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IMPLEMENTATION OF DEEP LEARNING IN ISLAMIC RELIGIOUS EDUCATION (PAI) LEARNING IN MADRASAH

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Abstract

The development of artificial intelligence (AI) technology, especially deep learning, has made significant contributions in various fields, including the world of education. In the context of Islamic Religious Education (PAI), the biggest challenge today is how to deliver teaching materials effectively, adaptively, and relevant to the development of the times and the characteristics of the digital generation. Deep learning implementations offer a variety of opportunities to support a more personalized, interactive, and efficient learning process. Through an algorithm-based approach, deep learning is able to process student learning data to provide a learning experience tailored to individual learning styles. The application of this technology also allows for automatic assessment of students' understanding through text, voice, and expression analysis, so that teachers can focus more on providing character development and spiritual values. On the other hand, the use of AI-based chatbots and intelligent assistants can facilitate discussions and consultations about Islamic teachings instantly and factually. The methodology used in this study is a descriptive qualitative study with a literature study and case study approach. Data were collected through a review of national and international scientific literature and focused observations on the practice of AI implementation in several madrassas and Islamic schools in Indonesia. The analysis was carried out thematically by identifying patterns, opportunities, and challenges of applying deep learning in PAI learning. The results of this study are expected to make a scientific contribution to the development of technology-based Islamic education in the digital era.

Keywords: Deep Learning, Islamic Religious Education (PAI), Artificial Intelligence, Adaptive Learning, Automatic Evaluation, Educational Technology.

1. INTRODUCTION

Islamic Religious Education (PAI) plays an important role in shaping the character, morality, and spiritual values of students. In the era of the industrial revolution 4.0 and society 5.0, conventional learning methods in PAI began to face various challenges, especially in terms of student involvement, the effectiveness of material delivery, and the suitability of the needs of the digital generation. Technological transformation requires teachers and educational institutions to innovate in the teaching and learning process that is able to answer the challenges of the times (Mustoip et al., 2024).

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One of the solutions that is now growing rapidly in the world of education is the use of artificial intelligence, especially in the form of deep learning. This technology enables the development of adaptive, personalized, and data-driven learning systems. In the context of PAI, deep learning can be used to create learning models that adapt teaching materials to individual learning styles, detect students' conceptual errors, and even develop chatbot-based Islamic virtual assistants that can answer religious questions quickly and accurately (Mahesa, 2024; Sajja et al., 2023).

However, the implementation of this technology is not free from challenges. The limitations of digital infrastructure, the low technological literacy of PAI teachers, and the issue of privacy and ethics in the use of student data are obstacles that need to be anticipated (Hakeu & Djahuno, 2024). Therefore, a study of the opportunities and challenges of using deep learning in PAI learning is very necessary as a basis for designing a holistic and sustainable implementation strategy (Owoc et al., 2021).

2. RESEARCH METHODS

a. Data Collection Techniques

The data in this study was obtained through two main techniques:

1. **Library Research**: The researcher reviews and analyzes relevant scientific literature, both from national and international journals, in the last five years. The main focus in the literature search is on the implementation of deep learning in education, especially in the learning environment of Islamic religion (Mustoip et al., 2024; Mahesa, 2024).
2. **Selected Case Studies**: The researcher examines reports, articles, and documentation from schools/madrasas that have applied AI or deep learning technology in PAI learning activities. Several cases from madrassas in Cirebon and MTs in Gorontalo became the focal point of secondary document-based field studies (Hakeu & Djahuno, 2024).

b. Data Analysis Techniques

Data analysis was carried out thematically, namely by identifying the main themes that emerged from the literature data and case studies, such as: deep learning implementation strategies, impacts on the PAI learning process, and challenges and solutions faced. The data were analyzed by reduction, categorization, and interpretation techniques on the meaning of the social context of technology-based Islamic education (Miles, Huberman & Saldaña, 2014).
To maintain the validity of the data, the source triangulation technique is used, which is by comparing various literature sources and cases from various institutional settings to obtain a comprehensive understanding (Yin, 2016).

