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Deep Learning-Based Learning Strategies in Realizing Meaningful, Critical, and Enjoyable Learning

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Abstract

This study aims to examine the form and scope of the application of *Deep Learning* in the Vocational High School (SMK), especially at SMK Mantingan, through a literature study approach. *Deep Learning*, as part of artificial intelligence, has great potential in the world of vocational education, especially in supporting technology-based learning and improving student competencies in the digital field. This study relies on various literature sources such as scientific journals, books, articles, and relevant documents to examine the concepts, applications, and challenges faced in the integration of *Deep Learning* in vocational schools. The results of the study show that although the application *of Deep Learning* in vocational schools, including at SMK Mantingan, is still relatively new and limited, there are great opportunities for development in project-based learning and improving students' digital literacy. The scope of implementation includes the introduction of basic concepts, the use of supporting software, and the use of simple models for educational purposes. This study recommends the need for teacher training, the provision of adequate infrastructure, and collaboration with higher education institutions or industry to expand the application of this technology in vocational schools.

Keywords: adaptive education, critical thinking, education quality improvement, inclusive learning, joyful learning, meaningful learning

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1. Introduction

DL-based learning models can be used for personalized adaptive education systems (Hidayani et al., 2025). Personalized learning can be leveraged to make this type of education more effective. Personalized learning (also known as competency-based learning) is an educational approach in teaching where students can adjust to their needs and abilities. This approach is considered an alternative to traditional education where students receive similar assignments, instruction, and assessments. This type of education is said to be most effective through the use of AI and big data analytics. Proponents of this approach believe that it will succeed in motivating to be better and that the number of students dropping out of school will decrease significantly.

Various studies have shown that the use of deep learning in education can increase learning effectiveness, increase student

motivation, and assist teachers in identifying students' learning needs more accurately. Research by Sari & Arta (2025) shows that the application of deep learning approaches in Islamic Religious Education learning can increase students' active participation and their conceptual understanding. In addition, research by Herliani (2025) highlights that deep learning can be used to create a more interactive and effective learning experience, by dynamically adapting the curriculum and providing more relevant feedback to students. However, to realize this potential, careful educational planning is needed, including in developing a curriculum that supports the development of students' character through a deep learning approach.

In addition, it is important to understand teachers' perceptions of the implementation of the deep learning curriculum, as they are the main implementers in the learning process. Researched by Juarminson, 2025 shows that most teachers have a positive view of this curriculum, but also face challenges in terms of training and resource support.

The urgency of developing Deep Learning-based learning models in this context becomes even clearer when we look at how these technologies can be integrated to create more inclusive learning (Mahardhika et al., 2025). Deep Learning technology allows for in-depth data analysis and personalization, so that learning content can be tailored to individual student needs. Thus, learning is accessible to all students, including those with special needs, such as the deaf, speech-impaired, or blind. In an increasingly digital world of education, the ability to personalize learning is key to creating an inclusive and adaptive learning environment (Sulistyanto et al., 2022).

The learning strategy using the deep learning approach will be a central topic of discussion at the end of 2024 in Indonesian education, because it was proposed by the Ministry of Primary and Secondary Education (Kemendikdasmen), Prof. Abdul Mu'ti is a learning strategy to improve the quality of education in Indonesia. This deep learning approach is not new, but this term has been around since 1976. The deep learning approach is not a new curriculum, but an approach to learning that has the potential to increase learning effectiveness, which focuses on deep understanding, critical thinking, internalizing meaningful knowledge, and fun learning. Critical thinking skills are essential for students to develop their ability to explore problems, questions, or situations, find a solution, and justify their positions (Rusiana et al., 2024).

This deep learning approach does not refer to the advancement of artificial intelligence technology, but rather to an education quality improvement strategy that emphasizes students to be active, understand meaning deeply, and understand religious values. This approach empowers students to think more critically, more deeply, collaborate actively, and solve problems meaningfully. The deep learning approach is a learning system designed to strengthen students' understanding with an in-depth approach. The deep learning approach emphasizes a learning process that involves critical analysis, relating information to prior knowledge, and being able to apply it in a broader context. The goal is to create reflective learning that is meaningful, fun, critical and more in-depth.

Research Choldun & Surendro (2018) shows that deep learning approaches are already being implemented in many countries by showing relevant developments and results in improving the quality of understanding and student engagement levels. This deep learning approach emphasizes three pillars of the concept, namely: first, mindful learning,

which is the awareness that each student has a different background and learning method so that there must be an increase in interaction and positive relationships between teachers and students.

Teachers must give full respect and must not ignore their students, humans have different ways, different ways of thinking, so that each student's style of thinking is also different. Second, meaningful learning is the existence of a meaningful learning process, which is able to encourage students to think critically, be actively involved in every learning activity, understand meaning concretely and deeply. Third, joyful learning is the formation of a fun learning experience, a fun and relevant learning environment. Pleasure is found because students feel valued, are able to do on their own, can find something new and find new meaning from the material studied.

