

Integration of *Deep Learning* Approach in Transforming Islamic Religious Education Learning in Schools: A Pedagogical and Technological Study

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Abstract: This research aims to examine the integration of a deep learning approach as a transformative force in Islamic Religious Education (PAI) learning in schools, from both pedagogical and technological perspectives. Traditional PAI often faces challenges in relevance and effectiveness due to outdated teaching methods and a lack of contextualized content. This study posits that deep learning, as a process of understanding complex patterns and fostering critical thinking, offers significant potential to address these limitations and reformulate the goals of PAI in contemporary education. A qualitative methodology was employed, using a library research approach to collect data from relevant national and international academic sources, including books, journal articles, and scholarly publications. The Miles and Huberman interactive model of data analysis was applied, consisting of data collection, data reduction, and conclusion drawing. The findings suggest that the deep learning approach enables a paradigm shift in PAI—from a conventional knowledge-transfer model to one that fosters character formation and spiritual intelligence. This transformation is realized through adaptive curriculum development, enhanced teacher competencies in technology integration, and the establishment of an ethical framework for AI implementation in religious education. The study contributes both academically and practically to making PAI more relevant, dynamic, and effective in addressing the educational needs of the modern era.

Keyword: Deep Learning, Islamic Religious Education Learning, Education Transformation, Educational Technology

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Introduction

The rapid advancements in information technology and artificial intelligence (AI) have significantly impacted various aspects of life, including the education sector (Huang dkk., 2021). *Deep learning*, a rapidly evolving branch of machine learning, stands out as a form of AI capable of complex data analysis, pattern recognition, and intelligent predictions based on artificial neural networks. In the field of education, *deep learning* has been utilized for student performance prediction, the development of adaptive learning systems that personalize content delivery, and automated assessment tools that enhance efficiency in evaluating student work.

However, in the 21st-century landscape, marked by technological disruption, religious education practices face new challenges. The rapid development of digital technology, particularly in the form of AI, demands pedagogical approaches that are adaptive, contextual, and relevant to the times. *Deep learning* is one of the most revolutionary branches of AI, an approach that mimics the human brain's ability to recognize patterns, make decisions, and learn from data in depth (Murphy, 2019).

(Mohammad, 2016) Education, at its most fundamental essence, is a process of human liberation towards the perfection of intellect and soul. From the perspective of Islamic educational philosophy, learning aims not merely to fill the mind, but also to shape the spirit, refine character, and instill divine values into the reality of daily life. From an early age, children need to be guided to harmonize their intellectual and spiritual development. This is where the urgency of Islamic Religious Education (PAI) in schools lies, serving as a solid foundation for moral and character building.

According to (Al-attas, 1984), the primary objective of Islamic education is the process of *ta'dib*, which signifies the inculcation of *adab* (right conduct or discipline), representing the pinnacle of knowledge and character. Therefore, the implementation of cutting-edge technologies like deep learning must be positioned not merely as technical aids, but as epistemological instruments supporting the achievement of education's transcendental goals. In other words, the integration of technology into Islamic religious education, in particular, must uphold the values of *Tawhid* (the oneness of God), rather than merely succumbing to the euphoria of modernity devoid of spiritual dimensions (Arifin, 2018).

PAI learning at the school level, which has predominantly been characterized by conventional approaches and textual lectures, now needs to evolve towards new approaches that are dialogical, participatory, and contextual (Daifi, 2017). The implementation of deep learning has the potential to make PAI learning more vibrant through digital media such as interactive videos, adaptive Islamic storytelling applications, and AI-based evaluation systems capable of holistically measuring students' religious character development (Pilco dkk., 2022).

According to (Oyedotun, 2024), the use of artificial intelligence technology can enrich students' learning experiences through personalized learning systems that are responsive to individual learning needs. *Deep learning* enables the development of systems capable of analyzing student learning behavior and providing automatic, real-time feedback, thereby allowing educators to more effectively guide the internalization process of Islamic values (Chassignol dkk., 2018).

The integration of *deep learning* can support the creation of adaptive learning media that tailor Islamic religious content to students' individual learning styles (Oktaviani, 2024). This aligns with modern pedagogical principles that emphasize dialogical and participatory learning processes rather than one-way instruction (Aslan & Wahyudin, 2020). Through this technology, students may engage with content on noble character and religious values via interactive simulations, educational Islamic games, or AI-curated learning videos based on their interests and competencies.

