



## INTEGRATION OF DEEP LEARNING AS AN EDUCATIONAL INNOVATION STRATEGY FOR ISLAMIC BOARDING SCHOOLS (PESANTREN) IN THE DIGITAL ERA

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**Abstract:** This study explores the integration of the pedagogical Deep Learning (DL) approach, specifically the Meaningful, Mindful, and Joyful (MMJ) framework, within the traditional educational system of Indonesian *pesantren*. The aim is to analyze the compatibility, challenges, and operationalization of DL to enhance learning outcomes and prepare students for the demands of the digital era. A qualitative case study approach was employed at *pesantren* Darunnajah in Bogor, involving in-depth interviews with 12 participants (3 teachers, 6 students, and 3 administrators), observations, and document analysis. The findings highlight a strong theoretical alignment between DL and *pesantren*'s core educational values, such as *Fahm* (deep comprehension), *Ijtihad* (critical reasoning), and *Adab* (moral development). Empirically, teachers reported improved student engagement and reflective learning practices, with one educator noting, "The MMJ framework helps students connect religious lessons to their daily lives, making learning more relevant." However, the study identifies key challenges, including infrastructure gaps, diverse levels of digital literacy, and the need to balance digital innovation with the preservation of moral guidance. Strategies such as blended learning models and focused teacher training are recommended. The integration of DL within *pesantren* represents a strategic pedagogical evolution, empowering students to develop both religious and modern competencies. Future research should focus on the longitudinal impacts of DL on student outcomes.

**Keywords:** Learning Approach, Deep Learning, *Pesantren*, Educational Innovation Strategy, Digital Era

**Abstrak:** Studi ini mengeksplorasi integrasi pendekatan Pembelajaran Mendalam (DL) pedagogis, khususnya *Meaningful, Mindful, and Joyful Learning* (MMJ), ke dalam sistem pendidikan tradisional pesantren di Indonesia. Tujuannya adalah untuk menganalisis kompatibilitas, tantangan, dan operasionalisasi DL dalam meningkatkan hasil belajar dan mempersiapkan siswa untuk tuntutan era digital. Pendekatan studi kasus kualitatif digunakan di pesantren Darunnajah di Bogor, melibatkan wawancara mendalam dengan 12 peserta (3 guru, 6 siswa, dan 3 administrator), observasi, dan analisis dokumen. Temuan ini menyoroti keselarasan teoretis yang kuat antara DL dan nilai-nilai pendidikan inti pesantren, seperti *Fahm* (pemahaman mendalam), *Ijtihad* (penalaran kritis), dan *Adab* (pengembangan moral). Secara empiris, guru melaporkan peningkatan keterlibatan santri dan praktik pembelajaran reflektif, dengan seorang pendidik mencatat, "Kerangka kerja MMJ membantu santri menghubungkan pelajaran agama dengan kehidupan sehari-hari mereka, membuat pembelajaran lebih relevan." Namun, penelitian ini mengidentifikasi tantangan utama, termasuk kesenjangan infrastruktur, tingkat literasi digital yang beragam, dan kebutuhan untuk menyeimbangkan inovasi digital dengan pelestarian bimbingan moral. Strategi seperti model pembelajaran campuran dan pelatihan guru yang terfokus direkomendasikan. Integrasi DL dalam pesantren merupakan evolusi pedagogis strategis, memberdayakan siswa untuk mengembangkan kompetensi agama dan modern. Penelitian di masa depan harus fokus pada dampak *longitudinal* DL terhadap hasil belajar santri..

**Kata Kunci:** Pendekatan Pembelajaran, *Deep Learning*, Pesantren, Strategi Inovasi Pendidikan, Era Digital

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## INTRODUCTION

Education in Indonesia is undergoing a significant transformation to meet the demands of the 21st Century, which prioritizes critical thinking, creativity, and collaboration (Anwari, 2022). In response, innovative learning approaches that move beyond rote memorization are essential (Haris et al., 2021; Putri, 2024). One approach gaining traction is the pedagogical model of Deep Learning (DL), introduced by the Minister of Education, Prof. Abdul Mu'ti. This educational approach should not be confused with Deep Learning in Artificial Intelligence (AI); in this context, DL emphasizes deep conceptual understanding, mastery of competencies, and the internalization of knowledge through meaningful experiences (Kompas, 2024).

