *Barakah*. Instead, it augments the cognitive aspect, liberating classroom time for higher-order spiritual discourse and moral modeling.

Connectionism: The Neural Architecture of Religious Literacy

While constructivism explains the *meaning making* process, connectionism explains the *mechanism* of learning in a networked, digital age. Learning is the process of connecting specialized nodes or information sources, and the capacity to know more is more critical than what is currently known. Deep learning technology, which is built upon the architecture of Artificial Neural Networks (ANNs), structurally mimics this biological process.

In the specific context of PAI instruction, this framework explains how students master complex religious data systems, such as the chains of *Hadith* transmission (*Isnad*) or the intricate rules of inheritance (*Faraid*). Just as an ANN adjusts the weights of connections based on error rates, deep learning platforms analyze student performance data to identify weak cognitive links. For instance, if a student consistently mispronounces the *Ikhfa* rule during Qur'anic recitation, a deep learning system identifies the specific neural pathway associated with nasalization sounds as the weak node. It then strengthens this «learning node» by increasing the frequency of specific exercises. This creates a highly optimized feedback loop where technology facilitates the repetitive practice (*Tikrar*) traditionally valued in Islamic education but enhances it with precision analytics that prevent the fossilization of incorrect patterns. This represents a modernization of

the *Talaqqi* method, ensuring that the «drill and practice» element of religion is efficient, measurable, and adaptive.

Deep Learning as a Pedagogical Strategy vs. Surface Learning

It is critical to conceptually distinguish «deep learning» as a technology from «deep learning» as a pedagogical strategy. In many Indonesian educational contexts, surface learning often prevails, characterized by the rote memorization of *Fiqh* rules without a corresponding understanding of the *Maqasid al Shari'ah* (Objectives of Islamic Law).

This study argues that the convergence of AI and deep pedagogy offers a tangible solution to this historical deficit. Deep learning pedagogy, as conceptualized by Fullan et al. (2018), emphasizes the «6Cs»: character, citizenship, collaboration, communication, creativity, and critical thinking. By utilizing AI systems to handle lower order cognitive tasks (remembering and understanding), the pedagogical focus in the classroom can shift entirely to higher order tasks (analyzing, evaluating, and creating). For example, instead of spending a lesson ensuring every student has memorized the definition of *Riba*, the AI ensures this foundational knowledge is achieved outside of class. The classroom session is then devoted to analyzing modern fintech products to determine their Shari'ah compliance based on the principles mastered. This shift transforms PAI from a static history lesson into a dynamic, relevant ethical framework for modern living.

Implementation of Deep Learning in PAI Instruction

Digital Platforms and Interactive Applications: The Shift to Adaptive Ecosystems

Current research trends indicate that the implementation of deep learning in PAI is transitioning from static e-learning to dynamic ecosystems driven by algorithms. The most significant technical advancement identified is the application of Natural Language Processing (NLP) to Islamic texts. Traditional digital Qur'ans are merely digitized text. Deep learning-based applications, however, are now capable of analyzing the semantic and syntactic structure of Arabic verses. They offer students not just translations, but context-aware linguistic breakdowns that explain *why* a word is in the accusative case or how a specific verb form implies intensity. This democratizes access to the linguistic beauty of the Qur'an (*I'jaz*), which was previously accessible only to students with years of Arabic grammar training.

Furthermore, Voice Recognition technology has matured to the point of becoming a viable digital teaching assistant. Applications utilizing Automatic Speech Recognition (ASR) trained on Qur'anic datasets can now provide real time, granular feedback on recitation with high accuracy. As noted by Purnama & Ulfa (2024), features such as flexible quiz modes and audio playback are not merely convenience tools; they fundamentally alter the memorization curve. They allow for «micro learning» sessions that fit into fragmented schedules, turning waiting times into productive *Muraja'ah* (review) sessions. Additionally, blended learning modules (Sulaiman, 2024) create a continuous learning

loop where data from online interactions informs physical classroom strategy, creating a seamless educational experience.

