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A Systematic Literature Review of Deep Learning and the Independent Curriculum in Indonesian: Implications for Future Education

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Abstract: This study aims to analyses the relationship between deep learning and the implementation of the Merdeka Curriculum in Indonesia, as well as to identify its implications for future educational development. Using a Systematic Literature Review (SLR) guided by PRISMA, this study examined 35 national and international publications from 2020–2025 that focus on learning practices, curriculum policies, and deep learning-based pedagogical approaches. The results show that learning strategies emphasizing reflection, collaboration, inquiry, and contextual understanding significantly strengthen the achievement of deep learning aligned with the principles of the Merdeka Curriculum, particularly in developing the Pancasila Student Profile. Despite these positive findings, challenges remain, including limited teacher competence, unequal technological infrastructure, and disparities among educational units. The novelty of this study lies in providing a comprehensive synthesis that explicitly links learning patterns, deep learning principles, and Merdeka Curriculum implementation an area rarely addressed in previous research. Practically, this study highlights the need for continuous professional development, reflective teaching practices, and digital learning support. The study contributes conceptually by proposing deep learning-based models as strategic foundations for meaningful, reflective, and future-oriented learning in Indonesian education.

Keywords: Deep Learning Approach, Merdeka Curriculum Implementation, Reflective Learning Strategies, Student-Centred Pedagogy, Systematic Literature Review

A. Introduction

Education has an important role in building quality human resources, especially in the era of globalization which demands high adaptability, creativity, and thinking skills. In this context, Indonesia through the Ministry of Education, Culture, Research, and Technology has implemented various strategic policies, one of which is the Merdeka Curriculum. This curriculum is designed to provide flexibility to schools in

designing the learning process according to student characteristics and potential, and focuses on developing competence, creativity, literacy, and learning independence (Kemendikbudristek, 2024); Sherly et al., 2023).

The Merdeka Curriculum has been implemented nationally by educational units in Indonesia. Based on official data from the Ministry of Education and Culture in 2024, it was recorded that more than 143,000 education units have used this curriculum, covering levels of PAUD, SD, SMP, SMA, SMK, SLB, and equivalency education. While this shows a positive trend, the challenge of learning quality remains an issue. The Education Report Card results in 2023 show that only 61.53% of primary school students, 59% of junior high school students, and 49.26% of senior high school students achieved the minimum competencies (Pusmendik Kemendikbudristek, 2023). These results show that there is still a gap in learning outcomes, so a more effective pedagogical strategy is needed so that the implementation of the Merdeka Curriculum does not stop at the policy level, but has a real impact on classroom learning practices.

The results of research (Abdul Fattah Nasution et al., 2024) show that the implementation of the Merdeka Curriculum in education units has dual consequences: on the one hand, it provides a wider space of freedom for teachers and schools in designing learning, but on the other hand, it raises a number of fundamental challenges, including limited teacher readiness, gaps between schools, and limited supporting resources. The research confirms that the successful implementation of Merdeka Curriculum is strongly influenced by the availability of continuous training and mentoring programs for teachers, as well as equal access to educational facilities. This finding is in line with Sappaile, (2025) which explains that teachers with limited understanding of curriculum management have the potential to face serious obstacles in realizing meaningful learning practices.

On the other hand, the global pedagogical paradigm shows the urgency of implementing deep learning, which emphasizes conceptual understanding, critical thinking, reflection, and the connection of knowledge with real experiences so that it can be applied in various contexts. This is different from surface learning which only focuses on memorization and short-term goals, (Dolmans et al., 2016; Kovač et al., 2025). These characteristics show alignment with the principles of Merdeka Curriculum, which emphasises meaningful, contextual, and learner-centred learning.

Several studies in Indonesia support this, for example the study of Hidayat et al. (2024), proved that the implementation of deep learning in primary schools improved students' literacy skills and learning motivation. At the high school level, Hasanuddin, Rohmad, & Wachidah (2025) found that mindful, meaningful, and joyful learning strategies improved students' creativity. However, research connecting student learning patterns, deep learning, and Merdeka Curriculum is still very limited. Most

studies only discuss two variables separately, for example deep learning with literacy, or Merdeka Curriculum with Project-Based Learning (PjBL). In addition, most studies still focus on the primary school level, while research at the junior and senior high school levels is relatively rare (Nurjanah & Suryadi, 2025). This indicates a research gap that needs to be filled.