However, most existing studies have focused on the application of *deep learning* in general education fields such as mathematics, language learning, or STEM subjects, with limited attention to its integration in religious education, particularly in the context of Islamic Religious Education (PAI). This study addresses that gap by exploring how *deep learning* can be specifically adapted to enhance the pedagogical effectiveness of PAI. It offers a novel contribution by proposing a conceptual framework for AI-assisted religious learning environments that not only personalize content delivery but also foster spiritual intelligence and moral development—areas that have remained underexplored in current AI-in-education research.

This research is crucial for illustrating how *deep learning* can be implemented in the design of PAI learning, as well as assessing the effectiveness and challenges of its application at the school level. Thus, this paper is expected to contribute to the

development of a more contextual, innovative, and contemporary model of religious education.

Methodology

The methodological analysis in this study employs a qualitative research design with a library research approach (Hamzah, 2020). This approach was chosen because the research focuses on analyzing concepts, theories, and prior research findings related to the integration of Deep Learning in the Transformation of Islamic Religious Education Learning in Schools.

Source selection was purposive, based on criteria of recency (within the last five to ten years), relevance to the topic, and the credibility of authors and publishers. All data were collected through a documentation process, involving the tracing and recording of important information from relevant literature such as books, journal articles, and national and international scholarly publications pertinent to the research topic (Abdussamad, 2021).

For data analysis, the researchers adopted the framework by (Miles & Huberman, 1992), which includes data collection, data reduction, and conclusion drawing. The collected data were then organized by problem categories and subsequently analyzed for interpretation as research findings. Conclusions were drawn when a sufficient amount of collected data met the criteria for data validity. This data validity was verified using a content check point technique, which involves verifying the accuracy of each piece of information used as a basis for drawing conclusions (Sugiyono, 2008). If multiple data sources presented the same information, a conclusion could be drawn (Mundofi, 2024). However, if discrepancies were found, the information was further clarified; significant differences were then presented as new findings within this research.

Result and Discussion

The Concept of Deep Learning in the Educational Context

Epistemologically, deep learning in education is more than just an intensive learning process. It represents an approach that emphasizes profound understanding, the interconnectedness of concepts, and reflection on the values and meaning of the learned material (Marton & Säljö, 1976). This concept differs essentially from surface learning, which primarily focuses on memorization and repetition of information. (Goodfellow dkk., 2016) categorize learning approaches into two: the surface approach and the deep approach, with the latter being closely associated with learners' personal engagement and the internalization of meaning.

According to (Biggs & Tang, 2011), *deep learning* encompasses three key characteristics: (1) the integration of new knowledge with prior understanding, (2) the interconnectedness of ideas and concepts, and (3) the capacity for reflective evaluation of knowledge and its application in real-world contexts. Consequently, this approach necessitates an active role for students in constructing meaning, rather than merely serving as passive recipients of information. In Indonesia, the concept of deep learning has begun to be explored within the framework of *Merdeka Belajar (Freedom to Learn)*, which prioritizes meaningful, student-centered, and contextualized learning (Zuhairini, 2008) asserts that effective learning in Islamic Religious Education (PAI) must foster critical reasoning, spirituality, and an applicative attitude in daily life, aligning precisely

with the principles of deep learning. A core characteristic of deep learning itself is its ability to automatically learn hierarchical data representations from vast volumes of data, eliminating the need for manual feature engineering.

Unlike traditional machine learning algorithms, which often necessitate explicit feature extraction by humans, deep learning can end-to-end identify complex patterns in raw data such as images, text, sound, or numerical data. In the educational context, this capability is highly relevant (Akhmedova, 2024). For instance, deep learning can be trained to recognize student learning patterns from their interaction data on online platforms, analyze handwritten essays, or comprehend the subtle nuances of student facial expressions in learning videos.

This layered structure enables deep learning approaches to handle data abstraction at various levels, from simple features to highly complex concepts (Tampos, 2024). Based on the discussion above, the deep learning approach has the potential to identify relationships unseen by conventional data analysis methods or even by human educators, thereby providing novel insights into students' cognitive and affective processes.

Deep learning models, particularly recurrent neural networks (RNNs) and transformers, are highly effective in analyzing temporal data sequences, such as student interaction histories with learning systems. This capability allows adaptive learning platforms to predict student difficulties, identify knowledge gaps, and dynamically adjust material difficulty levels or feedback types (Mustoip dkk., 2023). For instance, a system based on a deep learning approach can identify that a student is struggling with a particular algebra topic and automatically recommend alternative explanatory videos, additional exercises, or even connect the student with a virtual tutor. This personalization transcends simple rule-based approaches, creating a truly dynamic and responsive learning experience that adapts to student progress in real-time (Durhan, 2020).