2. Method

This study uses a descriptive qualitative approach with the library research method, which aims to explore and describe the form and scope of deep learning at Mantingan Vocational School. This approach was chosen because it allows researchers to analyze various written sources such as journal articles, books, research reports, and policy documents that are relevant to the theme of the study. The data in this study was obtained from secondary sources, namely scientific articles from accredited journals, both national and international, published in the last six years (2019–2025). Sources are selected based on relevance to the topic, the quality of publications, and their relevance to subthemes such as independent curriculum, educational innovation, learning technology, and artificial intelligence.

3. Result and Discussion

Deep learning in the educational context presents a pedagogical framework with the potential to transform learning experiences into more mindful, meaningful, and joyful processes (Andayanie et al., 2025). Deep Learning is an approach to problem solving on a computer learning system that relies on the concept of hierarchy. It involves intellectual (cognitive), ethical (moral), emotional (aesthetic), and physical (kinesthetic) engagement in an integrated, holistic manner (Chosya & Takiddin, 2025). These concepts allow computers to learn more complex concepts by combining simple concepts. If depicted in the form of a graph, this hierarchy will form a deep layer, which is why it is called Deep Learning. In Indonesia, the national education system continues to adapt to these changes by emphasizing the develop- ment of 21st-century skills, namely critical thinking, creativity, communication, and collaboration (4C) (Nugroho et al., 2025).

This research originated from the latest policy of the Ministry of Primary and Secondary Education (Kemendikdasmen) in emphasizing the deep learning approach as a strategy to improve the quality of education in Indonesia. The deep learning approach gives students the opportunity to think critically, understand the interconnectedness of concepts to generate new knowledge. In addition to being active in learning, students are expected to be able to understand the subject matter more deeply. Education must continue to transform and be more adaptive to the development of a very complex era (Figure 1).

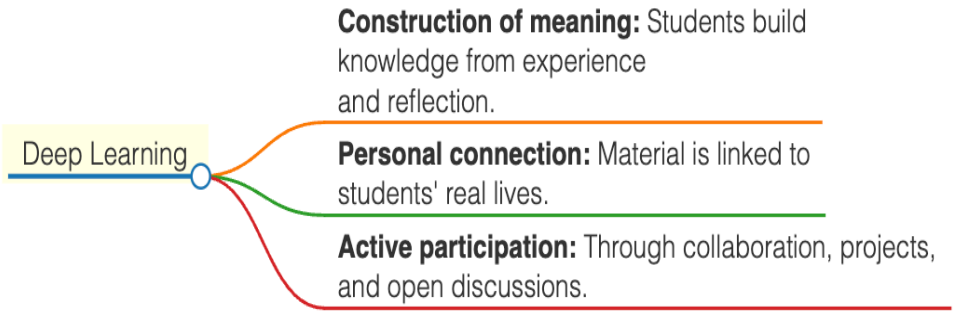

Figure 1. Deep Learning

As a school that was named a National Literacy Activist School in 2025, SMK Mantingan continues to strive to improve the quality of education by starting to implement a deep learning approach that can encourage student involvement in active and in-depth learning. Students are not only expected to be able to understand learning cognitively, but also to be able to apply and innovate more broadly. Teachers act as facilitators to guide and direct students. The establishment of active interaction between teachers and students is able to encourage students to build their understanding independently.

A. Forms of Deep Learning, Layered Thinking Processes

From Khotimah & Abdan (2025) The main form of climbing learning involves critical, reflective, and analytical thinking. This process does not stop at memorizing and repeating information, but will continue towards:

1) Conceptual understanding

Students will understand the core concepts and definitions, with this they will be able to explain by conveying their version but still on the same understanding also relate to other contexts as examples.

2) Interest between concepts

In deep learning, one piece of information does not stand alone, but will also always be connected to other knowledge. This indicates a strong mental direction and purpose.

3) Implementation in real-world situations

Deep learning is a real means to be a direction for students to apply the concepts that have been learned, this is also very relevant in solving problems and making decisions based on understanding.

4) Self-reflection and evaluation

The in-depth process is about encouraging individuals to reflect on what they have learned and question their own understanding and continue to refine what they want to know.

B. The Scope of Deep Learning in the Dimension of the Educational Process

The scope of deep learning encompasses several aspects in the world of educators as well as in character formation, among which are:

1) Cognitive, which develops a high level of thinking ability in individuals (analysis, synthesis, evaluation)
2) Affective, which touches attitudes and values. Deep understanding is often accompanied by the help of empathy, sensitivity and responsibility.
3) Psychomotor, which in some contexts of deep learning requires practical skills to

be performed with full awareness and understanding, not just mechanical routines.