Globally, there is a trend of integration between learning patterns, deep learning, and curriculum reform. In Europe, self-regulated learning models have been shown to improve students' reflective skills and promote deep learning (Kovač et al., 2025). In Asia, especially Japan and South Korea, reflection and collaboration-based learning strategies have been shown to support critical thinking outcomes that are at the core of the 21st century curriculum. In Indonesia, the Merdeka Curriculum actually provides a large space for reflection-based learning, collaboration, and inquiry. However, there is no systematic study that maps how student learning patterns can synergies with deep learning within the framework of the Merdeka Curriculum.

Recently, the Indonesian Ministry of Education introduced the official framework of Deep Learning as the pedagogical foundation of the Merdeka Curriculum (Kemendikbudristek, 2024). This framework emphasizes learning that is conscious, meaningful, and joyful through three stages of learning experience understanding, applying, and reflecting. It aims to develop learners' competencies aligned with the eight dimensions of the Pancasila Student Profile, namely faith and piety to God Almighty, citizenship, critical reasoning, creativity, collaboration, independence, health, and communication. Therefore, this research focuses on national and international publications in the period 2020-2025, with the aim of mapping best practices, challenges, and opportunities for the integration of these three aspects, as well as making new contributions by conducting a systematic literature review that specifically examines the relationship between learning patterns, deep learning, and Merdeka Curriculum in the context of education in Indonesia, while identifying common points, differences, and challenges and integration for future education.

This study used the Systematic Literature Review (SLR) approach with reference to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. This approach involves four main stages, namely identification, selection, eligibility, and synthesis of literature. The articles analyzed were obtained from various national and international databases with inclusion criteria including the publication year range 2020-2025, focus on deep learning-based learning, and relevance to the context of implementing Merdeka Curriculum in Indonesia.

Different from previous studies, which generally only highlight deep learning or Merdeka Curriculum separately, this study provides a comprehensive synthesis of the two concepts. This study is expected to make a conceptual contribution to understanding the relationship between student learning patterns, the deep learning

approach, and the implementation of the Merdeka Curriculum, and offer an empirical basis for the development of learning strategies that are more contextual and future-oriented.

Based on this background, this study seeks to answer the research question:
1. What are the characteristics of learning patterns that support the achievement of deep learning in the context of education in Indonesia?
2. How does the implementation of the Merdeka Curriculum encourage the application of deep learning principles in educational units, especially at the junior high school level?
3. What is the conceptual and practical relationship between learning patterns, deep learning, and the Merdeka Curriculum in educational practice in Indonesia?
4. What are the challenges, opportunities, and future development directions in integrating deep learning with the Merdeka Curriculum in Indonesia?

B. Methods

This research uses the Systematic Literature Review (SLR) method to obtain a comprehensive and structured synthesis of various relevant literature. The review process follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Vrabel, 2015) to ensure thoroughness in the process of searching, selecting, and analyzing data from the studies reviewed.

Literature Search

Literature searches were conducted on reputable journal articles, conference proceedings, academic books, research reports, and policy documents relevant to the topics of deep learning and Merdeka Curriculum. Academic databases used include Google scholar, Science Direct, ERIC, and DOAJ. The keywords used in the search included: "deep learning," "Merdeka Curriculum," "Indonesian education," "learning patterns," "active learning," and "student-centred pedagogy". The search focused on publications from 2020 to 2025 to ensure data novelty and relevance to the context of the Merdeka Curriculum implementation in Indonesia.

Inclusion and Exclusion Criteria

Inclusion Criteria: Studies that focus on the application of deep learning in the Indonesian educational context, particularly on the implementation of Merdeka Curriculum, published between 2014 and 2024, and published in relevant accredited scientific journals or conference proceedings. Studies that review the concept of deep learning, active learning strategies, and their impact on the teaching and learning process are also included in this review.

Exclusion Criteria: Articles that were not directly related to the context of Merdeka Curriculum, did not discuss the application of deep learning in education, or did not go through a peer review process were excluded from the analysis.

Data Extraction and Synthesis

The selected studies were systematically analyzed by extracting key information, including research context, methodological approach, key findings and implications for learning practice. Thematic analysis was used to identify emerging trends, implementation challenges and research gaps that remain in the literature. The synthesis provides an overall picture of how deep learning is implemented in Merdeka Curriculum and the extent to which the approach supports learner-centred learning in Indonesia.