3. RESULTS AND DISCUSSION

Deep Learning is one of the branches of artificial intelligence that has the ability to mimic the way the human brain works through artificial neural networks consisting of many layers. This technology allows machines to learn from large amounts of data, recognize patterns, and make predictions or decisions automatically and continuously. In the context of education, Deep Learning has revolutionary potential in personalizing the learning process according to each student's unique learning style, abilities, and needs. Through the analysis of student learning behavior data such as reading speed, response to questions, and evaluation results, the system can automatically recommend appropriate follow-up or reinforcement material (Mustoip et al., 2024).

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In addition to personalization, Deep Learning also plays an important role in the development of multimedia-based interactive teaching materials, such as adaptive educational videos, interactive simulations of religious values, and Islamic chatbots that can answer religious questions contextually. This technology also supports the development of an automatic assessment system, including in aspects such as voice recognition for the evaluation of Qur'an recitation and the analysis of student answer texts in faith, moral, or fiqh lessons. This makes learning Islamic Religious Education (PAI) more interesting, efficient, and provides instant and meaningful feedback for students (Hidayat et al., 2024).

With its ability to handle data complexity and present learning in an adaptive manner, Deep Learning not only accelerates digital transformation in the world of education, but also allows teachers to focus more on their role as spiritual facilitators and mentors. The implementation of this technology in PAI learning is not just a modernization of methods, but an opportunity to strengthen the understanding of Islamic values through a more personalized, reflective, and data-based approach.

Islamic Religious Education (PAI) has the main mission in shaping the character, morals, and spirituality of students to be in accordance with Islamic values that are rahmatan lil 'alamin. This goal not only focuses on cognitive mastery of religious material, but also on the formation of a personality with integrity, honesty, responsibility, and being able to internalize Islamic teachings in daily life. In this context, PAI plays a very important role in shaping a generation that is not only intellectually intelligent, but also noble in character and has high spiritual awareness.

Along with the development of digital technology and artificial intelligence, PAI is required to adapt so as not to be left behind in the process of educational innovation. One form of adaptation is the integration of technology such as Deep Learning into religious learning. However, this integration process must be carried out with the principle of prudence. Technology is just a tool, and Islamic values must remain the primary foundation in compiling, delivering, and evaluating learning materials. If not properly controlled, there is the potential for technology to obscure the meaning of teachings or replace the important role of teachers as moral role models (Mela, 2024).

Therefore, in developing and implementing technologies such as AI in PAI learning, there needs to be collaboration between education experts, scholars, and technology developers to ensure that the system built remains in harmony with Islamic principles. Digital content, learning algorithms, and automated feedback from deep learning systems must contain educational values that are morally and spiritually charged. With the right approach, technological integration can actually be an effective means to strengthen the main goal of PAI in forming an intelligent, pious, and highly competitive Muslim generation in the global era.

Several educational technology applications have been widely developed to support Islamic religious learning, especially in the fields of the Qur'an and Hadith. Apps such as Quran Companion, Ayat, Muslim Pro, and various other local platforms have facilitated students in memorizing, understanding, and delving into the content of the Qur'an with interactive features, translations, interpretations, and reminders of worship times. Likewise, hadith material has been packaged in the form of an easily accessible database-based application, complete with explanations of sanad, matan, and historical context. These apps have helped the learning process become more flexible, especially among the younger generation who are familiar with digital devices.

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However, most of these applications are still static and have not implemented a thorough Deep Learning approach. Deep Learning technology, which is able to adapt learning materials based on user interaction patterns, is still rarely used in the context of Islamic religious education. In fact, the potential of this technology is huge, for example in building a system that is able to recognize errors in the Qur'an reading through real-time voice analysis, suggest hadith that is relevant to the student's situation, or build a simulation of fiqh law learning based on real cases that are individually customized. This shows that the application of Deep Learning in religious learning is still in its early stages and requires further exploration and development (Lorens et al., 2024).

In-depth and collaborative research is needed between technologists, educators, and scholars to design Deep Learning applications that are not only technically sophisticated, but also theologically valid. This integration is not just the development of the system, but the transformation of the religious learning approach to be more contextual, adaptive, and touches the spiritual needs of today's students. Thus, advanced research in this field is very important as a scientific and practical foundation for the development of relevant Islamic religious education in the era of artificial intelligence.

