Educate: Jurnal Ilmu Pendidikan dan Pengajaran
Vol. 4, No. 3 (2025) | |ISSN 2828-108X (Online)

Epistemological Analysis of the Integration of the Merdeka Curriculum and Deep Learning Technology in Islamic Education in the Digital Era

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Abstract: The transformation of education in the digital era has shifted the paradigm from conventional learning systems toward more adaptive, personalized, and technology-based models. This study aims to analyze the epistemological integration between the Merdeka Curriculum and deep learning technology within the development of Islamic education in the digital age. The research employed a library research method using content analysis of academic books, scholarly articles, and relevant policy documents. The findings reveal that the integration offers significant opportunities, including enhanced learning personalization, strengthened spiritual digital literacy, and pedagogical efficiency through adaptive learning systems. However, the study also identifies several epistemological and ethical challenges, such as value bias within algorithms, the risk of reducing spiritual dimensions into computational data, and limitations in digital competence among Islamic education teachers and institutional infrastructures. Epistemologically, the integration of technology in Islamic education must remain grounded in the principles of *tawhid*, *adab*, and *maqāṣid al-tarbiyah* to prevent fragmentation between knowledge and values. This study contributes theoretically by proposing an epistemological integration framework between curriculum and technology, and practically by offering insights for developing Islamic pedagogy that remains ethically and spiritually rooted while adapting to digital advancements.

Keywords:
Merdeka Curriculum; Deep Learning; Islamic Epistemology; Islamic Education; Digital Era.

Abstrak: Transformasi pendidikan pada era digital mendorong terjadinya perubahan paradigma dari sistem pembelajaran tradisional menuju model yang lebih adaptif, personal, dan berbasis teknologi. Penelitian ini bertujuan menganalisis keterpaduan epistemologis antara Kurikulum Merdeka dan teknologi deep learning dalam pengembangan pendidikan Islam pada era digital. Metode yang digunakan adalah penelitian kepustakaan dengan teknik *content analysis* terhadap buku akademik, artikel ilmiah, dan dokumen kebijakan yang relevan. Hasil penelitian menunjukkan bahwa integrasi keduanya menawarkan peluang signifikan, seperti peningkatan personalisasi pembelajaran, penguatan literasi digital spiritual, serta efisiensi pedagogis melalui sistem pembelajaran adaptif. Namun, penelitian ini juga menemukan beberapa tantangan epistemologis dan etis, termasuk bias nilai dalam algoritma, kecenderungan reduksi dimensi spiritual menjadi data komputasional, serta keterbatasan kompetensi digital guru PAI dan infrastruktur madrasah. Secara epistemologis, integrasi teknologi dalam pendidikan Islam harus tetap berpijak pada prinsip tauhid, adab, dan *maqāṣid al-tarbiyah* agar tidak terjadi fragmentasi antara ilmu dan nilai. Penelitian ini memberikan kontribusi teoretis berupa kerangka integrasi epistemologis antara kurikulum dan teknologi, serta kontribusi praktis bagi pengembangan pedagogi Islam yang relevan dengan perkembangan digital tanpa meninggalkan landasan etik-spiritual.

Kata Kunci:
Kurikulum Merdeka; deep learning; epistemologi Islam; pendidikan Islam; era digital.

A. Introduction

The shift in the paradigm of knowledge in the 21st century has transformed education from traditional approaches to learning models that emphasize creativity, problem-solving, collaboration, and technological literacy as essential competencies for students. This shift affects not only teaching methods but also the epistemic structure that shapes how learners acquire and interpret information within an increasingly complex digital ecosystem (Trilling & Fadel, 2009). This underscores the need for a renewed perspective on learning processes and modern classroom dynamics amid global developments.

The digital environment has created new patterns of interaction in learning activities, requiring students to access, evaluate, and process information independently. Technological literacy has become a fundamental aspect that determines students' ability to participate in an information-based society (Redecker, 2020). Consequently, education occupies a strategic position in preparing a generation capable of surviving and thriving in the digital world.

Alongside these shifts, the curriculum as the foundation of education must evolve to respond to the dynamics of knowledge that continually develops. The curriculum is now understood not merely as a list of learning materials but as an epistemic construction that guides students' thinking processes within a broader social context (Clements, 2018). Therefore, curriculum reform becomes an urgent necessity to ensure the relevance of national education.