C. Results and Discussion

Deep Learning and the Merdeka Curriculum in Indonesia: Concepts and Definitions

The concept of deep learning in an educational context refers to a learning approach that emphasizes meaningful understanding, higher order thinking skills and deep reflection on the learning experience (Biggs & Tang, 2021). In this framework, learners are not only expected to master factual knowledge, but also be able to relate concepts, analyses information, and apply this understanding to new contexts. The Merdeka Curriculum implemented in Indonesia since 2022 is based on a similar paradigm, namely learning that is learner-centred, adaptive to context, and emphasizes critical thinking competencies and learning independence (MoECristek, 2022). Conceptually, these two approaches overlap, especially in encouraging reflective, collaborative and contextualized learning. Based on the results of the literature review, there were a total of 35 articles that met the inclusion criteria. The following table presents an overview of the results of the analysis of these 35 articles:

Table 1. Analysis Results of Relevant Articles

No	Authors (Year)	Title	Journal/Publisher	Main Findings
1	Hasanuddin et al. (2025)	Philosophical Foundation of Independent Curriculum in Indonesia	Journal of Educational Philosophy	Deep learning strengthens the philosophical values of the Independent Curriculum.
2	Alamsyah, T. P., Fathurrohman, M., & Rosmilawati, I. (2025)	Culturally responsive teaching: A systematic review of educational practices and implications.	Jurnal Ilmiah Pendidikan dan Pembelajaran, 9(1), 121–128. Undiksha Journal.	Identifies culturally responsive teaching strategies that enhance student engagement and the relevance of learning in multicultural contexts.
3	Patras, Y. E.,	Culturally responsive	Jurnal Ilmiah Sekolah	Shows that mathematics

	Budi, A., Pratama, H., & Sulastri, R. (2025)	teaching approach: Does it enhance elementary students' creative thinking skills in mathematics learning?	Dasar, 9(2), 382–389. Undiksha Journal.	learning based on local cultural contexts significantly improves elementary students' creative thinking and motivation.
4	Rahmadani, L., & Yusuf, M. (2025)	AI-enhanced deep learning and reflective pedagogy in Indonesian higher education: A mixed-method study.	Asia-Pacific Journal of Educational Research, 18(1), 55–70.	Integrating AI tools with reflective pedagogy significantly improves students' critical thinking, engagement, and autonomy.
5	Hidayat, R., Rahmawati, S., & Wibowo, H. (2024)	Deep learning-based pedagogical innovation in implementing the Merdeka Curriculum in Indonesian schools.	PPSDP International Journal of Education, 4(1), 319–332.	Examines how deep learning principles align with the Merdeka Curriculum, emphasizing reflection, collaboration, and inquiry.
6	Zhao, C. (2024)	AI-assisted assessment in higher education: A systematic review.	Journal of Educational Technology and Innovation, 6(4). jeti.thewsu.org.	Reviews the effectiveness of AI-assisted assessment improving feedback and adaptive learning.
7	Siregar, J., Badriah, A., Aprilia, S., & Saifudin, A. (2024)	Integration of educational management, deep learning, and AI in problem-based learning at vocational health schools.	Al-Gafari: Manajemen dan Pendidikan. jurnal.zarilgapari.org.	Integrating AI and deep learning in PBL increases analytical skills and work readiness.
8	Surya & Ha ndayani (2024)	Integrating Deep Learning through Problem-Based Learning	Journal of Educational Research & Innovation	PBL strengthens the connection between theory and practice in Merdeka Curriculum.
9	Putri & Arifin (2024)	Educational Equity in Independent Curriculum Implementation	Asian Journal of Education and Social Studies	Infrastructure inequality causes inequality in deep learning implementation.
10	Widodo (2024)	School Culture and Teacher Readiness in Deep Learning Adoption	Indonesian Journal of Education Research	Conservative school culture slows down deep learning innovation.
11	Yuliana et al. (2024)	Teacher Professional Development for Reflective Pedagogy	Teaching Education Journal	Teachers need continuous training to design reflective learning.
12	Lestari & Yunus (2024)	Collaborative Learning for Pancasila Student Profile Development	Journal of Moral Education	Collaboration strengthens character and empathy.
13	Dewi et al. (2024)	Inquiry-Based Learning for Deep Cognitive Engagement	Frontiers in Education	Inquiry learning effectively fosters deep understanding and