The implementation of DL in Indonesia aligns with the principles of the *Merdeka Curriculum*, which champions learning freedom and project-based approaches (Sari, 2023; Swawikanti, 2024). This curriculum allows students to explore topics contextually and according to their interests. DL, with its focus on meaningful and mindful learning experiences, is highly relevant for supporting national educational goals (Muzakir & Susanto, 2023).

*Pesantren* (Islamic boarding schools), as the oldest indigenous educational institutions in Indonesia, play a crucial role in national education and have historically served as bastions of national resilience (Azra, 2013). With unique characteristics that have produced great scholars, community leaders, and educators (Zarkasyi, 2005), *pesantren* must continually evolve their learning approaches. In *pesantren*, there is a term "*atthoriqotu ahammu minal maddah, wal mudarris ahammu mina ath-thoriqoh, wa ruuhu al-mudarris ahammu min mudarris nafsihi*" (the method is more important than the material, the teacher is more important than the method, and the spirit of the teacher is more important than the teacher themselves) which emphasizes that the teacher's spirit and methodology are vital for delivering meaningful learning. This philosophy provides a strong foundation for integrating the DL approach (Bengio, 2009).

However, a clear research gap exists. While numerous studies discuss Deep Learning in the context of AI and machine learning (Hernández-Blanco et al., 2019; Ravi et al., 2017), there is a scarcity of research exploring DL as a pedagogical model within traditional educational systems like *pesantren*. Most literature focuses on technological applications of DL, leaving its potential for educational innovation in religious contexts underexplored.

Therefore, this study aims to examine how the Deep Learning approach (Meaningful, Mindful, and Joyful) can be integrated within the *pesantren* educational model to enhance both religious and digital competencies (Hattie, 2008). It analyzes the compatibility, challenges, and strategies for implementing DL, addressing critical issues such as infrastructure readiness, teacher competency, and the balance between digital innovation and the preservation of moral guidance.

## LITERATURE REVIEW

### Clarifying Deep Learning: From AI to Pedagogy

It is crucial to distinguish the concept of Deep Learning (DL) in this study from its namesake in the field of artificial intelligence. In technology, DL is a subfield of machine learning based on artificial neural networks (Bengio, 2009; Ravi et al., 2017). In contrast, the pedagogical Deep Learning approach, as championed by the Indonesian Minister of Education, is an educational paradigm designed to foster a profound, holistic understanding and mastery of competencies, standing in direct opposition to Surface Learning (Swawikanti, 2024). Surface Learning covers broad material superficially, often relying on memorization, resulting in suboptimal competency development. Pedagogical DL, however, prioritizes depth over breadth, ensuring students not only know but also comprehend, internalize, and find relevance in their learning.

### The Meaningful, Mindful, and Joyful (MMJ) Framework

The pedagogical DL approach is operationalized through the MMJ framework. Meaningful learning, rooted in David Ausubel's theory, emphasizes connecting new knowledge to learners' existing cognitive structures, making learning relevant and deeply understood. Mindful learning involves metacognitive awareness, where learners consciously reflect on their understanding, identify gaps, recognize the material's relevance, and monitor their learning progress (Hattie, 2008). This element cultivates active, responsible learners. Joyful learning focuses on creating a positive, engaging learning environment through interactive, collaborative activities, which boost intrinsic motivation and make the learning process enjoyable (Mutaqin et al., 2016).

When combined, these three elements create a powerful synergy that promotes lasting and meaningful educational outcomes. 1) Meaningful learning, as presented by David Ausubel, emphasizes the importance of the relationship between new concepts taught and those previously understood by students. This process aims to create meaningful learning, where students can understand the material in greater depth and in a way that is relevant to the knowledge they already have. 2) Mindful learning is often associated with metacognition in educational theory, referring to learning that is accompanied by full awareness of the ongoing process. This awareness includes several aspects, including: (a. Understanding of concepts or competencies that have been mastered. b. Awareness of things that have not been understood or mastered. c. Knowledge of the importance of the material studied and its relevance in competency development. d. Awareness of the learning flow that is being undertaken to achieve goals. e. Reflection on the progress made in learning. f. Awareness of future exploration opportunities.