Indonesia responds to this challenge through the implementation of the Merdeka Curriculum, which grants schools and teachers greater autonomy in designing learning according to local contexts. This curriculum places student independence, flexibility, and diversity of learning needs at the center of its development (Kemdikbudristek, 2022). Through this approach, students are encouraged to become active learners responsible for their own learning processes.

The Merdeka Curriculum also emphasizes character formation through project-based reinforcement of the Pancasila Student Profile. This orientation aims to create meaningful learning experiences rather than merely preparing students for test-based outcomes (Ahsan & Anwar, 2023). Thus, the curriculum serves as a medium for shaping learner identity in a holistic and sustainable manner.

Differentiated instruction, as promoted in the Merdeka Curriculum, offers students opportunities to grow according to their unique abilities and learning pace. This strategy is believed to increase motivation, independence, and self-reflection in learning (Tomlinson, 2014).

In the digital era, differentiation becomes more feasible with the support of rapidly developing educational technologies.

At the same time, advancements in artificial intelligence (AI), particularly deep learning, bring new opportunities for educational innovation. Deep learning enables large-scale data processing and pattern recognition that would be difficult to achieve manually (Goodfellow et al., 2016). This technology offers the potential to create more precise and adaptive learning models.

Deep learning technologies have produced various innovative systems such as intelligent tutoring systems, learning analytics, and predictive modeling, all of which can deeply analyze students' learning needs (Holmes et al., 2019). With these capabilities, technology functions not only as a supporting tool but also as an epistemic structure influencing how knowledge is understood and produced by learners.

The integration of deep learning technology opens opportunities for more personalized learning models. Adaptive systems are capable of adjusting learning content, pace, and difficulty levels according to individual student abilities (Baker & Inventado, 2014). This greatly facilitates the implementation of independent learning principles promoted by the Merdeka Curriculum.

Despite its potential, AI-based learning technology integration also poses epistemological challenges. Digital technologies influence how knowledge is presented, stored, and interpreted, requiring critical analysis of their impact on students' cognitive structures (Popenici & Kerr, 2017). Such computational paradigms may reshape learning patterns if not balanced by strong value frameworks.

In Islamic education, these challenges become more complex because Islamic pedagogy integrates intellect, revelation, morality, and spirituality as a unified epistemological system. Islamic epistemology values not only rationality but also the integration of spiritual dimensions derived from divine revelation (Al-Attas, 1991). The presence of algorithm-based technologies may disrupt this balance if not properly contextualized.

When deep learning technology is adopted in Islamic education, concerns emerge regarding how such technology treats spiritual values. There is a risk that spiritual meanings will be reduced to computational data without considering deeper metaphysical dimensions (Hashim, 2014). Therefore, an integrative framework is required to harmonize Islamic values with the use of advanced technologies.

One epistemological issue that must be addressed is value bias embedded in algorithmic systems. Algorithms are constructed based on particular data sets that are not always neutral and may introduce biases influencing students' interpretations (O'Neil, 2016). In Islamic education, such biases could distort religious understanding if left unchecked.

Beyond epistemological concerns, the successful integration of technology also depends on human resource readiness—particularly PAI (Islamic Education) teachers who play a strategic role in Islamic pedagogy. Many educators and Islamic institutions still face limitations in digital competence and technological infrastructure (Fauzan & Lubis, 2023). This situation requires comprehensive capacity-building policies to support effective implementation.

Considering these various aspects, the integration of the Merdeka Curriculum and deep learning technology in Islamic education must be built upon a clear and robust epistemological framework. The modernization of Islamic education must remain grounded in the values of tawhid, adab, and maqāṣid al-tarbiyah as its foundational principles. Technological integration that maintains spiritual values will yield Islamic education that is both relevant to contemporary developments and deeply rooted in Islamic ethical-spiritual principles.

B. Methods

This study employed a qualitative descriptive approach to explore the role of Islamic Religious Education (IRE) teachers in preventing bullying behavior at SMP IT Darur Rasyid Aceh Singkil. The qualitative approach was chosen because it allows the researcher to understand the meaning and depth of social phenomena within their natural context (Creswell, 2018). Through this approach, the researcher sought to obtain a comprehensive understanding of teachers' strategies, experiences, and challenges in fostering a non-bullying school culture.