Project Based and Collaborative Learning (PBL)

Deep learning technology acts as a force multiplier for Project Based Learning (PBL) in PAI. In a conventional setting, a PBL assignment might be limited to «researching Islamic history» using library books. With deep learning tools, students can engage in data driven inquiry. For example, students can use basic AI text mining tools to analyze sentiment in social media regarding Islamic topics to design an evidence based *Da'wah* campaign that targets specific societal misconceptions.

Research indicates a significant increase in learning outcomes when PBL is supported by these technologies. Collaborative platforms facilitate «Digital Halaqahs», where students from diverse geographic locations can debate complex ethical issues such as bioethics or Islamic finance. These forums are often moderated by AI agents that can flag potential misconceptions or identify radicalized rhetoric for teacher review. This fosters a form of «Collective Intelligence» where the group's shared understanding exceeds individual capabilities. It teaches students the Islamic etiquette of disagreement (*Adab al Ikhtilaf*) in a digital space, a core competency for maintaining social harmony.

Personalized Learning and Learning Analytics

The «one size fits all» approach has long plagued PAI, where students with varying levels of religious literacy are taught the same material at the same pace. This leads to boredom for advanced students and frustration for beginners. Deep learning introduces the possibility of radical personalization.

Adaptive learning algorithms utilize Learning Analytics to build a comprehensive «Knowledge Graph» for each student. If a student demonstrates high proficiency in *Akhlaq* (ethics) but low retention in *Tarikh* (history), the system automatically adjusts the learning pathway. It might present historical content through interactive storytelling rather than dry date memorization. This personalization extends to *metacognition:* the system helps students understand *how* they learn best. Teachers are provided with dashboards that visualize these patterns, shifting their role from delivering content to diagnosing learning obstacles. This data driven intervention ensures that no student is left behind due to the pace of instruction, aligning with the Islamic principle of *Adl* (justice) in education.

Impact on Conceptual Understanding and Character Formation

Enhancement of Understanding of Key Islamic Concepts

Analysis of recent studies suggests that the implementation of deep learning has demonstrated a profound capacity to make abstract theological concepts tangible. Concepts such as the «unseen» (*Al Ghaib*), the descriptions of Paradise and Hell, or complex inheritance laws (*Faraid*) are often difficult to grasp through text alone. Through

Augmented Reality (AR) and Virtual Reality (VR), these concepts are visualized and experienced.

Students can virtually experience the geography of the Battle of Badr to understand the strategic context of the Prophet's decisions, creating a spatial memory of history. They can visualize the mathematical distribution of inheritance in 3D charts that shift in real time. This visualization fosters a transition from «knowledge by authority» (*Ilm al Yaqin*) to something closer to «knowledge by witnessing» (*Ain al-Yaqin*). Interactive methods encourage students to pose critical questions. Instead of passively accepting a *Fatwa*, students can use AI-powered semantic search to explore the diverse *dalil* (evidence) used by different schools of thought (*Madhabs*). This leads to a more nuanced, tolerant, and comprehensive understanding of Islamic jurisprudence.

Islamic Character Formation and Value Development

A primary concern in the digitalization of PAI is whether technology dilutes the spiritual transmission of *Adab* (etiquette) and character. Can a machine teach morals? Our review finds a consensus that, paradoxically, deep learning can strengthen character formation if designed correctly. While an AI cannot *model* character (as it has no soul), it can simulate ethical dilemmas with high fidelity.

Gamified learning platforms present students with complex, branching scenarios, such as business ethics dilemmas involving *Halal* growth versus *Riba*. The student must make decisions, and the system provides immediate consequences based on Qur'anic principles. This allows students to «practice» righteousness in a safe, simulated environment. Furthermore, collaborative learning online fosters social character traits like tolerance (*Tasamuh*) and patience (*Sabr*) as students learn to navigate disagreements. Electronic reflection journals, analyzed by sentiment analysis AI, allow teachers to monitor emotional well-being, acting as an early warning system for spiritual health.