4) Social and moral, for a person who studies deeply usually has the ability to see the impact of his knowledge on society, can also understand his ethics and social responsibility.

Deep learning as a learning approach is not only about the depth of information, but also more about understanding, awareness and the interconnectedness of meaning. It creates a comprehensive learning process, and can capture the intellectual, emotional, and spiritual aspects of students. In real practice, deep learning can help form individuals who think critically, learn well and be able to share knowledge with the reality of life in a reflective and responsible manner.

As an organization engaged in educational, social, and religious fields, Muhammadiyah has great potential to utilize deep learning technology in various aspects (Muhlis, 2024):

1) Muhammadiyah Education

With an adaptive system, Muhammadiyah's e-learning platform can be developed with AI to adapt the material to the students' abilities. Analyze student achievement and well-being with AI to detect students' academic and psychological problems early on. Introduction of hijaiyyah script and Arabic for early childhood.

2) Health

With this use of deep learning for automatic medical diagnosis, such as cancer diagnosis through radiological imaging.

3) Social and Philanthropy

For poverty mapping and data-based social assistance. With ai analysis to be able to determine the priority location of receiving lazismu benefits.

4) Development of catbot dahwah,

Detection of hate speech on social media, or the dissemination of NPL-based Islamic content

Deep learning-based learning enables high-level thinking processes that are very important in facing the challenges of the digital age. The deep learning approach in learning shows three main patterns that are integrated with each other (Rahman et al., 2023): Meaningful Learning, Mindful Learning, and Joyful Learning.

a) Meaningful learning

Meaningful learning is the process by which students connect new information with the knowledge they already have (Andayanie et al., 2025; Prihantoro et al., 2025). In this approach, learning is not just memorizing facts, but building a stronger and deeper cognitive structure. In the aspect of Meaningful learning, teachers can transform impressive learning into more contextual and meaningful. Teachers can integrate the curriculum with the real lives of students (Figure 2). As a concrete example, in science learning, students are involved in a spring water source conservation project in their village. The project not only teaches the concept of environmental conservation theoretically, but also provides hands-on experience in applying knowledge to address real problems in their communities.

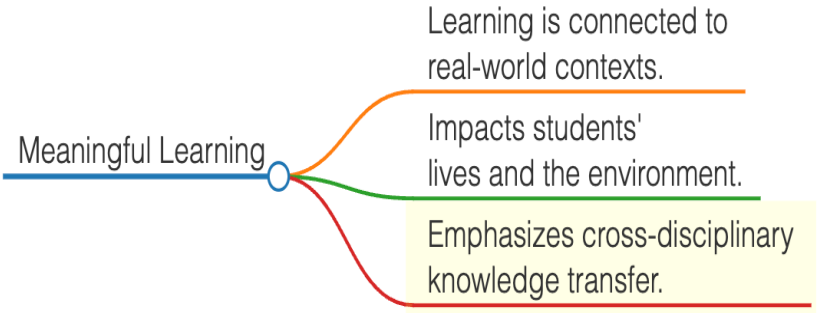

Figure 2. Meaningful Learning

b) Mindful learning

A learning approach that integrates the principles of mindfulness in the learning process, focusing on paying full attention to what is being learned without judging or rushing. Emphasizes that this approach encourages students to become conscious and reflective learners. Mindful Learning is not only about concentration, but it also includes the development of metacognitive awareness that allows students to understand and manage their own learning process. In other words, students are taught to focus not only on the material being studied, but also on the way they learn, the strategies used, and how they can improve their learning effectiveness (Figure 3). Research conducted by Zhao et al., 2024 shows that mindfulness-based interventions (MBIs) applied in learning improve self-regulated learning (SRL).

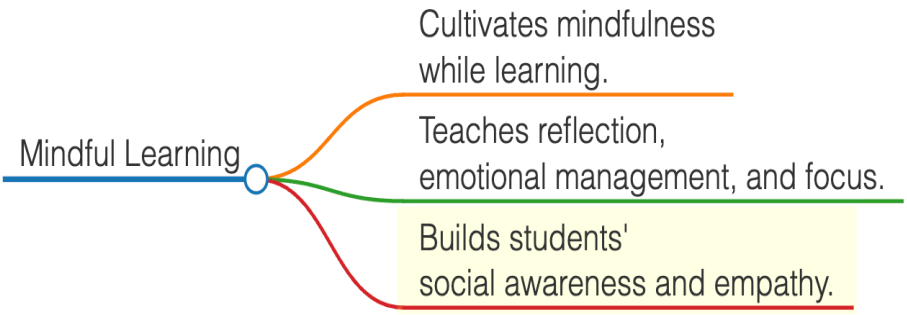

Figure 3. Mindful Learning

c) Joyful Learning

A learning approach that places fun, positive emotional engagement, and meaningful experiences as an important part of the learning process. The goal is for students to learn with enthusiasm, curiosity, and a sense of happiness, not just because of academic demands (Figure 4). In Indonesia, research shows that the application of outdoor activity-based Joyful Learning in science lessons increases the enthusiasm and learning outcomes of elementary school students. The implementation of Joyful Learning involves designing learning activities that integrate elements of play, creativity, and exploration.