The implementation of Deep Learning in Islamic Religious Education (PAI) learning shows a positive impact, especially in terms of personalizing teaching materials that are tailored to the individual needs of students. This technology allows the learning system to automatically analyze student interaction data, such as learning duration, difficulties in certain materials, and responses to learning evaluations. Based on the results of the analysis, the system can provide recommendations for further or reinforcement material in parts that have not been mastered, so that the learning process becomes more effective and adaptive (Mustoip et al., 2024).

One of the main advantages of this approach is its ability to accommodate diverse learning styles and the speed of student comprehension. In PAI learning which includes cognitive, affective, and psychomotor aspects, not all students can understand the material in the same way. Some understand the concept of monotheism faster through digital visualization, while others may require repetition in the form of audio or interactive quizzes to understand the rules of fiqh. With Deep Learning, the system is able to recognize these patterns and adjust the presentation of the material according to the preferences and learning performance of each student.

Furthermore, the ability of Deep Learning to provide instant feedback also supports the reflective process in religious learning. For example, in the practice of reading the Qur'an, the system can recognize errors in tajweed and makhraj in real-time and provide specific suggestions for improvement. This speeds up the learning process while increasing students' confidence because they feel personally accompanied. Thus, this approach not only increases the effectiveness of learning, but also strengthens students' spiritual and moral experiences in depth.

Deep Learning-based learning applications have the advantage of analyzing student data in real-time, which directly impacts increasing the effectiveness of learning interventions. Through this technology, the system can record and evaluate various indicators of student learning activities—such as the frequency of access to materials, the level of difficulty experienced, the duration of assignment work, and the pattern of answers to practice questions. All of this data is then processed by algorithms to identify individual learning needs quickly and accurately (Mela, 2024).

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This ability is very helpful for teachers in providing **feedback that** is timely and in accordance with the context of each student's difficulties (contextualized). No longer having to wait until the end of the summative evaluation, teachers can immediately find out if a student has difficulty understanding the material of faith, morals, or fiqh, and immediately provide additional direction or learning resources. In addition, teachers can also classify students based on their level of mastery of the material and adjust the learning approach more flexibly and responsively.

With data that is constantly updated and analyzed automatically, teachers can also make more evidence-based learning decisions (data-driven decision making), both in redesigning teaching strategies and in developing remedial plans. This encourages the realization of PAI learning that is more adaptive, efficient, and touches the spiritual learning needs of students in a more personalized manner. This implementation also strengthens the role of teachers as humanist educators, supported by intelligent technology that empowers, not replaces.

However, behind the various potentials and benefits of the application of Deep Learning in Islamic Religious Education (PAI) learning, there are still a number of significant challenges that need serious attention. One of the main obstacles is the limited technology infrastructure in many schools, especially those in remote, rural, or 3T (frontier, outermost, disadvantaged) areas. Slow or unstable internet access, lack of availability of hardware such as computers, tablets, or smartboards, and uneven access to digital learning platforms are the main obstacles in realizing comprehensive artificial intelligence-based learning (Lorens et al., 2024).

In addition, the implementation of advanced technology such as Deep Learning also requires adequate digital competence from teachers. Unfortunately, most PAI teachers still do not receive the relevant intensive training to master the optimal use of this technology. Many teachers are still limited to the use of conventional media, and find it difficult when faced with the interface of an AI-based adaptive learning system. The lack of technology-based pedagogic training makes teachers not fully understand how to integrate technology pedagogically and theologically in the teaching and learning process.

This situation shows that there is a digital and pedagogic gap that needs to be addressed immediately through education policies that are oriented towards strengthening teacher capacity and equitable distribution of infrastructure. Technology-based continuous professional training programs, collaboration between schools and edutech developers, and special budget support from the government are strategic steps to bridge these challenges. Without structured and systemic interventions, the implementation of Deep Learning in PAI learning risks only being enjoyed by excellent schools in urban areas, while other schools are lagging behind in the flow of educational digitalization.

In addition to technical constraints and the readiness of human resources, an equally important concern in the implementation of technology, especially Deep Learning in Islamic Religious Education (PAI) learning, is its impact on students' religious and moral values. In the midst of the rapid digitalization of education, critical questions arise about the extent to which technology is able to maintain the essence of religious education that focuses on character building, spirituality, and ethics. This concern is not without reason. Student interaction with AI-based systems that are automated and impersonal is feared to reduce the humanistic and exemplary dimensions that have been the main strength of religious education (Mustoip et al., 2024).