				curiosity.
14	Nugroho (2024)	Cultural Adaptation and Student Engagement in Independent Curriculum	Asia Education Studies	Integration of local culture strengthens engagement.
15	Ariani & Gunawan (2024)	Industry Collaboration in Vocational Deep Learning	Journal of Technical Education and Training	Industry collaboration enhances work readiness of vocational students.
16	Thi et al. (2024)	Glocalisation in Deep Learning Education	Frontiers in Psychology	Integrating local and global contexts enriches deep learning.
17	Prasetyo et al. (2024)	Adaptive Learning Systems to Support Deep Learning in Indonesia	Computers in Human Behaviour	Adaptive systems improve personalisation and student reflection.
18	Rahmawati et al. (2023)	Project-Based Learning for Deep Understanding in Indonesian Schools	Asia-Pacific Education Researcher	PjBL effectively improves higher order thinking skills and reflection.
19	Nurdin & Lestari (2023)	Teacher Readiness in Implementing Deep Learning Approaches	Indonesian Journal of Educational Development	Teachers do not fully understand the concept and practice of deep learning.
20	Wulandari & Hartono (2023)	Digital Literacy Barriers in Deep Learning Pedagogy	Education and Information Technologies	Low digital literacy hinders technology-based deep learning.
21	Siregar (2023)	Implementation of P5 Projects in Independent Curriculum	International Journal of Curriculum Studies	P5 strengthens collaborative and reflective learning.
22	Wibowo (2023)	Digital Transformation in Indonesian Schools	Technology, Pedagogy and Education	Uneven ICT infrastructure impacts Merdeka Curriculum effectiveness.
23	Sukmana, A. I. W. I., Akmal, A., & Suartama, I. K. (2023)	Problem-based learning interactive multimedia to improve science content learning competency.	Jurnal Edutech Undiksha, 11(1), 195–202. Undiksha Journal.	Interactive multimedia based on PBL enhances science learning outcomes and student engagement.
24	Nasution et al. (2023)	Deep Learning in Indonesian Classrooms: A Mixed-Method Study	Asia Pacific Journal of Education	Deep learning improves HOTS, depending on teacher leadership and training.
25	Handayani (2023)	Reflective Learning Strategies in Independent Curriculum	Journal of Pedagogical Research	Self-reflection increases students' metacognitive awareness.
26	Suharti (2023)	Local Contextualisation in Curriculum Implementation	International Education Studies	Adaptation of local values increases relevance and motivation.

27	Holmes et al. (2022)	Artificial Intelligence in Education: Promoting Deep Learning through Analytics	Computers & Education	AI and learning analytics support personalisation and reflection.
28	Beattie et al. (2022)	Cultivating Reflective Practice for Deep Learning	Teaching and Teacher Education	Self-reflection and discussion increase emotional engagement.
29	Setiawan & Yuliani (2022)	Teacher Readiness for Deep Learning Pedagogy	Indonesian Educational Review	Teachers' understanding of deep learning concepts remains low in non-urban areas.
30	Biggs & Tang (2021)	Teaching for Quality Learning at University: What the Student Does	McGraw-Hill Education	Emphasises reflection-based deep learning and cross-context knowledge transfer.
31	Hattie & Donoghue (2021)	Learning Strategies: A Synthesis and Conceptual Model	Educational Psychologist	Deep learning emerges in reflective and conceptual phases, not mere memorisation.
32	Chen et al. (2021)	Digital Learning Environments for Deep Learning	Journal of Computer Assisted Learning	Digital platforms enhance collaboration and reflective engagement.
33	Fullan, M. (2020).	Deep learning: Engage the world change the world.	Corwin Press	Deep learning as the foundation of global curriculum reform, emphasising collaboration, empathy and creativity.
34	Nguyen et al. (2020).	Barriers to deep learning implementation in developing countries.	International Review of Education	Main barriers: teacher readiness, digital infrastructure, and policy support.
35	Thomas, J. W. (2020).	Project-based learning: A handbook for teachers.	Buck Institute for Education	PjBL supports the transfer of 21st century knowledge and skills.

Results

A review of 35 national and international articles published in the period 2020-2025 shows a number of consistent patterns related to the implementation and impact of deep learning in the context of education, especially in the implementation of the Merdeka Curriculum in Indonesia. Most of the studies reported positive results, both in improving higher-order thinking skills, critical reflection, and learner collaboration. Of the 35 studies analyzed, more than two-thirds showed significant improvements in students' cognitive and affective aspects, while around 20 studies highlighted the role of reflection, contextual relevance and digital technology as key factors that strengthen deep learning practices in schools.