Through Mindful Learning, students are encouraged to become active learners who are responsible for developing their own understanding and competencies. However, unlike adults, this awareness does not develop automatically in children, so the teacher's role is essential in building and maintaining it throughout the learning process. Joyful learning highlights the importance of creating a positive, enjoyable learning environment that supports students at every stage of the learning process. For example, a game-based approach or interactive activities can increase students' enthusiasm for learning. This approach aims to encourage students' active involvement in the learning process, so that

they enjoy the learning experience and have intrinsic motivation to continue learning. When Joyful Learning is combined with the elements of Meaningful Learning and Mindful Learning, students are expected not only to understand the material deeply but also to develop a passion for lifelong learning.

### **Foundational Teaching Principles in *Pesantren***

The principles of effective teaching in *pesantren* environments, as outlined in classical educational literature, show remarkable synergy with the MMJ framework. Sutrisno Ahmad detailed several foundational rules, including: 1) moving from concrete examples to abstract concepts, 2) connecting new knowledge (the unknown) to prior knowledge (the known), 3) progressing from specific cases to general rules, 4) sequencing learning from simple to complex, and 5) building from empirical experience toward reasoned understanding. These principles inherently advocate for a deep, contextual, and student-centered learning process (Ahmad, 2008).

In the book *Ushūl al-Tarbiyah wa al-Ta'lim*, it was stated that teaching is a method that aims to facilitate students in expanding their knowledge horizons, strengthening their mental and moral strength, and forming noble morals (Ahmad, 2008). Meanwhile, the Educational Objectives describe the behaviors students will possess upon completion of the teaching process. To achieve this goal, several basic rules of teaching are important in determining teaching methods, including;

1. Teaching starts with real things and moves to sensible concepts, namely, through examples and sensory experiences to perceptual understanding. Since a child's initial contact with the world occurs through his senses, and his first perceptions are sensory, teaching should emphasize examples and real-life experiences before moving on to general definitions.
2. Learning evolves from the already known to the unknown. New information will be easier to understand if it is linked to previous knowledge, thus creating enthusiasm, interest, and fun in learning. New things that at first glance seem foreign can become more structured when linked to old information, creating a logical, continuous understanding. For example, the teacher first explained the well-known concept of "cat," then the concept of "tiger."
3. Learning moves from specific examples to general rules or definitions. This method is very effective for teaching natural sciences, grammar, and other fields. Teachers need to explain the differences and similarities in detail so that students can understand and conclude the rules that apply. Teachers are also advised to use examples relevant to students' experiences, encouraging them to contribute answers from personal experience.
4. The learning process starts from the simple to the complex. Teachers should begin with easy-to-understand material as a basis before introducing more complex concepts. For example, train children to write single letters first before moving on to compound words.
5. Learning moves from what is known through experience and observation to reason- and evidence-based understanding. Students often have information from personal experience, such as knowing that a lamp bottle will break if it is splashed with cold

water, or that a glass will crack if it is suddenly filled with hot water. Information like this can serve as a basis for learning the principles of natural science (Ahmad, 2008).

Some of the basic rules above serve as a basis for educators in determining the teaching method in Islamic boarding schools, and these rules are very much in line with the concept of the deep learning approach initiated by the Minister of Education, namely, meaningful, mindful, and joyful learning.

**Conceptual Integration: Bridging MMJ and *Pesantren* Values**

The theoretical alignment between the MMJ framework and *pesantren* educational objectives is profound. The MMJ framework can be viewed as a modern pedagogical vehicle to achieve the timeless ideals of *pesantren* education. The ultimate aim of *pesantren* is to cultivate individuals of profound understanding and wisdom who can critically contemplate and integrate knowledge (*Ulil Albab*). It aligns perfectly with DL's goals. The table below synthesizes this conceptual integration, which will guide the empirical analysis in this study.