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Technology, if not used wisely and directed, has the potential to give rise to mechanistic, superficial, and even biased religious understandings. For example, if the algorithm is not designed with sensitivity to the diversity of schools and local contexts, the learning system can present content that deviates from a moderate and contextual understanding of Islam. Furthermore, the use of AI that is too dominant can cause students to rely on machines to answer religious problems without the assistance of teachers as spiritual figures who understand social dynamics and students' emotions.

Therefore, the integration of technology into PAI learning must be carried out with great care, considering ethical, theological, and pedagogical aspects in a balanced manner. Islamic principles such as justice, trust, and the sanctity of knowledge must be the foundation in every AI system design used. The involvement of scholars, religious educators, and technology experts in system development is very important so that the content, methods, and algorithms used are not only technically sophisticated, but also sharia valid and morally charged. Thus, technology is truly a tool to strengthen Islamic values, not replace them.

It is also important to involve all stakeholders, including parents, the community, and religious leaders, in the process of implementing technology, especially Deep Learning, in the learning of Islamic Religious Education (PAI). Religious education is not only the responsibility of the school, but it is also part of the value system that grows in the family and community environment. With active involvement from parents, for example, the use of AI-based learning applications at home can be more monitored and targeted. Parents can provide reinforcement to the religious values that students learn at school and help form healthy and responsible digital learning habits (Mela, 2024).

Furthermore, community involvement — especially through religious institutions, such as mosques, taklim assemblies, and Islamic community organizations — can strengthen the relevance of teaching materials generated by Deep Learning systems. Community support also plays an important role in building a social environment conducive to the practice of Islamic values taught through digital platforms. This synergy allows PAI learning not only to stop at the cognitive and formal levels in the classroom, but can foster awareness and practice of religious values in real life.

Without the participation of external parties, the implementation of technology risks becoming an exclusive process and disconnected from the social context of students. Therefore, a community-based collaborative approach needs to be developed, both through school-parent communication forums, religious-based digital literacy training, and open dialogue between teachers, parents, and the community regarding the core values of Islamic education in the digital era. That way, the integration of Deep Learning in PAI will be more inclusive, contextual, and have a long-term impact on the formation of student character holistically.

The success of the implementation of Deep Learning in Islamic Religious Education (PAI) learning does not only depend on the readiness of technology and the ability of educators, but also is highly determined by policy support from the government and educational institutions. Visionary and responsive policies are an important foundation in encouraging the integration of AI-based technology into the education system, including in religious subjects. The government has a strategic role in providing regulations that regulate the ethical, safe, and effective use of technology in the teaching and learning process, as well as setting national standards for the development and application of learning technology in accordance with Islamic values (Lorens et al., 2024).

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In addition to regulations, institutional commitments in the form of providing resources, such as hardware, internet connectivity, and Deep Learning-based educational platforms, also greatly determine the success of implementation. Without adequate budget support, schools, especially in disadvantaged areas, will find it difficult to adopt this technology fairly and equitably. Therefore, it is important for the government through the Ministry of Education and the Ministry of Religion to design infrastructure assistance and training programs that focus on religious technology literacy, so that PAI teachers can make optimal and contextual use of AI in the teaching process.

Furthermore, educational institutions, both formal and non-formal, need to formulate internal policies that support the integration of technology pedagogically and theologically. This includes the development of a technology-based curriculum that remains based on the principles of Islamic teachings, strengthening teacher training in developing authentic digital teaching materials, and supervision of the quality and safety of learning content. Synergy between national policies, educational institutions, and technical implementers in the field will create an innovative, inclusive, and sustainable PAI learning ecosystem rooted in the noble values of Islam.

In the long term, the application of technology such as Deep Learning in Islamic Religious Education (PAI) learning is expected not only to be a form of adaptation to the times, but also as a strategy to improve the quality of religious education as a whole. By leveraging the capabilities of technology to analyze learning data, present materials in an adaptive manner, and provide real-time evaluation and feedback, AI-based learning systems have the potential to strengthen students' understanding of Islamic teachings in a more contextual and in-depth manner. This is an important step to make PAI more relevant, dynamic, and not stuck in rigid traditional patterns (Mustoip et al., 2024).