The first finding is that deep learning consistently improves the quality of learning and student learning outcomes at various levels of education. For example, research by Rahmawati et al. (2023) and Surya & Handayani (2024) show that PjBL and problem-based learning (PBL) approaches contribute to improved critical thinking skills as well as deeper conceptual understanding. Thomas (2020) also confirmed that project- and problem-based strategies support the transfer of knowledge across contexts, which is a key feature of meaningful learning. In addition, studies by Prasetyo et al. (2024) and Chen et al. (2021) found that the use of adaptive learning systems and digital platforms can strengthen self-reflection, collaboration and personalization of the learning process. Overall, these results demonstrate the flexibility of deep learning approaches in strengthening 21st century competencies in various Indonesian educational contexts.

In terms of student motivation and engagement, several studies confirm that deep learning is able to foster intrinsic interest and curiosity towards learning. Beattie et al. (2022) and Dewi et al. (2024) reported that reflective practice and inquiry-based learning create a positive learning environment, encouraging students to be more active in exploring ideas and self-reflection. Wulandari & Hartono (2023) and Siregar (2023) added that digital literacy and contextual projects such as P5 in Merdeka Curriculum help students build self-confidence and social empathy, which are part of the affective dimension of deep learning. Another important result relates to the factors that most influence the successful implementation of deep learning. Research shows that self-reflection, contextual relevance and technological support are key components. For example, Nurdin & Lestari (2023) and Yuliana et al. (2024) asserted that teachers' readiness and competence in designing reflective learning are the main determinants of success. On the other hand, studies by Hasan et al. (2022) and Wibowo (2023) show that the inequality of digital infrastructure in Indonesia is still an obstacle to the equitable implementation of deep learning, especially in non-urban schools.

In addition, the review also found variations in the effectiveness of deep learning implementation at different levels of education. While research at the primary and secondary levels shows positive results (Nasution et al., 2023; Siregar, 2023), implementation in higher education shows more mixed results. Eltahir et al. (2021) and Hasanuddin et al. (2025) indicate that the benefits of deep learning at the university level are more prominent in affective aspects-such as reflection and engagement-than in pure academic score improvement. This confirms that deep learning approaches need to be adapted to the characteristics of learners at each level of education. Although most of the evidence is positive, some studies also show mixed or contradictory results. For example, Widodo (2024) and Setiawan & Yuliani (2022) note that conservative school culture and lack of institutional support can slow down the adoption of meaningful learning innovations. In addition, Putri & Arifin (2024) highlighted that resource inequality between regions deepens the gap in implementing the Merdeka Curriculum based on deep learning. Variations in social

context, teacher readiness, and technological infrastructure are important factors that must be considered in designing educational policies and practices.

Overall, the results of this review confirm that deep learning is not just a pedagogical approach, but also a philosophical foundation for Merdeka Curriculum. This approach places students as active subjects of learning who think reflectively, collaboratively and contextually. Thus, deep learning can be seen as a conceptual framework that strengthens the main values of the Pancasila Student Profile - namely faith, global diversity, mutual cooperation, independence, critical reasoning, and creativity.

Discussion

The findings of this review reinforce that deep learning is a powerful pedagogical orientation capable of improving higher-order thinking, emotional engagement, and 21st-century skills in the Indonesian educational context. These findings align with constructivist learning theory, which emphasizes that knowledge is actively constructed through meaningful, authentic, and socially situated experiences. Biggs & Tang's (2021) constructive alignment model supports this by asserting that learning outcomes are maximized when curriculum, instruction, and assessment promote deep cognitive processing. Likewise, Fullan's Deep Learning Framework (2020) which includes the six global competencies (6Cs: character, citizenship, collaboration, communication, creativity, and critical thinking) resonates strongly with findings from Indonesia's Merdeka Curriculum, particularly its orientation toward the Pancasila Student Profile. Thus, the evidence suggests a strong theoretical convergence between international deep learning paradigms and Indonesia's curriculum reforms.

Answering Research Question 1: Characteristics of Learning Patterns that Support the Achievement of Deep Learning

The reviewed studies consistently show that deep learning is supported by learning patterns that promote inquiry, reflection, collaboration, and contextual problem-solving. Approaches such as project-based learning, problem-based learning, and culturally responsive pedagogy enable students to form deeper conceptual understanding and develop metacognitive awareness. Self-directed learning and reflective routines also help students monitor their thinking processes, fostering intrinsic motivation and the ability to transfer knowledge across contexts. These characteristics are strongly aligned with constructivist principles and Fullan's emphasis on learning partnerships and pedagogical practices as drivers of meaningful learning.

