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Implementation of A Deep Learning Approach to Improve the Learning Outcomes of Students in the Building Design, Modeling and Information Department at State Vocational High School 1 Kaidipang

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ABSTRACT

The low level of Higher Order Thinking Skills (HOTS) and student learning outcomes in vocational subjects remains a major challenge in vocational education in Indonesia. Students generally operate at the level of Lower Order Thinking Skills (LOTS) and have difficulty connecting vocational concepts with their application in real-world contexts. This study aims to improve student learning outcomes through the implementation of a Deep Learning approach in vocational instruction at the Building Modeling and Information Design (DPIB) Department of SMK Negeri 1 Kaidipang. The research employed Classroom Action Research (CAR) based on the Kemmis and McTaggart model, conducted in two cycles comprising planning, action, observation, and reflection stages. The research participants consisted of 10 Grade X DPIB students. The Deep Learning approach was implemented through inquiry learning and project-based learning methods. The results demonstrate a significant improvement in learning outcomes, with average scores increasing from 42% in the pre-cycle to 66% in Cycle I and 86% in Cycle II. Improvements were also observed in collaboration, conceptual understanding, critical analysis skills, and student engagement.

Keywords: Classroom Action Research, Deep Learning, Learning Outcomes, Vocational Education

INTRODUCTION

Vocational education plays a strategic role in preparing competent, adaptive human resources ready to enter the workforce. Along with advances in science and technology, demands on vocational education graduates extend beyond technical skills to higher-order thinking skills (HOTS). However, various educational evaluations indicate that students' HOTS skills in Indonesia remain relatively low and are dominated by Lower-Order Thinking Skills (LOTS), particularly in vocational learning contexts that require integration between concepts and practice (Ministry of Elementary and Secondary Education, 2025).

Several previous studies have shown that student-centered learning approaches have the potential to increase engagement and learning outcomes. Project-Based Learning (PjBL) has been shown to be effective in enhancing students' critical thinking and problem-solving skills, but its application remains general and has not specifically targeted the characteristics of certain vocational competencies (Taufik, 2025). Other research confirms that the Deep Learning approach can foster more meaningful and sustainable conceptual understanding, but most studies still focus on general education and have not been widely applied in vocational education contexts (Suhardiman, 2025). Furthermore, studies integrating inquiry learning and project-based learning within a single deep learning approach in the Building Information Modeling and Design (DIPB) major are still very limited.

Based on this literature review, a research gap can be identified: the suboptimal application of a Deep Learning approach designed contextually according to the characteristics of vocational subjects, particularly in the Building Information Modeling and Design competency. Therefore, the scientific novelty of this article lies in the application of the Deep Learning approach through the integration of inquiry learning and project-based learning in DIPB vocational learning, and its systematic testing through Classroom Action Research.

The research problem focuses on low student learning outcomes and their limited ability to connect vocational concepts to real-world practice. The proposed action hypothesis is that the application of the Deep Learning approach can improve student learning outcomes in vocational subjects. Thus, the purpose of writing this article is to analyze the improvement of learning outcomes of students in the Building Modeling and Information Design Department through the application of the Deep Learning approach in vocational learning.

METHOD

This study employed the Classroom Action Research (CAR) method to address the problem of low student learning outcomes in vocational subjects. The research model employed refers to Kemmis and McTaggart, which encompasses four main stages: planning, action, observation, and reflection, implemented cyclically over two cycles (Kemmis & McTaggart, 2014). The study was conducted at SMK Negeri 1 Kaidipang, located on Jalan Manggis, Bigo Village, Kaidipang District, North Bolaang Mongondow Regency, North Sulawesi Province. The study subjects consisted of 10 tenth-grade students majoring in Building Modeling and Information Design (DPIB) in the odd semester of the 2025/2026 academic year.

