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Deep Learning Training: Improving Teacher Competence in Implementing the 2024 Merdeka Curriculum

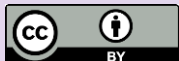
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Abstract

The transition to a competency-based curriculum requires a paradigm shift for teachers, from mere implementers of material to innovative curriculum developers. However, teacher training is often theoretical and fails to address substantive classroom practice. This study aims to document and analyze the effectiveness of Deep Learning strategy-based training in improving the competence of high school teachers in DKI Jakarta to authentically implement the 2024 Merdeka Curriculum. Using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) instructional design framework, this activity involved 224 teachers in the online phase and up to 33 selected teachers per class in the offline phase. Data were collected through needs surveys, observation of the Learning Objective Flow (ATP) drafts developed by teachers, and pre- and post-tests on pedagogical strategies. The results showed an increase in participants' knowledge from an average pretest score of 68.5 to an average posttest score of 83.7, with an N-gain of 0.48. The Deep Learning approach significantly improved teachers' pedagogical literacy, as evidenced by their ability to deconstruct Learning Outcomes (CP) into contextual instructional designs based on deep conceptual understanding. The transformation in mindset is evident in the shift from conventional teaching methods to reflective and inclusive learning strategies. This study concludes that training that emphasizes independent knowledge construction and collaboration is key to bridging the gap between macro curriculum policies and micropedagogical practices in the classroom.

Keywords: Merdeka Curriculum, ADDIE, deep learning, teacher competence

INTRODUCTION

The transition to a competency-based curriculum has become a dominant global trend over the past decade, serving as a strategic response to the increasingly dynamic demands of the times (Henri et al., 2017). Implementation of this curriculum model has become a key agenda for educational reform in various countries, with the primary goal of equipping students with 21st-century skills such as critical thinking, collaboration, and digital literacy (Kailo et al., 2025; Voogt & Pareja Roblin, 2012). Through this approach, the focus of education shifts from merely mastering textual material to developing practical capabilities that enable students to adapt to complex real-world challenges.

In the national context, this educational transformation is realized through the Merdeka Curriculum (*Kurikulum Merdeka*) policy, which upholds the principles of flexibility and institutional autonomy. This curriculum specifically emphasizes differentiated learning tailored to individual needs and character building (Iyanda et al., 2025). The success of this transition depends heavily on teachers' pedagogical competence in integrating these values into classroom practice. The effectiveness of the teaching and learning process depends on teachers' ability to integrate pedagogical competence with the use of appropriate instructional materials in the classroom (Nassor et al., 2026). Therefore, mastery of these competencies is a crucial foundation for educators to create a learning environment that is not only meaningful but also inclusive for all students (Florian & Linklater, 2010).

The fundamental challenges in curriculum implementation are often rooted not in the substance of the policy itself but in the effectiveness of the training strategies provided to educators (Kailo et al., 2025). Although current curriculum designs demand high levels of pedagogical innovation, the reality on the ground shows that most in-service training remains trapped in traditional paradigms (Darling-Hammond et al., 2017; Kennedy, 2016). The dominance of standard lecture and discussion methods in training sessions often results in the neglect of contextual problem-solving. A theoretical approach without ongoing practical support has proven unsuccessful in providing a substantive long-term impact on teachers' professional growth (Kraft et al., 2018).

The failure to transform this training model ultimately creates a wide gap between visionary curriculum design and conventional classroom practice (Kailo & Njagi, 2025). This phenomenon confirms that the implementation of new curricula at the national level consistently faces similar systemic obstacles, namely the difficulty of translating macro policies into effective, concrete actions at the micropedagogical level (Mlenge et al., 2025; Spillane et al., 2002). Without a reorientation toward a more practice-based and collaborative teacher professional development system, the curriculum's ambition to create flexible and innovative learning will be difficult to achieve equitably (DuFour & Fullan, 2013; Vescio et al., 2008).

Much research has been conducted on improving teacher competence in the context of curriculum reform, but most has focused on top-down administrative and technical training.