Table 1. Conceptual framework: alignment of the MMJ framework with *pesantren* values

MMJ Principle	Core Concept	<i>Pesantren</i> Value	Theoretical Integration
Meaningful Learning	Connecting new knowledge to prior understanding and real-world context.	<i>Fahm</i> (Deep Comprehension)	Ensures knowledge transcends rote memorization and is applied to contemporary realities, supporting the integration of worldly and spiritual understanding ( <i>Integrasi Ilmu Duniawi dan Ukhrawi</i> ).
Mindful Learning	Metacognition, critical thinking, reflection, and self-awareness.	<i>Ijtihad</i> (Critical Reasoning) & <i>Muhasabah</i> (Introspection)	Develops the reflective and critical reasoning skills essential for deep religious study, independent judgment, and ethical character development.
Joyful Learning	Emotional engagement, motivation, collaboration, and a positive environment.	<i>Adab</i> (Moral Conduct) & <i>Halaqah</i> (Collaborative Learning)	Fosters a motivating and respectful learning community, where learning is seen as an act of worship ( <i>Ibadah</i> ) and is enhanced through positive teacher-student relationships ( <i>Keteladanan</i> ).

**Critical Research Gap**

While the theoretical compatibility is evident, there is a scarcity of empirical research investigating the practical application, challenges, and outcomes of implementing this integrated MMJ-DL model within the unique socio-cultural and structural context of *pesantren*. This study seeks to fill this gap by providing empirical evidence from the field.

**RESEARCH METHODOLOGY**

**Research Design**

This study employed a qualitative approach with a single-case study design. This approach was selected because it allows for an in-depth investigation of a contemporary

phenomenon (the integration of DL) within its real-life context, over which the researcher has limited control (Yin, 2020). The case study design is optimal for answering "how" and "why" questions regarding the strategic integration of DL as an educational innovation in *pesantren* (Creswell, 2013). The single case, bounded by its specific context, provides rich, detailed insights into the processes, challenges, and dynamics of this integration.

The research was conducted at *pesantren* Darunnajah in Bogor, West Java. This *pesantren* was purposively selected because it represents a traditional Islamic boarding school actively integrating digital tools and innovative pedagogical approaches, making it a relevant and information-rich case for this study.

Participants were selected using a purposive sampling technique to ensure they could provide meaningful insights related to the research objectives. The total number of informants was 12 individuals, consisting of: 3 Teachers (*Ustaz/ustazah*) with over 5 years of teaching experience in both religious and general subjects, 6 Students (*Santri*) from various grade levels to capture diverse perspectives, and 3 Administrators (including a member of the *pesantren*'s leadership board) involved in curriculum and policy decisions.

### **Data Collection**

The researcher will collect data from various relevant informants, such as *pesantren* caregivers, teachers, and students, to provide a more complete picture of the implementation of *deep learning* as a learning innovation strategy in *pesantren*. This approach allows researchers to obtain rich, in-depth information on the phenomenon of deep learning integration in the *pesantren* education process in the digital era. Data collection in this study uses three main techniques, namely interviews, observations, and documentation (Kustianti, 2022). The interviews were conducted to gather information directly from informants, including *pesantren* caregivers, teachers, and students, regarding the implementation of *deep learning* as an educational innovation strategy in the digital era. The interview questions were prepared in line with the research objectives, including understanding and applying *deep learning strategies*, teachers' readiness to design meaningful learning experiences, and students' perceptions of deep learning-based experiences. Observations were conducted to examine firsthand the learning practices in Islamic boarding schools, particularly the interactions between teachers and students, the use of deep learning strategies, and the classroom dynamics that emerge from this approach. Meanwhile, documentation is used to complete the data from interviews and observations (Saat & Mania, 2020), by examining various relevant documents such as the *pesantren* curriculum, Learning Implementation Plan (RPP), the vision and mission of the institution, project-based activities implemented, and student achievement records that reflect the implementation of deep learning-based learning.

### **Data Analysis**

The data analysis in this study was carried out interactively and continuously, following the analysis model proposed by Miles and Huberman. The data analysis process consists of four main stages, namely data condensation, data presentation, data management, and conclusion/verification (Miles et al., 2014). Data analysis followed the interactive model proposed by Miles, which consists of: Data Condensation: Interview

transcripts, field notes, and documents were summarized and coded to identify relevant themes. Data Display: Organized data were displayed in the form of narrative texts and matrices (e.g., Table 1 and Table 2 in the Findings section) to provide a structured overview. Conclusion Drawing and Verification: Initial conclusions were drawn and continuously verified through triangulation of data sources (comparing insights from teachers, students, and documents) to ensure validity and reliability.

To ensure the trustworthiness of the findings, this study employed source triangulation (cross-checking data from interviews, observations, and documents) and member checking, where initial interpretations were presented to key informants to confirm the accuracy of the collected data.