By analyzing these patterns, deep learning-based systems can inform educators about students who may be experiencing difficulties. Furthermore, deep learning-based sentiment analysis of student interactions in online forums or responses can provide insights into student engagement levels, motivation, or even potential mental stress. This assists educational institutions in making data-driven decisions to enhance the quality of support provided to students, preparing them to face the challenges of the modern era.

The concept of deep learning provides a strong technological foundation for educational transformation. Its ability to learn from data automatically and recognize complex patterns opens up significant opportunities for learning personalization, predictive analytics, intelligent content development, and assessment automation (Goodfellow dkk., 2016). However, the implementation of deep learning in education is not without its challenges, particularly concerning data requirements, access gaps, ethical issues, algorithmic bias, and the shifting role of educators. Therefore, the successful integration of deep learning necessitates a holistic approach, considering technological,

pedagogical, ethical, and social aspects to ensure its potential can be optimally leveraged for enhancing inclusive educational quality.

Transforming Islamic Religious Education: Challenges and Opportunities

Islamic Religious Education (PAI) plays a central role in shaping national character. However, the approaches traditionally used in schools often remain verbalistic and normative, failing to address the aspects of internalization and transformation of values (Muhaimin, 2001). This poses a serious challenge as students confront complex social realities that often contradict religious values.

Currently, Islamic Religious Education (PAI) faces significant challenges regarding its relevance to contemporary student life. There is a substantial gap between PAI teaching materials, which tend to be normative and dogmatic, and the complex realities of modern social, moral, and ethical issues encountered by students. This condition potentially leads to PAI being perceived as a subject lacking context or practical application (Saripudin & Muhammad Dzikri Fathur Robbani, 2024).

According to (Nasr, 1993), in a modern world that tends to be secular and materialistic, religious education must serve as an instrument to restore transcendental meaning to life. Therefore, the integration of deep learning and transformational learning approaches in Islamic Religious Education (PAI) has become an urgent necessity, ensuring that Islamic teachings are understood not only textually but also contextually and existentially.

Within the context of Indonesia's national curriculum, PAI functions to cultivate in students a comprehensive understanding, awareness, and practice of Islamic teachings. This is underscored by Ministry of Education and Culture Regulation No. 23 of 2015 concerning the Cultivation of Character, which positions character education and religious values as the core of the educational process. Hence, a deep and transformative approach is crucial for PAI learning to genuinely shape well-rounded personalities, rather than merely imparting superficial religious knowledge.

Transforming Islamic Religious Education (PAI) through a deep learning approach enables the development of more interactive and dynamic PAI learning. For instance, it allows for PAI teaching methods that can adjust their flow based on student responses, or virtual simulations that enable students to experience religious practices or ethical situations in a safe environment. Project-based learning supported by deep learning can provide relevant resource recommendations or analytical tools to assist students in their understanding of religious issues (Ali dkk., 2023).

Islamic Religious Education often faces criticism regarding its relevance to modern students' lives. This indicates a significant gap between teaching materials, which tend to be normative and dogmatic, and the complex realities of contemporary social, moral, and ethical issues encountered by students. Non-contextual material potentially leads to PAI being perceived as a rigid or less applicable subject.

According to (Shofiyyah dkk., 2024), this gap is rooted in several factors. First, the PAI curriculum is not yet fully adaptive to contemporary changes and advancements in knowledge. The teaching materials sometimes remain overly focused on textual memorization without adequate deep understanding of their meaning and practical

application. Second, prevailing teaching methods are often monotonous, lecture-based, and lack participation, failing to capture the interest of students growing up in the digital era. PAI teachers may not yet be adequately equipped with the competence to design innovative and contextualized learning experiences. Third, there's a societal perception that PAI is merely a "complementary" subject or a formality, rather than a fundamental pillar for character and moral development.

These challenges necessitate a paradigm shift in Islamic Religious Education from simply "transferring religious knowledge" to "education for character building and spiritual intelligence" that is applicable in real life. Furthermore, the limited opportunities for teachers to update their religious understanding in line with contemporary issues also pose a problem (Achmadi, 2010).

The sub-optimal competency of an educator can directly impact the quality of the learning process, ultimately affecting students' interest in and understanding of PAI. Improving the quality of PAI teachers necessitates sustained investment in training, professional development, and learning community support (Annisa dkk., 2024). By utilizing a learning platform that incorporates various media, the reach of PAI can be expanded, enabling flexible learning and broader access to resources. Artificial Intelligence (AI) and deep learning (as discussed in other contexts) can be employed for personalized learning, material recommendation systems, sentiment analysis in religious discussions, and even interactive chatbots to answer student questions.