Previous studies have emphasized that the main obstacle to curriculum implementation lies in teachers' low pedagogical literacy in translating curriculum flexibility into instructional design (Iyanda et al., 2025; Mlenge et al., 2025). Although various in-service trainings have been conducted, the models used tend to be theoretical and lack a deep cognitive focus, resulting in a dichotomy between policy vision and classroom practice (Kailo & Njagi, 2025). A significant correlation exists between teachers' competence levels and their teaching performance in secondary schools (Matira & Ofrin, 2024). This reinforces the urgency of providing Deep Learning training to ensure that teachers possess competencies aligned with the demands of curriculum change. The main challenge faced by teachers in the field is changing their teaching patterns from traditional approaches to deeper learning (Retnosari et al., 2025).

This is the gap that the present program addresses. Unlike conventional training, which focuses solely on introducing the curriculum structure, this program integrates a Deep Learning approach into teacher training (Fullan et al., 2017). This approach not only trains technical aspects but also encourages teachers to engage in critical reflection, in-depth collaboration, and independent knowledge construction to create truly meaningful and inclusive learning (Avalos, 2011). The novelty of this activity lies in the implementation of Deep Learning strategies specifically aligned with the 2024 Merdeka Curriculum update, which demands more dynamic curricular adaptation than previous versions. Through Deep Learning Training (DLT), teachers are trained in (1) critical and creative thinking, (2) interdisciplinary connections, and (3) pedagogical reflection (Baharuddin, 2025). Deep Learning literacy goes beyond simply using digital devices; it encompasses teachers' ability to use technology as a tool to encourage students to think critically, collaborate globally, and independently construct new knowledge. Empowering teachers with this literacy is an absolute prerequisite (Mahardhani et al., 2025).

Therefore, this article aims to document how a Deep Learning-based training model can significantly improve teachers' competence in authentically implementing the Merdeka Curriculum. The primary focus is on transforming teachers' mindsets from curriculum implementers into curriculum developers who are responsive to students' needs.

METHOD

This activity involved high school teachers in Jakarta. The initial phase was conducted online with 224 participating teachers. The second phase, Deep Learning training, was conducted on-site with a maximum of 33 participants per class. The training design used the ADDIE framework to ensure that the teacher competency training was structured and had an impact on classroom practice (Spatioti et al., 2022).

Analysis

The initial step was to identify gaps between the 2024 Merdeka Curriculum policy and the understanding of physics teachers in DKI Jakarta. In coordination with the management of the DKI Jakarta Physics Subject Teachers' Forum (*Musyawah Guru Mata Pelajaran*, MGMP), the team conducted an initial survey to determine teachers' difficulties in analyzing the latest

Learning Outcomes (*Capaian Pembelajaran*, CP). Given that high schools in Jakarta have diverse facilities, the analysis was based on the specific needs of each school to ensure that the curriculum was contextualized.

Design

At this stage, the team designed a training curriculum that integrates Deep Learning concepts. The main goal was for teachers to be able to transform the CP into a Learning Objective Flow (*Alur Tujuan Pembelajaran*, ATP) suited to the characteristics of each school. A two-stage training flow was designed: (1) a curriculum document development workshop and (2) training on Deep Learning strategies (such as problem-based learning [Hmelo-Silver, 2004] or inquiry-based learning [Pedaste et al., 2015]).

Development

The development phase involved creating the materials and instruments used in the training. A guide for dissecting the 2024 Physics CP and a self-assessment instrument for teacher competence were developed. The training materials were validated by curriculum and pedagogy experts to ensure the relevance of the Deep Learning approach.

Implementation

Implementation was carried out in two phases under the coordination of the DKI Jakarta Physics MGMP.

Phase I (ATP Workshop). Teachers collaboratively analyzed the high school Physics CP. The output of this phase was a draft ATP that reflects the dimensions of the graduate profile and the local wisdom or real-world conditions of each school. This phase was implemented in March 2025 with Physics teachers within the DKI Jakarta Physics MGMP.

Phase II (Deep Learning Training). Teachers were trained to understand the concept of the Deep Learning approach and implement it in classroom learning. The training emphasized how teachers could foster a deep understanding of physics concepts and the interrelationships between phenomena, rather than the memorization of formulas. This phase was implemented from July to November 2025 with teachers from several high schools in DKI Jakarta and consisted of on-site training followed by on-the-job mentoring.

Evaluation

Evaluation was conducted to measure the effectiveness of the activities and the improvement in teacher competence. During the training, evaluation was carried out through observation of the ATP drafts compiled by teachers. Changes in competence were measured through pre- and post-tests on Deep Learning strategies, as well as product assessment of teaching modules integrated with the principles of the 2024 Merdeka Curriculum.