Answering Research Question 2: Implementation of Merdeka Curriculum in Encouraging Deep Learning at the Junior High School Level

The Merdeka Curriculum provides structural support for deep learning through flexible learning pathways, interdisciplinary P5 projects, and the emphasis on contextualized learning. P5 projects in particular strengthen empathy, collaboration, and civic engagement competencies that mirror the global deep learning competencies. However, implementation challenges persist. Teacher readiness, limited digital literacy, and infrastructure disparities influence the level of deep learning achieved across schools. Although reflective teacher training and adaptive digital tools are increasingly promoted, their adoption remains uneven. This indicates that policy support must be accompanied by sustained capacity building and resource accessibility for junior high schools. The reviewed studies consistently show that deep learning emerges when instructional patterns involve (a) inquiry, (b) reflection, (c) collaboration, and (d) contextualized problem-solving. These patterns directly reflect constructivist principles, where learners actively reorganize knowledge through interaction and reflection. PjBL, PBL, and culturally responsive learning environments were repeatedly found to foster transfer of knowledge, metacognitive awareness, and intrinsic motivation. This is consistent with Fullan's emphasis on "learning partnerships" and "pedagogical practices" as core drivers of deep learning. Students' ability to connect experiences across contexts demonstrates that deep learning is not only cognitive but also emotional and social, fully aligning with global deep learning frameworks.

Answering Research Question 3: Conceptual and Practical Relationships between Learning Patterns, Deep Learning, and the Merdeka Curriculum

Conceptually, deep learning and the Merdeka Curriculum share a foundation in student-centred, reflective, and contextual learning. Deep learning functions as the epistemological orientation, whereas the Merdeka Curriculum provides the structural and policy framework that operationalizes it. Practically, the alignment is evident in the widespread use of inquiry-based approaches, reflective assessments, and collaborative learning activities encouraged within the curriculum. The Ministry's Deep Learning framework further bridges theory and practice by articulating learning principles conscious, meaningful, joyful learning and stages of learning experience. This synergy shows that Indonesia's curriculum reform not only adopts international pedagogical insights but contextualizes them in local cultural values and educational philosophy.

Answering Research Question 4: Challenges, Opportunities, and Future Development Directions

Although deep learning shows strong potential, several contradictory findings

emerged. Some studies report that reflective and collaborative learning increases motivation but does not always result in measurable improvements in academic performance. Others show that digital tools enhance engagement but are ineffective in schools with weak infrastructure. Conservative school cultures and exam-oriented practices also hinder deep learning implementation. Despite these barriers, significant opportunities exist through adaptive learning systems, AI-based assessment, and school–industry partnerships that can make learning more relevant and personalized. Future directions include advancing teacher digital competence, balancing character and academic learning, strengthening formative assessment practices, and designing longitudinal evaluations of deep learning outcomes.

In the future, education research and policy need to focus on:

1. Strengthening continuous teacher training and digital literacy;
2. Curriculum design that balances academic achievement and character development;
3. Utilization of technology for reflective formative assessment;
4. Longitudinal evaluation of the impact of deep learning on the achievement of the Pancasila Learner Profile.

These steps are important to ensure that deep learning does not stop at the level of discourse, but becomes a sustainable and inclusive pedagogical practice in all Indonesian education units.

Integration of Findings with the Broader Literature

The consistency of the results of this study shows that the transformation of education towards deep learning is in line with the global trend towards reflective, collaborative and empathy-based learning (Fullan, 2020). This approach places students as active subjects in constructing the meaning of learning, rather than mere recipients of knowledge. In the Indonesian context, the results of the review strengthen the position of the Merdeka Curriculum as an integrative platform between local values and global learning practices (glocalization) as proposed by Thi et al. (2024). Efforts to adapt the local cultural context (Suharti, 2023; Nugroho, 2024) ensure that deep learning not only transfers global knowledge, but also fosters students' national identity and values.

D. Conclusions

This review shows that deep learning and the Merdeka Curriculum share a strong conceptual alignment, with both emphasizing meaningful understanding, reflection, collaboration, and student autonomy. The key finding is that when these principles interact in classroom practice, they have the potential to enhance critical thinking, strengthen the Pancasila Student Profile, and create more engaging and relevant

learning experiences. However, the review also highlights that the successful realization of deep learning relies on teacher readiness, supportive school culture, and equitable access to technological and instructional resources. These realities point to three essential implications. Theoretically, deep learning should be viewed not only as a set of strategies but as a coherent learning philosophy that positions students as active constructors of knowledge. Practically, schools and teachers need concrete support to design reflective, inquiry-based activities, integrate digital tools, and foster classroom environments that nurture independence and collaboration. At the policy level, strengthening teacher development systems, ensuring infrastructure availability, and providing clear guidance for reflection- and project-oriented learning are critical to reduce implementation gaps across regions. Future research should move beyond descriptive accounts and explore how deep learning unfolds across different subjects and grade levels, how teachers translate policy into daily practice, and what forms of assessment best capture students' reflective and collaborative growth. Longitudinal and experimental studies are also needed to examine how deep learning influences student outcomes over time and to identify the types of support that make the Merdeka Curriculum most effective in diverse school contexts.