The approach employed in this study was Deep Learning, implemented through inquiry learning in the initial stages of learning and project-based learning during the concept development and application stages. The learning material used was Technical Drawing, as part of the Basic Vocational DPIB subject. Learning activities were designed in the form of initial investigations, conceptual discussions, and vocational project work relevant to real-world contexts.

Data were collected through observations and learning outcome tests. Observations were used to observe teacher activities and student engagement throughout the learning process. Learning outcome tests were administered at the pre-cycle, cycle I, and cycle II stages to measure improvements in student learning outcomes. The test instruments were developed based on subject competency indicators and used consistently throughout each cycle. The research data were analyzed using quantitative descriptive analysis. Learning outcome test results were calculated as average scores and percentage of learning completion in each cycle to determine improvements in student learning outcomes. Observational data were analyzed descriptively to illustrate changes in student learning behavior, engagement, and critical thinking skills during the implementation of the Deep Learning approach.

RESULTS AND DISCUSSION

This classroom action research was conducted in two cycles, each consisting of four meetings. The primary objective of this research was to improve student learning outcomes in the Building Modeling and Information Design major at SMK Negeri 1 Kaidipang through the application of an immersive learning approach. Data for the action results were obtained through observations of learning activities and a final assessment in the form of an oral exam on the projects completed by each group.

In the initial stage, before implementing the action, the researcher observed the learning process of students in grade X DPIB. At this stage, the researcher recorded student learning outcomes based on the usual learning method, namely conventional learning. Based on the results of the pre-cycle observations, the average student learning outcome was only 42%. Students were only able to memorize the material and had difficulty understanding the concepts taught.

Cycle I was conducted with four meetings. The first meeting used the inquiry learning method, and the second through fourth meetings used the project-based learning method. Before implementing the Action, the researcher first compiled a learning module using an in-depth learning approach that included learning identity, identification in the form of initial student abilities, learning materials and graduate profile dimensions, learning design in the form of learning outcomes, cross-disciplinary, learning objectives, learning topics, pedagogical practices, learning partnerships, learning environments and digital utilization, including learning experiences and learning assessments. This module was agreed upon by fellow teachers in the field of expertise in Building Modeling and Information Design as well as the Principal and Vice Principal of the Curriculum section. At the end of cycle I, the researcher conducted a reflection on student learning outcomes reaching a percentage of 66%, this result increased compared to the results in the pre-cycle even though it had not yet reached the desired KKTP with a minimum score of 75. See figure 1.

Figure 1. Implementation of Actions in cycle I

Students whose scores did not meet the KKTP (Competency Minimum Competency) criteria were identified based on adjustments to the learning approach and a combination of inquiry learning and project-based learning methods. This method focuses students on investigating information and practicing the information they have learned through investigation. Students also struggled to divide tasks evenly within group projects, and communication among group members was lacking. Observations of student learning outcomes were obtained through group understanding evaluations and oral exams based on completed projects. Based on these findings, improvements were decided in Cycle II.

Actions continued in Cycle II, focusing on correcting weaknesses identified in Cycle I to improve student learning outcomes. Cycle II consisted of four meetings, with inquiry learning being used in the first meeting and project-based learning methods being used in meetings two through four. In Cycle II, researchers guided students who had difficulty working together in groups and gave students the freedom to explore learning resources from various sources.

During the reflection stage, student learning outcomes increased by 86%. This indicates that the improvements made in Cycle II have addressed the weaknesses of Cycle I. See Figure 2.

Figure 2. Implementation of Actions in cycle I

The research results showed an increase in student learning outcomes after implementing the Deep Learning approach. In the pre-cycle phase, the average student learning outcome score was 42%. After implementing the actions in cycle I, the average score increased to 66%. A more significant increase occurred in cycle II, with an average score reaching 86%. See table 1.

Table 1: Summary of Student Learning Outcomes

Research Stage	Percentage	Achievement Category
Pre-cycle	42%	Low
Cycle I	66%	Fair
Cycle II	86%	High

In addition to improving cognitive learning outcomes, observations also show improvements in non-cognitive aspects, such as student collaboration, active engagement in discussions, conceptual understanding, and critical analysis skills in completing vocational projects. Students are able to connect technical drawing concepts to real-world practice through contextually designed project activities.