FINDINGS AND DISCUSSION

Findings

The comprehensive analysis conducted in this research reveals that integrating the Deep Learning (DL) approach, encapsulated by the Meaningful, Mindful, and Joyful (MMJ) framework, within the *pasantren* Darunnajah ecosystem is a strategic pedagogical alignment. The empirical data, synthesized from interviews, observations, and documents, confirms a strong theoretical and practical compatibility between DL and the core objectives of *pasantren* education. The findings are organized into two main matrices below. The success of this transition, however, is demonstrably conditional upon successfully addressing critical operational challenges, particularly balancing blended learning models and significantly enhancing educators' competence in the rapidly changing digital landscape (Feriyanto & Anjariyah, 2024).

Table 2. Alignment of deep learning principles (MMJ) with *pasantren* tradition/value

Deep Learning Principle	Core Concept	<i>Pasantren</i> Tradition/Value	Empirical Evidence from the Field
Meaningful Learning	Connecting new knowledge with prior context and application.	<i>Fahm</i> (Deep Comprehension); Contextual Integrasi Duniawi <i>Ukhrawi</i> .	A teacher noted: " <i>When we discuss Islamic law of business (fiqh muamalah), we no longer just read the kitab. We ask students to analyze modern business cases like online trading. It makes the classical text alive and meaningful for them.</i> " (Teacher 1, Interview)
Mindful Learning	Full attention, reflection, critical thinking, and stress management .	<i>Muhasabah</i> (Introspection); <i>Muraqabah</i> (Vigilance); <i>Adab</i> in seeking knowledge; <i>Ijtihad</i> .	A senior student shared: " <i>Now, after each halaqah, our ustadz asks us to write a short reflection in a journal: what we understood, what was unclear, and how it relates to our life. It forces us to think deeper, not just listen.</i> " (Student 4, Interview)
Joyful	Emotional	<i>Halaqah</i>	Observation data showed that

Learning	engagement, motivation, creativity, and collaboration .	(Collaborative Discussion); Learning as <i>Ibadah</i> ; <i>Keteladanan</i> (Role Modeling).	group quizzes on a digital platform (e.g., Quizizz) to review nahwu (Arabic grammar) material created a lively, competitive atmosphere. Students were observed actively collaborating and cheering. (Observation Notes, Date)
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Table 2: Theoretical Alignment Matrix (DL, MMJ, and *pesantren* Values) provides an analytical framework that systematically maps contemporary Deep Learning principles to traditional *pesantren* values. This matrix illustrates the intrinsic philosophical compatibility required for non-disruptive educational innovation, demonstrating how the DL approach serves as an amplifier of the *Ulil Albab* ideal. Complementing this theoretical basis (Sasra, 2024)

Table 3. Strategic matrix for digital deep learning implementation in *pesantren*

Digital Era Challenge	Impact on DL Implementation (MMJ)	Mitigation Strategy (Digital Integration)	Empirical Evidence
Infrastructure & Connectivity Gaps (Rural/Traditional)	Limits access for Meaningful resource exploration and Joyful collaboration.	Leveraging national infrastructure, managed device provision, and access points.	The IT administrator stated: " <i>We have a dedicated study room with regulated Wi-Fi access. Students can use provided tablets during specific hours to access digital kitab and learning apps, preventing distraction.</i> " (Administrator 2, Interview)
Diverse Digital Literacy (Santri & Guru)	Inability to utilize DL tools for Mindful reflection or Joyful creation.	Dedicated Pelatihan Guru; Integrated basic digital literacy for santri.	A teacher admitted: " <i>The training on creating interactive digital content was crucial. At first, I was hesitant, but now I can design simple mind maps and quizzes that make my tafsir class more engaging.</i> " (Teacher 3, Interview)
Maintaining Tradition ( <i>ruh pesantren</i> ) & Ethical Content	Risk of technology replacing essential face-to-face moral guidance and <i>Adab</i> .	Blended Learning model (Halaqah + E-learning); Strict content supervision.	The <i>pesantren</i> leader emphasized: " <i>Technology is a tool, not a replacement for suhbah (companionship) . Our rule is clear: digital tools are for seeking knowledge, not entertainment. The halaqah and the</i>



*teacher's role as a moral  
model remain  
central."* (Administrator 1,  
Interview)

Table 3. A strategic matrix for the implementation of deep learning details the critical operational challenges inherent in the digital transition. These challenges include systemic infrastructure limitations and the urgent need for enhanced *Guru* (teacher) competence. The matrix also outlines corresponding, targeted strategies, such as structured teacher training and rigorous oversight of digital content, which are essential prerequisites for realizing the full potential of the MMJ framework in the digital learning environment (Adnyana et al., 2025).