Training outcomes were evaluated by analyzing pretest and posttest scores using the N-gain (Hake, 1998). Thirty questions were used for both the pretest and the posttest, covering pedagogical knowledge, Deep Learning knowledge, and implementation.

RESULTS AND DISCUSSION

The training program for high school teachers in Jakarta yielded significant results in bridging the gap between macro curriculum policies and micropedagogical practices in the classroom. The results, organized according to the ADDIE framework, are discussed below.

Transforming Curriculum Understanding through CP and ATP Analysis

The results of Phase I showed improved teacher skills in translating the 2024 Learning Outcomes (CP) into a contextual Learning Objective Flow (ATP). Unlike previous practices that tended to copy government examples, teachers were able to:

- deconstruct the CP in accordance with the diverse characteristics of school facilities in DKI Jakarta; and
- integrate local wisdom, so that the resulting ATP drafts reflect a graduate profile relevant to the sociocultural conditions of students.

Implementation of the Deep Learning Approach

Evaluation data show a paradigm shift in teaching from surface learning (memorizing formulas) to deep learning (Marton & Säljö, 1976). A comparison of teacher competencies before and after the training is presented in TABLE 1.

TABLE 1. Comparison of Teachers' Pedagogical Competence

No	Aspect	Before Training	After Training
1	Material focus	Textual and formula mastery	Conceptual understanding
2	Methods	Standard lectures and discussions	Deep learning through problem-based learning or other relevant models
3	Teacher role	Curriculum implementer	Curriculum developer (responsive)
4	Products	Administrative teaching tools	Technology-based learning tools designed with deep learning principles

Analysis of Pretest and Posttest Results

The evaluation results showed a significant increase in average scores from the pretest to the posttest. This improvement included understanding of:

- strategies for sparking student curiosity through real-world physics phenomena;
- critical reflection techniques in the learning process; and
- development of inclusive and differentiated teaching modules.

The findings of this activity confirm the argument of Kailo et al. (2025) that the main obstacle to curriculum implementation lies not in its content but in the teacher training strategy. This training successfully broke through the traditional paradigm that relies solely on lectures. By engaging teachers in independent knowledge construction, the training demonstrated that the Deep Learning approach can narrow the gap between visionary curriculum design and conventional practice.

The novelty of this training lies in the transformation of the teacher's role. In line with the vision of the 2024 Merdeka Curriculum, teachers are no longer positioned merely as transmitters of knowledge but as autonomous curriculum developers (Voogt et al., 2011). Through critical reflection in the on-site training phase, teachers were able to align curriculum flexibility with individual student needs, which is the essence of differentiated learning (Iyanda et al., 2025; Tomlinson et al., 2003).

Specifically in physics, the Deep Learning approach helps teachers shift from simply teaching mathematical problem solving to exploring the relationships between phenomena. This is crucial because high pedagogical literacy directly correlates with teaching performance and student learning outcomes (Baumert et al., 2010; Matira & Ofrin, 2024). The use of the ADDIE model ensures that each stage of the training, from needs analysis to product evaluation (teaching modules), is structured and has a long-term impact on teacher professionalism.

Analysis of Participant Satisfaction

Overall, the training had a significant impact on participants. Of the participants, 61.3% stated that the training material was highly relevant to teachers' needs in schools, and the remaining 38.7% stated that it was relevant. In addition, 48.4% stated that the examples provided were very practical and relevant, and 45.2% stated that they were practical and relevant.

The six-day training should be followed by mentoring during the learning process at school (Kraft et al., 2018). Collaboration between teachers also needs to be developed to produce a learning process that aligns with the concept of Deep Learning (Vescio et al., 2008).

CONCLUSION

The implementation of Deep Learning-based training for high school teachers in Jakarta significantly improved their pedagogical competence in adopting the 2024 Merdeka Curriculum. This program demonstrates that shifting the training model from a merely technical and administrative one to one that emphasizes critical reflection and collaboration can transform teachers' roles from curriculum implementers into responsive and autonomous curriculum developers.

Overall, this activity confirms that the success of the national curriculum transition depends heavily on the reorientation of the teacher professional development system. The Deep Learning approach to in-service training is a strategic solution to bridge the gap between the government's policy vision and the reality of classroom practice. The results of this program indicate the need for ongoing mentoring so that the pedagogical innovations that have been formed can be internalized into a consistent academic culture in schools.

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