While the use of Virtual Reality (VR) and Augmented Reality (AR) in education—including religious education has been previously explored, most existing studies have primarily focused on their role in enhancing cognitive engagement or visualizing historical-religious content. This study moves beyond such descriptive implementations by proposing the integration of VR/AR with *deep learning*-based personalization to create spiritually immersive learning experiences in Islamic Religious Education (PAI). By combining immersive technology with AI-driven adaptability, this approach aims not only to inform but also to inspire students through emotionally resonant and context-aware simulations of religious rituals, Islamic history, and sacred sites. The novelty of this research lies in its emphasis on designing VR/AR experiences that dynamically adjust to students' spiritual development levels and character-building needs, something that has not been widely examined in previous literature. Through this synergy, the development of noble character and spiritual values becomes not merely an educational outcome, but an integral part of the learning journey preparing students to confront the moral and ethical crises of the modern era with a strong internal compass (Salam dkk., 2025). PAI learning in schools can play a vital role in fostering critical religious literacy, which encompasses students' ability to comprehensively understand religious teachings, discern accurate information from misinformation, and cultivate attitudes of tolerance and religious moderation.

Islamic Religious Education can serve as a platform for constructive discussions on contemporary religious issues, aiding students in developing ethical reasoning and decision-making grounded in Islamic values (Durhan, 2020). This presents an opportunity to establish PAI learning as a cornerstone for shaping citizens who are

characterized by strong morals, civility, and tolerance. By embracing a deep learning approach, Islamic Religious Education currently stands at a crossroads, confronting challenges related to relevance, teacher quality, and technology integration. Yet, behind these challenges lie significant opportunities for transformation. Leveraging digital technology, strengthening character and religious literacy, and fostering cross-sector collaboration are key to making PAI a dynamic, relevant subject capable of producing a generation that is not only intellectually astute but also morally upright and spiritually profound. Systematic and sustained efforts from all stakeholders are essential to realize the transformative potential of PAI in the future.

Integrating Deep Learning as a Transformational Approach in PAI Learning

The integration of deep learning as a transformational approach in PAI involves several strategies: (1) utilizing reflective questions that awaken moral and spiritual awareness, (2) employing contextual problem-based learning, (3) fostering active student engagement in dialogue, discussions, and collaborative projects, and (4) using technology as a tool for interactive and meaningful learning (Nugraha & Fauzi, 2020).

This integration of deep learning initiates a significant shift from the traditional PAI learning paradigm, which often centers on the teacher and is oriented towards rote memorization, towards a more student-centered, personalized approach focused on deep understanding (of values, concepts, and applications) (Treve, 2024). This phenomenon aligns with constructivist theory, which emphasizes the active role of students in constructing their own knowledge.

Unlike mere memorization, deep learning encourages students to grasp the meaning and implications of PAI values. Deep learning-based Natural Language Processing (NLP) tools can be used to analyze students' reflective essays on Quranic verses or hadiths, providing instant feedback on the depth of their understanding or the consistency of their arguments. Interactive discussions facilitated by chatbots trained with religious texts can prompt students to ask deeper questions, explore nuances of meaning, and connect teachings to real life. This aligns with PAI's objective of cultivating individuals with noble character, enabling them to implement religious teachings in daily life, and fostering critical thinking.

According to (Fullan & Langworthy, 2014), deep learning in the 21st century demands the creation of "new pedagogies" that integrate knowledge, technology, and humanity. In this regard, PAI learning is not merely the transmission of religious material; it becomes a transformative space that fosters spiritual awareness, social responsibility, and moral commitment in real life. Deep learning technology (for instance, through recommender systems or adaptive learning platforms) enables the customization of PAI material based on individual student profiles, including their learning pace and teaching styles (Hajri, 2023). Historical student learning data (concept understanding history, error patterns, learning preferences) can be analyzed by deep learning algorithms to present the most relevant content or learning pathways. For example, a student struggling with *fiqh muamalah* concepts can be directed to interactive modules or supplementary explanatory videos, while proficient students can be given complex case studies on contemporary Islamic business ethics. This minimizes the "one-size-fits-all" approach in

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PAI learning, aiming for every student to achieve their maximum potential in understanding and internalizing Islamic teachings in their daily lives.

The integration of deep learning as a transformational approach in PAI learning offers significant potential to create a more personalized, adaptive, profound, and relevant learning environment. A paradigm shift from memorization-oriented learning to deep understanding, enhanced pedagogical effectiveness through teacher support, and positive impacts on learning outcomes (especially in character building and critical thinking skills) are key indicators of this transformation's success (Degni, 2025).