These findings align with Deep Learning theory, which emphasizes active engagement and in-depth conceptual understanding. The application of inquiry learning encourages students to ask questions and reason, while project-based learning provides authentic experiences relevant to the world of work.

CONCLUSION

The research conducted shows that the implementation of a deep learning approach can improve the learning outcomes of students majoring in Building Modeling and Information Design at SMK Negeri 1 Kaidipang. This can be seen in the improvement in learning outcomes, from 42% in the pre-cycle to 66% in the first cycle, and after corrective actions, to 86% in the second cycle. This indicates that the implementation of a deep learning approach in vocational education, particularly in technical drawing, can improve student learning outcomes.

REFERENCES

Afifi Mutiarani, A. K. (2025). Innovating Bacterial Cultivation Practicums to Promote Deep Learning: A Trial and Reconstruction of Student Worksheets (LKPD). Jurnal Penelitian Pendidikan IPA.

Alwafi, E. M. (2023). The effect of learner-generated digital materials on learners' deep learning approach and self-efficacy. Journal of Education and e-Learning Research.

Dr. Budi Suhardiman, M. P. (2025). Deep Learning dan Implementasinya dalam pembelajaran. Bandung: Situ Pustaka.

Floran Carvalho, J. H.-L.-H. (2023). Deep learning for the detection of acquired and non-acquired skills in students' algorithmic assessments. Journal of Education and e-Learning Research.

Heni Komalasari, B. B. (2025). Deep Learning in Dance Education : A Strategy for Instilling Character Values. Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran.

(Kementrian Pendidikan Dasar dan Menengah Republik Indonesia, 2025)

M. Anggrayni, A. I. (2025). Development of a Deep Learning-based Instructional Module for Enhancing Critical Thinking in Pancasila Learning. Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran.

M. Anggrayni, A. I. (2025). Development of a Deep Learning-based Instructional Module for Enhancing Critical Thinking in Pancasila Learning. Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan di Bidang Pendidikan, Pengajaran dan Pembelajaran.

Muhammad Aidil Sudarmono, H. H. (2025). Deep Learning Approach in Improving Critical Thinking Skills of Elementary School Students. Jurnal Penelitian Pendidikan IPA.

Neneng Sulastri, S. A. (2024). Deep Learning-Based Planning Model for Islamic Education in Indonesian Integrated Schools. EDUKASIA: Jurnal Pendidikan dan Pembelajaran.

Sinaga, D. (2024). BUKU AJAR PENELITIAN TINDAKAN KELAS (PTK). Jakarta: UKI Press.

Suhardiman, B. (2025). Deep Learning dan Implementasinya dalam Pembelajaran. Bandung: Situ Pustaka.

Suryo Ediyono, D. S. (2025). Utilization of deep learning for the implementation of pancasila philosophy in pancasila education in christian middle schools. JPPI (Jurnal Penelitian Pendidikan Indonesia).

Syafril, J. (2025). Exploring The Impact of Deep Learning Approaches on Geography Education: Student Perceptions and Educational Implications. Jurnal Penelitian Pendidikan IPA.

Taufik, M. E. (2025). The Effectiveness of Deep Learning based PjBL on Student's Scientific and Critical Thinking Skills at Indonesia. Jurnal Penelitian Pendidikan IPA.

Thuong T. K. Nguyen1, M. T. (2023,). Artificial intelligent based teaching and learning approaches: A comprehensive review. International Journal of Evaluation and Research in Education (IJERE).

Yaping Qiu, N. A. (2025). AI-Assisting Technology and Social Support in Enhancing Deep Learning and Self-Efficacy among Primary School Students in Mathematics in China. International Journal of Learning, Teaching and Educational Research.