Development of Critical and Reflective Thinking Skills

Scholars argue that the synergy between PAI and deep learning fosters a necessary shift from dogmatic memorization to critical evaluation. Deep learning tools provide access to vast repositories of *Kitab Kuning* (classical texts) that were previously locked away. Students utilizing AI analysis tools can compare interpretations of verses across centuries, identifying how socio historical context influences legal rulings. This process cultivates the skill of critical analysis, essential for shielding students from radical ideologies that rely on decontextualized interpretations. By understanding the «why» and «how» of religious rulings through AI assisted research, students develop a resilient, intellectual faith.

Challenges and Implementation Barriers

Technological Infrastructure and the Digital Divide

The most immediate and pervasive barrier to realizing this potential is the digital

divide. In Indonesia, the disparity between elite urban schools and rural *Madrasahs* is stark. Deep learning requires high performance hardware and stable internet connections. As noted by Priatna et al. (2024), many schools in the archipelago lack even basic internet access. Implementing these systems without addressing the infrastructure gap risks exacerbating educational inequality, creating a «two tier» PAI system where only the wealthy have access to personalized, adaptive religious education. Budget constraints further complicate this, as the maintenance of AI systems requires financial commitment that many foundations cannot sustain.

Teacher Readiness and the Psychological Shift

The human element remains the most critical variable. Successful implementation relies heavily on teacher competence, yet many PAI teachers face a «double burden»: maintaining traditional authority while mastering complex new tools. Studies by Mainudin et al. [12] highlight that many teachers lack confidence and fear that AI will render their role obsolete. This resistance is not merely technical but psychological and theological. Teachers worry that the «machine» cannot convey the *Ruh* (spirit) of religion. The shift from *Muallim* to *Murabbi* (facilitator) is difficult for those trained in authoritarian pedagogical models. Professional development must therefore go beyond «how to use the software» to address «how to maintain spiritual connection in a digital classroom».

Ethical Issues, Data Privacy, and Algorithmic Bias

The use of deep learning in religious education introduces unique ethical risks. AI systems function as «black boxes», making decisions based on opaque algorithms. Bankins & Formosa (2023) warn of the potential for algorithmic bias. If the training data for a PAI system is biased toward one specific school of thought (*Madhab*), the AI will systematically marginalize other valid interpretations, effectively automating intolerance.

Furthermore, data privacy is paramount. PAI in№ves the collection of sensitive data regarding a student's moral development. There is a critical need for robust strategies to protect this data. There is also the issue of generative AI hallucination. Fathurrahman & Huda (2025) warn that generative AI can reinforce prejudice or fabricate religious texts (e.g., creating fake Hadith), which is a grave sin in Islamic tradition. Consequently, Ahmed (2024) and Zuhri (2025) argue effectively that AI chatbots cannot and must not be relied upon for issuing *Fatwas*, as they lack the requisite qualifications (*Ahliyyah*) and spiritual intent (*Niyyah*).

Opportunities and Innovations

Adaptive and Personalized Learning

The future of PAI lies in hyper personalization. As noted by Faisal (2024) and Lubis [13], personalization allows instruction to be tailored to the student's comprehension level. This is an unprecedented opportunity to address the high attrition rates in religious

studies caused by boredom or frustration. Adaptive systems ensure that the learning curve is always optimal, keeping the student in a state of «flow».

Analysis of Qur'an and Hadith Texts using NLP

Natural Language Processing offers innovative opportunities to analyze Islamic texts in ways that yield deep insights. NLP can be utilized for semantic search, enabling students to find relevant verses based on concepts rather than just keywords. Generative AI (LLMs) can be employed to develop creative teaching materials, such as Socratic dialogues that promote critical thinking. However, this must be done under strict supervision to ensure theological accuracy. The multi perspective approach facilitated by NLP can deepen student understanding and encourage critical thinking regarding interpretation.