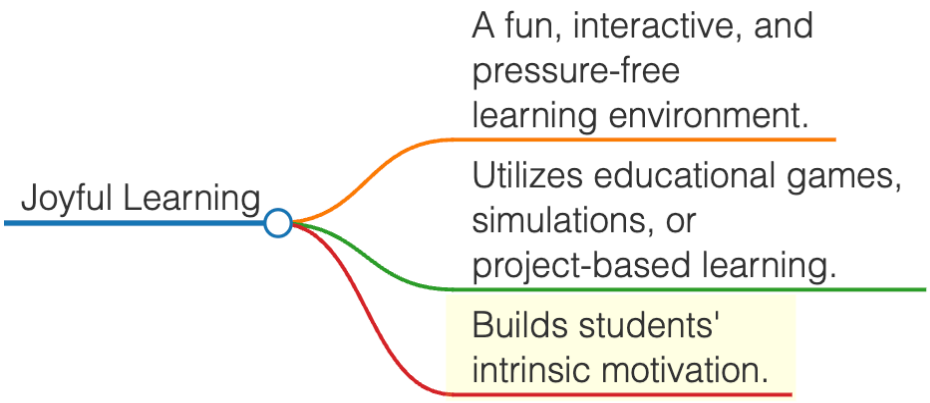

Figure 4. Joyful Learning

Teachers can use various methods such as game-based learning, role-playing where lesson concepts are taught through engaging educational games; creative projects, which allow students to express their ideas through art, design, or other media; and collaborative activities that encourage teamwork and positive social interaction. Thus, students feel more comfortable and motivated to learn, as they see the learning process as something fun and rewarding.

C. The Scope of Deep Learning in Vocational Schools Related to Islam

Deep learning consists of a series of effective and efficient activities, aiming to create a quality and meaningful learning experience. Assessments by educators are carried out throughout the process, from planning to final evaluation, to monitor student progress. The deep learning approach is in line with the development of 21st Century skills, which support learners' ability to analyze, evaluate, and create, as well as improve their ability to communicate and collaborate to solve problems.

Efforts to form leadership attitudes and behaviors among students can be carried out by various methods, one of which is through the process of internalizing values (Akhyar, 2024). Internalization of values is the process by which educators transform certain values in learning, so that learners can understand and consider concepts that are initially unfamiliar as truth. This process can be carried out in a variety of ways, including providing examples and socialization through a substantive approach to learning materials. The substantive approach packages the material in an attractive way, integrating leadership values such as siddiq (honest), amanah (trustworthy), tabligh (delivering), and fathonah (intelligent) in learning and reading. In addition, conveying leadership stories, from the biographies of successful leaders to their achievements, can also be done, with adjustments according to the age and development of students.

The internalization of leadership values must not only be carried out in schools or madrasas, but must also be applied in the family and society. Therefore, cooperation between educational institutions, families, and the community is essential to align learning activities in the classroom with real life. This synergy can be realized through meetings between the school and the committee or guardians of students, so that families and the community can play an active role in supporting the learning process. In this way, they not only become consumers of graduates, but also contribute to achieving

educational success in accordance with the teachings of the Qur'an, al-Hadith, and other sources of Islamic law.

Integrating learning activities with daily life can be done by parents and the community conducting continuous supervision of students' behavior outside the school environment. In addition, providing input in the form of constructive criticism and suggestions is also very important in the learning process. Each form of internalization of the value that has been described needs to be evaluated periodically. This evaluation aims to improve the less effective aspects, continue the good ones, and stop the ones that don't. The evaluation process involves not only reporting, but also self-assessment for introspection on individual achievement in learning.

4. Conclusion

Based on the results of the research, it can be concluded that *Deep Learning* has great potential to be applied in vocational education environments such as vocational schools, including at SMK Mantingan. The form of application can be in the form of introduction to basic concepts of artificial intelligence, the use of supporting software, to the development of simple projects based on *machine learning*. The scope of its application in vocational schools is still limited, mainly due to human resource constraints, lack of technological infrastructure, and lack of in-depth understanding from educators about this technology. However, with the support of teacher training, adaptive curriculum development, and cooperation with external institutions, *Deep Learning* can become an important part of technology-based learning in vocational schools. This study emphasizes the importance of the readiness of educational institutions in facing digital transformation and suggests strategic steps to gradually expand the application of *Deep Learning* technology in vocational schools.

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