Furthermore, the integration of this technology is also a means to equip students with 21st century skills that are urgently needed in the digital era. Students not only learn to understand religious values conceptually, but also become accustomed to thinking critically, adaptively to technology, and being able to use digital resources ethically and productively. This is in line with the concept of Islamic digital literacy, which is the ability to access, assess, and produce information based on Islamic values. Thus, religious education can act as a balance between the rapid development of technology and the need to form noble character in the daily lives of students.

With continued support from the government, educators, and the community, Deep Learning technology can be a catalyst to transform religious education in a more inclusive and responsive direction to the challenges of the times. PAI is no longer seen as a normative and static subject, but as an important part of the development of a whole human being who is ready to face spiritual, social, and technological challenges simultaneously. Therefore, this long-term strategy is not only oriented towards academic results, but also on the formation of a Muslim personality who is digitally capable and firm in the values of faith.

However, although the potential application of Deep Learning in Islamic Religious Education (PAI) learning is very promising, further research is still needed to comprehensively evaluate its long-term impact on the development of students' character and morals. To date, most studies have focused on technical aspects, such as the effectiveness of personalizing learning or improving cognitive outcomes, while the affective and ethical dimensions which

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are at the core of religious education have not been explored in depth and longitudinally (Mela, 2024).

Students' character and morals are not aspects that can be formed in a short period of time, but rather the result of a continuous, repetitive educational process and influenced by the interaction between values, environment, and spiritual mentors such as teachers. Therefore, it is important to know the extent to which AI-based learning is really able to instill Islamic values authentically, not just providing religious information in the form of data or digital text. Technology that only mimics or automates cognitive processes is not necessarily able to replace the moral and spiritual touch that is usually built through example and emotional relationships between teachers and students.

More than that, longitudinal and multidisciplinary research is needed to measure the impact of Deep Learning in shaping the dimensions of integrity, empathy, religious awareness, and social behavior of students in the long term. Qualitative research approaches, digital ethnographic studies, and Islamic value-based evaluations can provide a more complete understanding of how this technology plays a role in shaping the personality of Muslim students that is balanced between digital intelligence and moral strength. Without a holistic and sustainable approach, the implementation of technology in PAI risks producing only technically sophisticated, but morally and spiritually superficial outputs.

This study also opens up wide opportunities for further research, especially related to the development of Deep Learning-based learning applications specifically designed to support the learning process of Islamic Religious Education (PAI) more effectively, efficiently, and contextually. Today, most of the applications available are still generic and do not fully accommodate the complexity of the material and values of Islamic teachings. Therefore, in-depth research is needed to design and develop a platform that is not only technically superior, but also has high pedagogical and spiritual sensitivity (Lorens et al., 2024).

Such an application should ideally be able to tailor content and learning strategies based on individual characteristics of students, including their level of understanding, learning interests, and learning style tendencies. For example, a creed learning module that can automatically adjust the depth of the material based on student responses, or a voice recognition system that is able to evaluate tajweed and makhraj in the recitation of the Qur'an in real-time with high accuracy. In addition, the integration of character-strengthening features such as daily reflection, content habituation of Islamic values, and reporting spiritual progress to teachers and parents is also a promising area of development.

Thus, the development of Deep Learning-based technologies for PAI is not just a software innovation, but a breakthrough in religious education approaches that combine the power of technology and spiritual values. Collaboration between AI developers, Islamic education experts, and educational technology practitioners is urgently needed to produce digital solutions that are authentic, theologically valid, and adaptive to the needs of future generations of Muslims. Future research can also explore how this technology can be systemically integrated into the national curriculum and used as a learning tool that enriches, rather than replaces, the role of teachers as moral and spiritual educators.

Thus, although there are still various challenges—ranging from limited infrastructure, lack of teacher training, to concerns about the influence of technology on moral and spiritual values, the implementation of Deep Learning in Islamic Religious Education (PAI) learning still shows great potential to improve the quality of religious education in schools. This

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technology is able to present a more personalized, adaptive, and data-based approach to learning, allowing each student to learn according to their own abilities, needs, and learning styles (Mustoip et al., 2024).