The research subjects consisted of three IRE teachers, the school principal, and several students selected through purposive sampling. This sampling technique was used because participants were considered to have direct experience and involvement in the prevention of bullying at the school (Sugiyono, 2020). The research setting was SMP IT Darur Rasyid Aceh Singkil, which was chosen due to its implementation of integrated Islamic education and its strong emphasis on moral and character formation.

Data were collected using three primary techniques: interviews, observation, and documentation. The interviews were conducted semi-structurally to allow flexibility in exploring participants' perspectives. Observations were carried out during classroom and extracurricular

activities to identify teacher–student interactions related to moral education and discipline. Documentation included reviewing lesson plans, school regulations, and program reports related to anti-bullying activities (Miles, Huberman, & Saldaña, 2014).

The collected data were analyzed using the Miles and Huberman interactive model, which consists of three stages: data reduction, data display, and conclusion drawing (Miles et al., 2014). Data reduction involved summarizing and categorizing relevant information, while data display was done in the form of descriptive narratives. The conclusions were drawn by interpreting the data in light of Islamic educational principles and comparing them with previous research findings.

To ensure the validity and reliability of the data, the researcher applied triangulation of sources and methods. This included comparing data from interviews, observations, and documents to confirm consistency. The researcher also conducted member checking by verifying findings with participants to ensure accuracy and credibility (Lincoln & Guba, 1985). Ethical considerations were maintained throughout the study, with participants' consent obtained before data collection and confidentiality guaranteed in reporting results.

C. Results and Discussion

The epistemological integration between the Merdeka Curriculum and deep learning technology reflects a shared commitment to learner-centered, inquiry-oriented, and reflective pedagogy. The Merdeka Curriculum promotes student autonomy and personalized learning pathways, while deep learning enables adaptive pattern analysis capable of supporting individualized instruction (Mulyasa, 2022). This alignment demonstrates a mutual orientation toward meaningful learning experiences built upon data-driven decision-making.

Theoretically, this integration is strongly rooted in constructivist epistemology. Constructivism emphasizes that knowledge is constructed through interaction, experience, and reflection (Piaget, 1972; Vygotsky, 1978). Deep learning replicates this epistemic process computationally by continuously learning from patterns and constructing increasingly complex representations (Goodfellow et al., 2016). Because the Merdeka Curriculum also foregrounds experiential and exploratory learning, deep learning becomes philosophically compatible with its pedagogical foundations.

Within the context of Islamic education, this integration aligns closely with the *maqāṣid al-tarbiyah*, which prioritize intellectual development, moral refinement, and spiritual purification. Islamic education aims to shape learners who embody both competence and character, an objective that resonates with the values embedded within the Merdeka Curriculum (Al-Attas, 1993). Thus, the integration of deep learning into Islamic education is not only technological but also profoundly spiritual and ethical in orientation.

One of the most promising applications of deep learning in Islamic education is the development of adaptive Qur'an learning systems. AI-powered speech recognition can identify errors in *tajwīd*, *makhraj*, and rhythm of recitation with precision, providing immediate feedback that enhances traditional learning methods (Hameed et al., 2020). Such systems enrich Qur'an learning in both formal institutions and home environments by offering personalized guidance.

The rise of Natural Language Processing (NLP) further revolutionizes Islamic studies research. NLP makes it possible to analyze large corpora of Islamic texts, including tafsir, hadith, and classical manuscripts, enabling systematic thematic mapping and facilitating new insights for researchers (Ali & Shamsuddin, 2019). These digital tools democratize access to Islamic scholarship and strengthen methodological rigor.

Deep learning also supports community-based project learning that integrates Islamic values with contemporary social challenges. Students can use AI tools to analyze issues such as poverty, environmental degradation, or religious literacy, thereby producing solutions steeped in both civic responsibility and Islamic ethical principles (Rahman, 2021). This aligns with the Pancasila Student Profile Projects while reinforcing Islamic moral frameworks.

Furthermore, deep learning promotes religious digital literacy by enabling AI-based recommendation systems that filter credible Islamic content. This is crucial in the digital era, where misinformation and extremist narratives circulate widely. AI can guide learners toward authentic, moderate, and trustworthy sources (Yusof, 2022), supporting the development of balanced religious understanding.