**Discussion**

**Theoretical Integration: Deep Learning as a Manifestation of *Ulil Albab***

The integration of Deep Learning (DL) methodologies within the *pesantren* structure is anchored in a fundamental philosophical congruence. DL, defined by its focus on moving past rote memorization toward profound understanding, critical thinking, and applied knowledge, aligns precisely with the *pesantren's* highest educational aspiration: the creation of *Ulil Albab* (Nafi'ah & Faruq, 2025). The term *Ulil Albab*, as understood in Islamic tradition, refers to individuals with a deep understanding and wisdom, capable of reflective contemplation of divine signs. This goal mirrors the essential reflective and analytical components embedded in Mindful Learning.

This theoretical compatibility positions the DL approach as a powerful amplifier for traditional Islamic pedagogy, rather than a radical replacement. The foundational goals of *pesantren*: deep understanding (*Fahm*), independent reasoning (*Ijtihad*), and comprehensive moral formation (*Adab*), already necessitate a 'deep' processing approach to knowledge, often facilitated through classical methods such as *halaqah* (discussion groups) and *muhadlarah* (textual explanation). When contemporary DL models (MMJ) are introduced, they leverage these established principles. For instance, Mindful learning's focus on attention and reflection supports the institutional requirement for *Adab* and introspection (*Muhasabah*). The critical implication is that potential resistance to innovation stemming from philosophical discontinuity should be minimised, provided the methodology is strategically framed as a modern, efficient vehicle for achieving the ancient and enduring *Ulil Albab* ideal.

Meaningful learning further reinforces this integration by emphasizing the connection between new concepts and existing understanding, coupled with real-world application. This dimension directly parallels the traditional *pesantren* emphasis on contextual *Fiqh* (Islamic jurisprudence), which requires students to connect religious texts (*kitab-kitab fiqh*) not only to theological principles but also to contemporary social, political, and cultural realities. This process ensures the learning is immediately contextual and relevant, actively preventing the segregation of knowledge into separate, disconnected fields (*Integrasi Ilmu Duniawi dan Ukhwawi*).

Implementing Deep Learning requires extending the institutional standard of deep competency to encompass both religious rigor and modern reflective skills. *Pesantren* already enforces a high standard of deep competency in religious fields, particularly in Qur'anic memorization, through methods such as *Mutqin*. The *Mutqin* method ensures quality, thematic memorisation, and focuses on the meaning and structure of the verses rather than simple rote repetition (Mustafa et al., 2023). For DL integration to be genuinely successful, this high standard must be systematically extended to include digital competence and the advanced reflective skills promoted by Mindful Learning. The institutional culture must evolve to recognize that digital literacy and critical, reflective thinking are dual core competencies, equally crucial alongside *Mutqin* religious knowledge, enabling *santri* to truly embody the characteristics of the modern *Ulil Albab*, those who are deeply rooted in faith yet capable of shaping the modern world.

### **Practical Pedagogy: Enhancing Core Competencies through MMJ and Digital Tools**

Operationalizing the Deep Learning framework within the traditional educational environment necessitates tailoring the MMJ components to enhance core *pesantren* competencies. Joyful learning, focused on emotional engagement, retention, creativity, and motivation, is particularly vital. The demanding, long-term nature of *pesantren* education, encompassing intensive *Tahfidz* and theological study, benefits significantly from integrating collaborative, creative, and game-based activities. These elements are critical for fostering sustained motivation and preventing academic burnout over the long trajectory of continuous learning emphasized in the *pesantren* tradition.