However, successful implementation heavily relies on infrastructure readiness, the development of appropriate AI models, careful attention to ethics, and the increased competency of PAI teachers. Thus, this approach can meet the demands of modern education without abandoning the enduring substance of Islamic values (*tsawabit*), while also remaining adaptive to contemporary changes (*mutaghayyirat*).

Impact of Transformational Deep Learning Implementation on PAI Learning

The integration of technology into education has unlocked numerous opportunities for innovation, including in Islamic Religious Education (PAI) learning. One particularly promising approach is the transformational implementation of deep learning ([Consoli dkk., 2023](#)). Unlike merely using digital tools, transformational deep learning implementation focuses on fundamental changes in the PAI learning paradigm, aiming to achieve deep understanding, internalization of religious values, and the ability to apply them in daily life. This is especially relevant given the demands of 21st-century education, which requires students not only to memorize content but also to think critically, reflectively, and possess strong spiritual awareness (Muhamad et al., 2024). ([Muhamad dkk., 2024](#)).

The integration of deep learning approaches, supported by technology, has led to significant transformations in the process and outcomes of Islamic Religious Education (PAI). This impact is not only methodological but also touches upon students' psychological, affective, and even spiritual aspects. These transformative impacts align with Tang's (2024) observations:

1. **Personalized and Adaptive Learning:** This approach enables learning that is better suited to the individual needs, interests, and pace of each student. By leveraging technology and learning data analytics, materials and delivery methods can be adjusted automatically. For example, students who show a weaker understanding of a particular concept can be provided with additional materials or different learning approaches, while faster learners can be given more complex challenges. This contrasts with traditional learning models, which tend to be homogenous.
2. **Increased Engagement and Learning Motivation:** Active, interactive learning methods relevant to students' real-life contexts are a hallmark of deep learning. The use of case studies, problem-based projects, in-depth discussions, and self-reflection can enhance students' cognitive, emotional, and social engagement.

Technology facilitates this through interactive digital learning platforms, engaging multimedia learning resources, and online collaboration tools.

3. **Development of 21st-Century Skills:** Deep learning doesn't solely focus on mastering PAI content; it also emphasizes developing crucial skills such as critical thinking, problem-solving, collaboration, communication, and creativity. Students are encouraged to analyze religious issues from various perspectives, seek creative solutions to moral and ethical challenges, work together on religious projects, and effectively communicate their understanding (Murphy, 2019).
4. **Strengthening Reflection and Metacognition:** The deep learning process encourages students to actively reflect on their understanding, identify knowledge gaps, and develop effective learning strategies. Transformational PAI learning provides space for students to ponder religious values within their life contexts, connect Islamic teachings with personal experiences, and cultivate self-awareness as Muslims.
5. **Developing Deep Understanding:** The primary focus of deep learning is comprehension that goes beyond mere memorization and superficial understanding. Students are encouraged to delve into deeper meanings of Islamic teachings, grasp the interconnections between concepts, and apply them in diverse contexts (Hajri, 2023). This can be achieved through in-depth analysis of religious texts, philosophical discussions, and complex case studies. In Interdisciplinary Learning, deep learning opens opportunities to integrate PAI material with other disciplines, such as social sciences, natural sciences, and humanities. This approach helps students view PAI as an integral part of broader knowledge and understand how religious values interact with various aspects of life.

Thus, the transformational implementation of a deep learning approach holds immense potential to revolutionize PAI learning. By focusing on deep understanding, value reflection, and real-life application, this approach aligns with PAI's primary objective of nurturing a younger generation that is morally upright, critically thinking, and spiritually aware. Despite the challenges that need to be addressed, sustained investment in infrastructure development, teacher competency, learning materials, and appropriate evaluation systems will enable the realization of a more effective and relevant transformation in PAI learning that meets contemporary demands. Further research is necessary to explore best practices for implementing transformational deep learning in various PAI educational contexts and to empirically measure its impact.

Conclusion

Based on the results and discussion above, it can be concluded that the deep learning approach provides a strong technological foundation for the transformation of Islamic education. However, implementing deep learning in education is not without its challenges, particularly concerning data requirements, access gaps, ethical issues, algorithmic bias, the shifting role of teachers, and data privacy. Therefore, the successful integration of deep learning necessitates a holistic approach, considering technological, pedagogical, ethical, and social aspects to ensure its potential can be optimally utilized for

enhancing inclusive educational quality. Pedagogically, integrating deep learning enables adaptive personalized learning tailored to each student's needs, interests, and learning pace. This facilitates a deep understanding of PAI values and concepts, encourages critical reflection, and develops 21st-century skills such as problem-solving and collaboration within a religious context. The impact includes increased learning motivation and strengthened student character.

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