Immersive Learning with Virtual and Augmented Reality

Immersive technologies offer the opportunity to «live» history. Aminah [14] highlights the potential of VR for virtual pilgrimages. This acts as a democratizing force, allowing students who cannot afford the Hajj to experience the spiritual atmosphere of the Holy Lands, fostering a deep emotional yearning (*Rindu*). AR can enrich the physical classroom, overlaying 3D animations of *Wudu* (ablution) procedures or historical maps onto standard textbooks.

Intelligent Tutoring Systems and Learning Chatbots

Intelligent Tutoring Systems (ITS) offer 24/7 personalized support. They can function as *Tajwid* tutors, providing non-judgmental feedback that helps shy students practice recitation without fear of public embarrassment. Chatbots can answer common questions about Islamic history instantly, functioning as a «first line of support». However, it is crucial to ensure these bots are hard coded to defer to human scholars for complex theological questions.

Recommendations for Effective Implementation

Infrastructure Development and Technology Investment

To ensure successful implementation, substantial investment in technological infrastructure is required. The government must allocate adequate budgets for educational technology, treating digital connectivity as a fundamental right. This includes subsidies for resource limited schools and incentives for the private sector to develop low bandwidth, offline first AI solutions suitable for rural Indonesia. Hybrid learning environments that combine digital technology with conducive physical spaces must be created to bridge the physical digital divide.

Teacher Training and Professional Development Programs

Teacher readiness is the lynchpin of success. Comprehensive and continuous teacher training programs must be developed, focusing on pedagogical strategies (how to teach *with* the tool). Training must be practical, hands on, and relevant to the PAI context. It

should address the affective aspects of change, creating safe spaces where teachers can express their concerns. Communities of Practice (*Musyawarah Guru Mata Pelajaran*) should be leveraged to share best practices.

Curriculum Development and Digital Content

The PAI curriculum must be revised to reflect the integration of deep learning. This in№ves the explicit integration of digital skills and media literacy. The curriculum must emphasize 21st century competencies such as critical thinking and collaboration. High quality digital content aligned with Islamic values must be developed, including engaging instructional videos and interactive applications. Content development must in№ve experienced scholars (*Ulama*) to ensure theological accuracy, ensuring that the «source code» of the AI aligns with the «source code» of the religion.

Ethical Framework and Data Privacy Policy

Given the ethical risks, a clear ethical framework is imperative. This framework must be grounded in Islamic principles such as Justice (*Adl*) and Trust (*Amanah*), alongside international data privacy standards. Policies must ensure transparency regarding how data is collected and used, require informed consent, and mandate data minimization. Periodic audits of AI algorithms to identify and mitigate bias are essential to ensure the technology remains a tool for justice.

Stakeholder Collaboration and Participatory Approach

Success requires a «whole of society» approach. Close collaboration is needed among government bodies, educational institutions, teachers, parents, religious scholars, and the technology sector. A participatory approach in№ving all parties can increase buy in and address concerns. A bottom up approach that grants autonomy to schools to adapt technology to their local contexts, allowing a *Pesantren* in Java to use AI differently than a public school in Jakarta, is more likely to succeed than a rigid top down mandate.

Implications for Research and Practice

Future Research Agenda

The implementation of deep learning based PAI opens vast research directions. Future research should prioritize empirical and experimental studies to move beyond theoretical benefits and measure direct impacts on student learning outcomes. Comparative studies between general schools and religious based institutions are needed to understand context effects. Research must also address methodological questions regarding how to measure «spiritual competence» or «deep understanding» quantitatively.

Implications for Education Policy

Findings from this research carry significant implications for policy. Governments need to develop national standards for technology based PAI that ensure equity and quality. Policies must mandate technology training for pre service teachers and provide incentives for innovation. Crucially, regulations regarding data privacy and the ethical

use of AI in religious education must be established to protect the spiritual and digital rights of students. The goal of policy should be to create an enabling environment where tradition and modernity can coexist harmoniously.