Furthermore, Deep Learning provides opportunities for teachers to be more effective in monitoring student development, providing real-time feedback, and developing more accurate learning strategies. In the context of religious education that is oriented towards character formation, spirituality, and morals, this technology can also function as a tool to strengthen the delivery of Islamic values through an interactive and reflective approach. As long as its use remains guided by Islamic ethical principles and involves educators as key actors, AI becomes not only a technical tool, but also a partner in the transformative mission of education.

Therefore, in the future, cross-sector collaboration is needed between the government, educational institutions, teachers, technology developers, and the community to ensure that this innovation can be implemented inclusively, equitablely, and still based on the noble values of Islamic teachings. With a strong policy foundation and adequate resource support, Deep Learning can be an important milestone in creating a religious learning ecosystem that is not only relevant to the times, but also excels in shaping a whole Muslim person: intellectually intelligent, spiritually strong, and noble.

Case Study of Implementation of Deep Learning in PAI Learning

1. Case Study 1: Madrasah Tsanawiyah (MTs) Al-Azhfar, Gorontalo

Madrasah Tsanawiyah Al-Azhfar in Gorontalo is one of the Islamic educational institutions that has applied deep learning-based artificial intelligence technology in PAI learning since 2022. This program was initiated in response to the low student involvement in online learning post-pandemic. With the support of a local developer team, MTs Al-Azhfar launched an AI-based interactive learning platform that allows students to access teaching materials adaptively.

The platform's main features include an Islamic chatbot for basic fiqh law consultation, NLP-based (Natural Language Processing) automated evaluation for Qur'anic verse memorization and comprehension tests, as well as a material recommendation system based on previous learning outcomes. Teachers act as facilitators, supervising students' learning activities through a dashboard that provides real-time progress reports.

Preliminary results showed a significant increase in students' active participation and understanding of PAI material. Around 85% of students showed an increase in cognitive and affective scores in the end-of-semester assessment (Hakeu & Djahuno, 2024). However, the main challenge is the limited internet network in rural areas and the initial resistance of some teachers who are less familiar with technology.

2. Case Study 2: Madrasah Ibtidaiyah Negeri (MIN) 1 Cirebon City

MIN 1 Cirebon City will start integrating deep learning in PAI learning in 2023 through collaboration with local education startups. The focus of implementation is not only on technology, but also on a pedagogical approach that combines Islamic values with the use of AI.

One of its flagship programs is "PAI Voice Feedback", which is a mobile application that can assess students' Qur'an readings automatically using speech recognition technology. The app identifies errors in makhraj and tajweed, and provides immediate feedback in the form of sound and visuals.

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Teachers use this app to guide students in individual recitation practices. In addition, the AI system was developed to provide adaptive quizzes related to Islamic faith, morals, and history. The quiz result data is automatically classified to find out the material that needs to be reviewed with students.

Internal evaluations show that this method is able to increase students' interest in learning and correct reading errors quickly. The school reported that 78% of students experienced an improvement in the quality of recitation within three months of using the app. However, advanced training is needed for teachers to maximize the analytical features of this system (Mustoip et al., 2024).

Increasing the Effectiveness of PAI Learning

The results of the study show that the application of Deep Learning technology in PAI learning in general has a positive impact on the effectiveness of the teaching and learning process. In schools that implement AI, such as MIN 1 Cirebon and MTs Al-Azhfar Gorontalo, students show increased understanding of religious concepts and higher learning motivation (Mustoip et al., 2024; Hakeu & Djahuno, 2024). This is shown by the achievement of increased formative and summative grades, as well as the high level of student involvement in online and interactive discussions.

AI-based applications such as PAI Voice Feedback have been proven to be effective in helping students improve Qur'an reading. The Deep Learning-based sound detection feature that detects tajweed and makhraj errors provides a personalized and instant learning experience. This is in accordance with the findings of Ayatillah et al. (2024) that the automatic feedback feature can significantly improve students' cognitive competence.