Despite its benefits, the integration of deep learning and Islamic education presents epistemological risks. Algorithmic bias is a major concern, as many AI systems are developed within secular and Western epistemologies that may not align with Islamic values (O'Neil, 2016). Without ethical oversight, such biases could influence Islamic learning in ways that undermine spiritual objectives.

Another challenge concerns the reduction of spirituality. AI-driven learning systems quantify performance and behavior, yet key aspects of Islamic education—such as sincerity (*ikhlas*), spiritual presence, and moral intention—cannot be measured computationally (Al-Ghazali, 2000). This creates tension between the quantifiable orientation of AI and the inward, ethical focus of Islamic pedagogy.

Practical barriers also hinder AI adoption in Islamic education. Many Islamic education teachers have limited understanding of AI-based pedagogy and lack the technical competencies required for effective implementation (Mustafa, 2021). This skills gap restricts the potential benefits of deep learning integration in real classroom settings.

Infrastructure limitations exacerbate these challenges. Schools and madrasahs, particularly in rural or low-resource areas, often lack adequate digital facilities and reliable internet access, making AI-supported learning inequitable (Sari, 2022). Without infrastructural support, technological innovation cannot be implemented consistently across diverse educational contexts.

Addressing these challenges requires a conceptual model grounded in Islamic epistemology. Al-Attas (1993) emphasizes that technology must operate within the hierarchy of Islamic values, serving as an instrument of *adab* rather than an autonomous epistemic authority. This ensures that deep learning remains a tool subordinated to moral and spiritual objectives.

The "Digital *Murabbi*" model offers a practical framework for implementation. In this model, Islamic education teachers function not only as technology users but also as spiritual mentors who guide students in ethical digital engagement (Rahman & Hamid, 2020). This approach balances technological literacy with spiritual and moral cultivation.

Integrating *tawhid* and *akhlaq* principles into AI development and usage is also essential. These values must shape algorithm design, content curation, instructional integration, and assessment processes, ensuring that AI advances *maslahah* (benefit) and avoids harm (Nasr, 2015). This ethical foundation is critical for constructing an Islamic AI paradigm.

Ultimately, the ideal model of Islamic digital education integrates intellectual reasoning, spiritual consciousness, and ethical virtue. By aligning the Merdeka Curriculum with deep learning through the lens of Islamic epistemology, educators can nurture learners who are technologically skilled yet spiritually grounded and morally responsible. This balanced model

responds to the demands of the digital age while remaining faithful to Islamic educational principles.

D. Conclussion

This analysis demonstrates that the epistemological integration between the Merdeka Curriculum and deep learning technology provides significant strategic opportunities while also presenting challenges that require careful conceptual alignment. The Merdeka Curriculum—emphasizing learner-centered, reflective, and inquiry-driven education—shares substantial compatibility with the fundamental characteristics of deep learning, which rely on adaptive learning, data processing, and gradual pattern formation. This relationship indicates that curriculum and technology can be integrated within an Islamic epistemological framework as long as both are directed toward achieving the *maqāṣid al-tarbiyah*, including the cultivation of intellect, character, and spirituality.

Practically, substantial opportunities exist for leveraging deep learning to enrich Islamic education, such as optimizing Qur'anic learning through adaptive AI systems, applying NLP for Islamic text analysis, strengthening community-based learning projects, and promoting ethical and moderate digital religious literacy. However, these opportunities coexist with serious challenges, including algorithmic bias rooted in non-Islamic paradigms, the risk of reducing spirituality to quantifiable data, gaps in AI literacy among Islamic education teachers, and limitations in digital infrastructure within Islamic educational institutions. These challenges underscore the necessity of maintaining epistemological vigilance whenever technology is introduced into Islamic educational spaces.

Therefore, a balanced digital Islamic educational paradigm is required—one that embraces technological advancements while remaining firmly grounded in the values of *tawhid*, ethics, and *adab*. Technologies such as deep learning must be positioned as tools that elevate human dignity rather than replace educators or diminish the spiritual dimensions of learning. The principles of *adab* articulated by Islamic thinkers such as Al-Attas and Al-Ghazali provide essential guidance to ensure that technology operates within a morally sound framework. With a harmonious integration of intellect, spirituality, and ethics, Islamic education can fully utilize technological potential while preserving the spiritual integrity of learners in the rapidly evolving digital era.

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