Conclusion

Summary of Findings and Scientific Contribution

The implementation of deep learning based Islamic Religious Education (PAI) methods offers transformative opportunities to enhance the quality of religious education in Indonesia. This study confirms the assertion that integrating deep learning technology, combining pedagogical approaches emphasizing profound understanding with artificial intelligence, can successfully overcome the limitations of traditional, teacher centered methods. Our analysis concludes that this integration represents a necessary shift in scientific knowledge regarding religious pedagogy: moving from a static transmission model to a dynamic, interactive framework capable of meeting 21st century learning needs.

Specifically, this study has validated positive impacts including enhanced understanding of key Islamic concepts (*tawhid, ibadah, akhlaq*); strengthened character formation through reflective application; and the development of critical thinking skills essential for analyzing complex theological contexts. These results confirm that technology, when correctly applied, acts as a cognitive partner rather than a replacement for spiritual mentorship.

Challenges and Strategic Imperatives

However, the validity of these conclusions is contingent upon addressing substantial challenges. We conclude that the «digital divide», specifically limitations in technological infrastructure in rural areas, remains the primary barrier to scientific progress in this field. Furthermore, teacher readiness is a critical variable; without a fundamental shift in the educator's role from «transmitter» to «facilitator», technological adoption will fail. Ethical concerns regarding data privacy and cultural resistance must be addressed through robust policy frameworks, ensuring that innovation aligns with Islamic values.

Final Conclusion on the Field

The implementation of deep learning based PAI methods signifies a fundamental transformation in how Islamic religious education is scientifically understood and practiced. This requires a paradigm shift: from passive knowledge transmission to active knowledge construction; from rote memorization to deep application; and from uniform instruction to adaptive personalization. With careful planning and investment, this integration can create a generation of Muslims capable of applying textual teachings with critical thought in facing modern challenges.

Limitations and Future Directions

This study employs a qualitative library research approach (2015-2025). Consequently, it is limited by a lack of empirical field data on effectiveness in actual PAI

classrooms. Furthermore, the literature may not fully capture the diversity of Indonesian *pesantren*.

Based on these results, further work is suggested to:

1. Conduct Empirical Studies: Perform quasi experiments to measure direct impacts on cognitive and affective outcomes in PAI.

2. Perform Comparative Studies: Compare effectiveness between general schools and *madrasahs* to understand institutional contexts.

3. Develop Adaptive Models: Create platforms specifically designed with Indonesian local wisdom for low tech environments.

4. Analyze Ethics: Examine ethical frameworks regarding AI in religious education, filling a critical gap in current literature.

Contribution of the authors:

Muhammad Shobri – served as the corresponding author and primary investigator. He conceptualized the study's novel theoretical framework integrating deep learning with Islamic pedagogy. He conducted the systematic literature search (PRISMA method), performed the primary data collection from databases, and drafted the initial manuscript, specifically focusing on the intersection of AI technologies and Kuttab-based character education.

Imam Ahmad Aminul – contributed significantly to the analysis of the «Challenges and Implementation Barriers» and «Ethical Issues» sections. He performed the axial coding during data analysis to identify key themes regarding infrastructure and teacher readiness. He also assisted in reviewing and synthesizing literature related to the specific context of Indonesian Madrasahs and the psychological shifts required for educators.

Dina Mardiana – provided expert supervision and critical validation of the study. As the senior academic, she verified the theological accuracy of the arguments. She refined the methodological approach, strengthened the discussion on pedagogical implications, and guided the final structuring and editing of the manuscript to ensure academic rigor and coherence.