Personalization and Learning Adaptability

Deep Learning is able to map students' learning abilities automatically based on their interaction data with learning materials. With a data-driven recommendation system, teaching materials are adaptively adjusted, avoiding learning gaps and allowing for individual reinforcement of concepts. This is very helpful in PAI subjects that are reflective and personal in nature (Mahesa, 2024).

In the context of fiqh and moral learning, a Deep Learning-based system can adjust real-life simulations based on students' social profiles. For example, when discussing social ethics topics, the system is able to present case studies that are appropriate to the student's local context, making learning more relevant and contextual (Mela, 2024).

The Role of Teachers as Digital Facilitators

The change in the role of teachers from the only source of knowledge to technology facilitators is very pronounced in the application of Deep Learning in PAI classrooms. Teachers are more focused on designing learning experiences and guiding students in the process of exploring digital materials. In a study at SMKN Pringkuku Pacitan, PAI teachers reported that the deep learning method encourages students to think critically, collaboratively, and deeply about Islamic teachings (Khotimah & Abdan, 2024).

However, this role transformation does not necessarily go smoothly. There are still many teachers who have not mastered technology or feel burdened with digital adaptation. Therefore, strengthening teachers' digital literacy is a key factor in the successful integration of AI technology in PAI learning (Ayatillah et al., 2024).

Infrastructure Challenges and the Digital Divide

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Despite the positive results, the application of Deep Learning technology in PAI learning still faces serious challenges, especially in areas with limited infrastructure. Some schools, especially in rural and island areas, still experience difficulties in internet access, device availability, and network stability. This makes the implementation of AI-based learning uneven nationally (Lorens et al., 2024).

This disparity raises concerns about the gap in the quality of religious education between advanced and disadvantaged schools. The solution requires policy support from the government and education agencies, as well as collaboration with technology service providers to expand access and reduce operational costs.

Ethics and Data Protection Issues

The use of AI in education requires schools to manage students' personal data ethically and securely. In some case studies, concerns have arisen that student data—including voice recordings while reading the Qur'ancan be misused if not managed with good security standards (Hidayat et al., 2024). This raises the urgent need for specific regulations on data protection in AI-based education.

In addition, religious learning that is normative requires caution in AI algorithms. When AI is used to answer religious questions, it is important to ensure that the answers given are in line with the prevailing beliefs in schools, and in accordance with the principles of religious moderation (Mela, 2024).

Affective and Spiritual Impact

The implementation of Deep Learning also has an impact on the affective and spiritual realms of students. The material presented in the form of multimedia, interactive videos, and digital simulations makes it easier for students to reflect on Islamic values in more depth. According to Khotimah & Abdan (2024), this approach encourages a more meaningful learning experience because students can relate the teaching material to their daily lives.

However, some teachers emphasized the importance of maintaining the nuances of sacredness in religious learning. The integration of technology must not deprive teachers of exemplary value or diminish respect for religious knowledge. Therefore, a blend of technology and a humanist spiritual approach is needed.

4. CONCLUSION

The application of Deep Learning technology in Islamic Religious Education (PAI) learning in schools has opened up a new paradigm in the transformation of religious education. This technology allows for personalized learning, automatic adaptation of materials, and increased interactivity between students and teaching materials. In the digital era that demands efficiency, flexibility, and relevance of learning, the use of Deep Learning is able to bridge the gap between the learning needs of 21st century students and the normative and spiritual characteristics of PAI learning.

The results of studies and case studies show that PAI learning that integrates Deep Learning not only improves students' cognitive achievement, but also enriches their affective and spiritual dimensions. AI-based applications, such as voice recognition systems for the evaluation of Qur'an recitation and interactive chatbots for religious consultations, have proven effective in increasing students' motivation and depth of understanding of teaching materials. However, the success of implementation is highly dependent on the readiness of infrastructure,

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teachers' digital competence, and clarity of regulations related to ethics and student data protection.

Thus, the implementation of Deep Learning in PAI learning should not only be seen as a technological innovation, but as part of a broader pedagogical transformation. Cross-sectoral collaboration between educational institutions, technology developers, and governments is needed to create a safe, inclusive, and adaptive education ecosystem. Future recommendations include continuous training for teachers, investment in digital infrastructure, and strengthening Islamic values so that the technology applied remains in line with the goals of Islamic religious education in Indonesia.

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