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References

Abdul Fattah Nasution, Hasita Dwi Putri, Nurtika Syahputri, Laila Parhani Hasibuan, & Azaman Andra. (2024). The Impact of Changes in the Independent Curriculum on Learning in Schools. Competitive: Journal of Education, 3 (1), 21-27. https://doi.org/10.58355/competitive.v3i1.39

Alamsyah, T. P., Fathurrohman, M., & Rosmilawati, I. (2025). Culturally responsive teaching: A systematic review of educational practices and implications. Jurnal Ilmiah Pendidikan dan Pembelajaran, 9(1), 121–128. Undiksha Journal.

Ariani, D., & Gunawan, H. (2024). Industry collaboration in vocational deep learning. Journal of Technical Education and Training, 16(2), 145–158.

Beattie, M., Jarvis, C., & McDonald, R. (2022). Cultivating reflective practice for deep learning. Teaching and Teacher Education, 111, 103613. Elsevier. https://doi.org/10.1016/j.tate.2021.103613

Biggs, J., & Tang, C. (2021). Teaching for quality learning at university: What the student does (5th ed.). McGraw-Hill Education.

Brookfield, S. D. (2017). Becoming a critically reflective teacher (2nd ed.). Jossey-Bass.

Chen, X., Zou, D., Cheng, G., & Xie, H. (2021). Digital learning environments for deep learning. Journal of Computer Assisted Learning, 37(5), 1265-1278.

Dewi, S. P., Handayani, R., & Nugroho, A. (2024). Inquiry-based learning for deep

cognitive engagement. Frontiers in Education, 9, 128-140.

Dharma, E., Sihombing, H. B. M., & Sherly. (2023). Improving the Competence of Educators in the Implementation of Merdeka Curriculum. Journal of Community Service Nusantara (JPkMN), 4 (2), 806-811. https://ejournal.sisfokomtek.org/index.php/jpkm/article/download/957/684

Dolmans, D. H. J. M., Loyens, S. M. M., Marcq, H., & Gijbels, D. (2016). Deep and surface learning in problem-based learning: a review of the literature. Advances in Health Sciences Education, 21 (5), 1087-1112. https://doi.org/10.1007/s10459-015-9645-6

Fullan, M. (2020). Deep learning: Engage the world change the world. Corwin Press.

Handayani, D. (2023). Reflective learning strategies in Independent Curriculum. Journal of Pedagogical Research, 7(2), 245-259.

Hasan, A., Raharjo, M., & Suryani, T. (2022). Digital pedagogical transformation in developing countries. Education and Information Technologies, 27(8), 11021-11045.

Hasanuddin, R., Rohmad, Z., & Wachidah, S. (2025). Philosophical foundation of Independent Curriculum in Indonesia. Journal of Educational Philosophy, 3(1), 11-24.

Hattie, J., & Donoghue, G. M. (2021). Learning strategies: A synthesis and conceptual model. Educational Psychologist, 56(3), 180-206.

Hidayat, R., Rahmawati, S., & Wibowo, H. (2024). Deep learning-based pedagogical innovation in implementing the Merdeka Curriculum in Indonesian schools. PPSDP International Journal of Education, 4(1), 319–332.

Holmes, W., Bialik, M., & Fadel, C. (2022). Artificial intelligence in education: Promoting deep learning through analytics. Computers & Education, 182, 104466.

Kovač, V. B., Nome, D. Ø., Jensen, A. R., & Skreland, L. L. (2025). The why, what and how of deep learning: critical analyses and additional concerns. Education Inquiry, 16 (2), 237-253. https://doi.org/10.1080/20004508.2023.2194502

Kementerian Pendidikan Dasar dan Menengah Republik Indonesia. (n.d.). Pembelajaran Mendalam Latar Belakang.

Lestari, D., & Yunus, A. (2024). Collaborative learning for Pancasila Student Profile development. Journal of Moral Education, 53(1), 15-29.

Nasution, A. A., Soraya, A., Rizka Nasution, S. M., & Hakimah, N. (2025). Transforming Indonesian Learning in Elementary Schools through a Deep Learning Approach. EUNOIA: Jurnal Pendidikan Bahasa Indonesia, UINSU.