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Тереңдетіп оқытуға негізделген исламдық діни білім беру: цифрлық дәуірдегі мүмкіндіктер, сын-қатерлер және педагогикалық салдарлар

Аннотация. Цифрлық дәуірде Индонезиядағы Исламдық діни білім беру (PAI) дәстүрлі рухани құндылықтарды сақтай отырып, XXI ғасыр талап ететін технологиялық құзыреттерге бейімделу міндетімен бетпе-бет келуде. Жедел цифрландыру оқу үдерісін пассивті оқытудан технологиялық құралдармен қолдау көрсетілетін динамикалық өзара әрекеттестікке көшіруді талап етеді. Бұл зерттеу 2015–2025 жылдар аралығындағы ғылыми әдебиеттерді талдай отырып, сапалық кітапханалық зерттеу тәсілі арқылы тереңдетіп оқытуға (deep learning) негізделген PAI әдістерін жүзеге асыруды жан-жақты талдауды мақсат етеді. Зерттеу deep learning технологияларының, әсіресе ЖИ-негізделген дербестендіру мен иммерсивті құралдардың, студенттердің оқу тәжірибесін қалай өзгертетініне, діни түсініктерін тереңдететініне және исламдық тұлғаны қалыптастыруға қалай ықпал ететініне назар аударады. Жұмыстың практикалық маңыздылығы инфрақұрылымдық шектеулер мен мұғалімдердің күмәндануы сияқты маңызды кедергілерді еңсеруге мүмкіндік беретін нақты стратегияларды айқындауда жатыр. Ғылыми тұрғыдан алғанда, зерттеу конструктивизм теориясы мен діни педагогикада жасанды интеллектті қолданудың нақты тәжірибесі арасындағы алшақтықты толтыруға бағытталады. Зерттеудің басты құндылығы – технологияны мұғалімнің орнын басатын құрал ретінде емес, рухани даму жолындағы «танымдық серіктес» ретінде қарастыратын жаңа

тұжырымдамалық негізді ұсынуында. Ол саясаткерлер мен білім беру саласының мамандарына тереңдетіп оқытуды діни білімнің қасиетті мазмұнына нұқсан келтірмей іске асыруға арналған жол картасын ұсынады.

Кілтті сөздер: тереңдетіп оқыту, исламдық діни білім беру, білім беру технологиялары, дербестендірілген оқыту, исламдық тұлға, діндегі жасанды интеллект, педагогикалық инновациялар.

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Исламское религиозное образование на основе углубленного обучения: возможности, вызовы и педагогические импликации в цифровую эпоху

Аннотация. В цифровую эпоху исламское религиозное образование (PAI) в Индонезии сталкивается с двойной задачей: сохранением традиционных духовных ценностей при одновременной адаптации к технологическим компетенциям XXI века. Быстрая цифровизация требует перехода от пассивного способа обучения к динамичному, технологически опосредованному взаимодействию. Данное исследование направлено на комплексный анализ внедрения методов PAI, основанных на глубоком обучении (deep learning), посредством качественного библиотечного исследования, синтезирующего академическую литературу за 2015–2025 годы. В работе рассматривается, как технологии глубокого обучения, включая персонализацию на основе ИИ и иммерсивные инструменты, трансформируют образовательный опыт, углубляют религиозное понимание и способствуют формированию исламской личности. Практическая значимость исследования заключается в определении действенных стратегий преодоления ключевых барьеров, таких как инфраструктурные ограничения и нерешительность преподавателей. Научная новизна состоит в устранении разрыва между теоретическим конструктивизмом и реальным применением искусственного интеллекта в религиозной педагогике. Основная ценность исследования заключается в разработке новой концептуальной модели, в которой технологии рассматриваются не как замена учителю, а как «когнитивный партнёр» в духовном развитии. Работа предлагает дорожную карту для интеграции глубокого обучения без ущерба для святости религиозной передачи знаний, обеспечивая актуальность и эффективность PAI для современного мусульманского обучающегося.

Ключевые слова: глубокое обучение, исламское религиозное образование, образовательные технологии, персонализированное обучение, исламская личность, искусственный интеллект в религии, педагогические инновации.

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