Mindful Learning practices serve as the intellectual engine for advanced skill development. Practices that encourage focused attention, reflection, and stress management, often enhanced by digital tools such as AI-assisted personalisation, have been shown to improve critical thinking and reflective capabilities. It directly supports the institutional objective of fostering *Ijtihad*. Digital platforms can facilitate structured methods for *muhasabah* (self-introspection) and enable *santri* to systematically track their reflective growth, turning abstract moral and intellectual guidance into measurable, actionable learning outcomes. Furthermore, the *Mutqin* method serves as a pre-existing prototype for Deep Learning. By focusing on conceptual linkage and thematic patterns (*lokomotif ayat*) to strengthen memorization, *Mutqin* aligns seamlessly with the Meaningful and Mindful dimensions of DL, prioritizing conceptual understanding over surface-level retention.

A key strategic application of technology involves the digitalization of core religious references. Institutions such as Ar-Rohmah have implemented strategies to digitize *kitab kuning* and other religious books. This innovation significantly transforms traditional scholarly engagement. In the past, the study of *kitab kuning* involved time-consuming manual processes for textual retrieval and cross-referencing. By providing digital access to these references, *santri* can rapidly compare and synthesise diverse scholarly interpretations, thereby enabling faster and deeper *Ijtihad*. Critical analysis is a fundamental objective of the Deep Learning methodology. This acceleration of conceptual linkage fosters Meaningful Learning by allowing students to engage with a broader context more efficiently.

The strategic leveraging of MMJ is also essential for addressing inherent motivational and retention challenges. The high-intensity study environment in *pesantren* poses a risk of stress and eventual attrition. Studies confirm that integrating DL, particularly through the emotional regulation provided by Mindful Learning and the engagement created by Joyful Learning, improves conceptual understanding, fosters creativity, and enhances motivation. By mitigating stress and boosting emotional engagement, these pedagogical components ensure a sustained commitment to continuous learning, thereby sustaining the rigorous theological and knowledge-acquisition process central to the *pesantren*'s mission.

### **Theoretical Contribution and Practical Implications**

This study's primary theoretical contribution lies in its empirical validation of a conceptual model that bridges a modern pedagogical framework (MMJ) with classical Islamic educational philosophy. It demonstrates that educational innovation in traditional contexts can be most effective when framed as a reinforcement of core values rather than a departure from them.

Practically, the findings suggest that: 1) For *pesantren* Leaders: Adopting a DL-MMJ framework requires investing in targeted teacher professional development and establishing clear ethical guidelines for technology use. 2) For Policymakers: Supporting such innovations necessitates addressing infrastructure disparities, particularly in rural *pesantren*, to ensure equitable access to digital learning tools.

### **CONCLUSION**

This study demonstrates that integrating the pedagogical Deep Learning (DL) approach, operationalized through the Meaningful, Mindful, and Joyful (MMJ) framework, is both theoretically viable and practically achievable within the Indonesian *pesantren* ecosystem. The central finding confirms a profound philosophical congruence between modern DL principles and the *pesantren*'s enduring goal of cultivating individuals of deep wisdom and critical understanding (*Ulil Albab*). The Mindful Learning component, in particular, seamlessly strengthens traditional reflective practices like *Muhasabah*, thereby enhancing students' capacity for *Ijtihad* (critical reasoning) and *Fahm* (deep comprehension).

Operationally, this research underscores the critical importance of a disciplined blended learning model for navigating the digital era. While the digitalization of core religious references (*kitab kuning*) significantly accelerates scholarly access and synthesis, the findings affirm that face-to-face mentorship (*halaqah*) remains indispensable for transmitting *Adab* (character) and preserving the *ruh* (*spirit*) of the *pesantren*. It necessitates rigorous ethical supervision (*Muraqabah*), reinforcing the need for technological integration within a firm's spiritual and moral framework.

### **Practical Implications**

The study offers two primary practical implications: 1) For *pesantren* leaders and policymakers, developing and implementing structured teacher-training modules in DL-MMJ pedagogy is essential to build educators' capacity to design meaningful, mindful, and joyful learning experiences. 2) Educational authorities should support the creation

of contextualized blended learning models that provide clear guidelines for balancing digital tools with the preservation of traditional values and moral guidance.

### Suggestions for Future Research

Future studies should focus on: 1) Longitudinal research to examine the sustained impact of DL integration on student engagement, academic performance, and character formation over time. 2) Exploratory studies testing the effectiveness of the MMJ framework across different types of *pesantren* (e.g., traditional vs. modern) to develop more nuanced implementation strategies.

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