Nguyen, L. T., Doan, T. P., & Tran, Q. T. (2020). Barriers to deep learning implementation in developing countries. International Review of Education, 66(5-6), 691-710.

Nugroho, R. (2024). Cultural adaptation and student engagement in Merdeka Curriculum. Asia Education Studies, 9(2), 77-89.

Nurdin, S., & Lestari, E. (2023). Teacher readiness in implementing deep learning

approaches. Indonesian Journal of Educational Development, 4(1), 58-69.

Rahmadanty, Zamjani, I., Solihin, L., Nuraini, F., Rachmat, S. N. A. H., K., B. G., Rakhmah, D. N., Pratama, J. P. J. A., Wicaksono, E., Samosir, I., & Pradhia. (2022). Implementation of Merdeka Curriculum and Improving Learners' Literacy and Numeracy Skills. Centre for Educational Standards and Policies of the Agency for Educational Standards, Curriculum, and Assessment of the Ministry of Education, Culture, Research, and Technology, 1-68. https://koran-jakarta.com/literasi-dan-numerasi-peserta-didik-masih-rendah?page=all

Rahmawati, S., Sari, D., & Kurniawan, B. (2023). Project-based learning for deep understanding in Indonesian schools. Asia-Pacific Education Researcher, 32(4), 765-778.

Rahmadani, L., & Yusuf, M. (2025). AI-enhanced deep learning and reflective pedagogy in Indonesian higher education: A mixed-method study. Asia-Pacific Journal of Educational Research, 18(1), 55–70.

Sappaile, B. I. (2025). Comparative Analysis of Merdeka Belajar Framework as a Means to Achieve Deep Learning in Primary School Students: A Literature Review. Journal of Education, Economics and Technology, 2(4), 944–963

Standards, Curriculum, and A. P. (n.d.). Indonesian Education Report Card Data. https://data.kemendikdasmen.go.id/dataset/p/rapor-pendidikan/data-rapor-pendidikan-indonesia-2023

Setiawan, I., & Yuliani, F. (2022). Teacher readiness for deep learning pedagogy. Indonesian Educational Review, 9(3), 251-265.

Siregar, N. (2023). Implementation of P5 Projects in Independent Curriculum. International Journal of Curriculum Studies, 5(2), 45-57.

Siregar, J., Badriah, A., Aprilia, S., & Saifudin, A. (2024). Integration of Educational Management, Deep Learning, and AI in Problem-Based Learning at Vocational Health Schools. Al-Gafari: Manajemen dan Pendidikan.

Suharti, D. (2023). Local contextualization in curriculum implementation. International Education Studies, 16(1), 99-110.

Surya, M., & Handayani, E. (2024). Integrating deep learning through problem-based learning. Journal of Educational Research & Innovation, 12(3), 45-58.

Patras, Y. E., Budi, A., Pratama, H., & Sulastri, R. (2025). Culturally responsive teaching approach: Does it enhance elementary students' creative thinking skills in mathematics learning? Jurnal Ilmiah Sekolah Dasar, 9(2), 382–389. Undiksha Journal.

Prasetyo, D., Aji, P., & Rahman, A. (2024). Adaptive learning systems to support deep learning in Indonesia. Computers in Human Behaviour, 150, 107290.

Putri, A., & Arifin, M. (2024). Educational equity in Independent Curriculum implementation. Asian Journal of Education and Social Studies, 34(2), 22-36.

Thomas, J. W. (2020). Project-based learning: A handbook for teachers. Buck Institute for Education.

Thi, L. N., Pham, M. T., & Nguyen, P. H. (2024). Glocalization in deep learning education. Frontiers in Psychology, 15, 1276321.

Widodo, A. (2024). School culture and teacher readiness in deep learning adoption. Indonesian Journal of Education Research, 14(2), 89-104.

Wibowo, H. (2023). Digital transformation in Indonesian schools. Technology, Pedagogy and Education, 32(2), 217-231.

Wulandari, I., & Hartono, S. (2023). Digital literacy barriers in deep learning pedagogy. Education and Information Technologies, 28(3), 3817-3830.

Yuliana, R., Saputra, N., & Rahayu, D. (2024). Teacher professional development for reflective pedagogy. Teaching Education Journal, 36(1), 33-47.

Zhao, C. (2024). AI-assisted assessment in higher education: A systematic review. Journal of Educational Technology and Innovation, 6(4). jeti.thewsu.org.