



Implementation of Deep Learning-Based Curriculum: Readiness of Elementary School Teachers

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ABSTRACT

Purpose- The effectiveness of learning, mainly when it adopts innovative approaches such as deep learning, is greatly influenced by teachers' readiness. This study aims to investigate the readiness of primary school teachers to understand and implement a curriculum based on the principles of deep learning.

Methodology- A qualitative research approach with a phenomenological design was used to explore teachers' experiences and perspectives. This study involved nine teachers from various grade levels in five primary schools in Cina Subdistrict, Bone Regency. Data were collected through in-depth interviews. Interview transcripts were analysed using NVivo 12 software. This analysis follows the model of data reduction, data presentation, and conclusion drawing to ensure the validity and credibility of the research results.

Findings- Teachers regard deep learning as active and discovery-based, but their readiness remains limited due to insufficient training, weak dissemination, and dependence on support from colleagues, schools, communities, and government. Deep learning adoption will remain uneven due to weak support networks, reliance on a few facilitators, and teacher resistance. Stronger collaboration and sustained professional development are required to address these challenges.

Contribution- The findings of this study confirm the extent to which teachers are prepared to implement deep learning approaches in primary schools. This provides empirical evidence of the need for continuous professional development for teachers, especially in adopting learning innovations. The results of this study serve as a recommendation to the government of Bone Regency to take strategic steps to accelerate the effective implementation of deep learning in primary schools.

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INTRODUCTION

There are two main dimensions to improving the curriculum, namely responding to community needs and preparing the next generation to face future challenges. The curriculum, as the main guide in learning, must remain dynamic and adaptive to the demands of an ever-evolving era (Santika et al., 2022). In its development process, it should continue to prioritize flexibility and provide teachers with as much autonomy as possible to design relevant teaching strategies (Wulandari et al., 2023). In this context, the Indonesian government is refining the curriculum through a deep learning approach (Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia, 2025). However, curriculum reform that is not accompanied by adequate dissemination and professional support may create a gap between policy design and classroom practice. Such a condition can result in teachers being insufficiently prepared to implement the new approaches promoted by the curriculum. Therefore, this study aims to explore the extent to which primary school teachers are ready to implement the curriculum with its renewed pedagogical orientation.

Recent curriculum reforms in Indonesia have been introduced to enhance the relevance of learning and foster competencies aligned with twenty-first-century skills. However, previous studies show that teachers often face challenges in interpreting and implementing new curricula due to limited socialisation, inadequate professional development, and insufficient institutional support (Rahmawati & Yusuf, 2021; Nurdin, 2023). Teachers have a vested interest in being professionally ready for the success of curriculum innovation. Dang (2023) found that teachers' perceptions and readiness are crucial in effectively implementing new curricula. However, this is often hampered by inadequate guidance and training. Similarly, Yue et al. (2024) highlighted that teachers' technical and pedagogical knowledge influences their readiness for implementation. This view aligns with the findings of Ayanwale et al. (2022), who found that teachers' confidence and perceptions of the relevance of new subjects strongly impact their mental readiness to teach.

Teachers are key elements in translating abstract curriculum messages into real learning experiences. In this process, readiness certainly plays a significant role in shaping choices that support the success of innovation. Without solid readiness, strategic decisions are difficult to achieve. Therefore, strategic steps are needed to determine whether primary school teachers have a strong understanding, the skills, and the confidence to implement new approaches effectively. This study aims to explore teachers' readiness to implement new pedagogical approaches required by curriculum reform. This study will provide insights into potential gaps between policy formulation and learning practices, using the latest techniques. Although deep learning offers significant potential to improve academic quality, its implementation is primarily hampered by teachers' reluctance to accept change (Viona & Gistituati, 2023; Sakan et al., 2019).

In this study, the term "deep learning" is defined as meaningful, in-depth, and enjoyable learning within the teaching and learning process. Its effective implementation depends heavily on teacher readiness. Teachers who are ready for new approaches can facilitate meaningful student interactions (Nácher et al., 2021) and promote more relevant learning strategies (Sudirman, 2024). The application of deep learning in primary education is crucial, as it will form the foundation for students' critical, creative, and reflective thinking skills. While shallow learning only results in short-term understanding, deep learning allows students to connect concepts, construct meaning, develop curiosity, and independence from an early age (Burner & Schipor, 2025; Yi et al., 2024). This aligns with recent studies showing that applying deep learning in the classroom can enhance students' higher-order thinking and intrinsic motivation to learn (Nafi'ah & Faruq, 2025; Alfianingtias & Hadi, 2025).

It is well understood that implementing new learning approaches requires teachers to be prepared not only psychologically, but also professionally and pedagogically. The importance of this readiness stems from research showing a gap between expected competencies and classroom learning practices (Lestari et al., 2020; Padmadewi et al., 2020; Rahmayanti et al., 2020). Teachers may claim confidence in their success, yet innovative classroom practices remain limited, especially in literacy learning (Almazroa & Alotaibi, 2023; Awali, 2020). This imbalance indicates an incomplete understanding of how these differences can occur. This

highlights the need for thorough preparation to achieve effective curriculum implementation. Empirical studies have also found that primary school teachers' readiness for deep learning is still limited amid the increasing demands of 21st-century education (Ogunseemi & Idowu, 2022). This gap underscores the urgent need for a more comprehensive assessment of teachers' readiness to implement deep learning at the primary level.

To address this gap, this study examines the variables of primary school teachers' readiness in applying deep learning approaches in the teaching and learning process. The researchers explored how teachers interpret, internalise, and apply the principles of deep learning. Thus, these findings are expected to provide policymakers, curriculum designers, and educators with insights into enhancing professionalism in designing and implementing curricula with a deep learning approach, enabling effective and efficient implementation.

METHODOLOGY

Research Design

This study uses a qualitative, phenomenological approach. Qualitative research focuses on gaining an in-depth understanding of social phenomena from the participants' perspectives. The phenomenological approach was chosen because this study emphasizes understanding the meaning of individual experiences and the need to explore facts in depth, rooted in context. This type of research involves an in-depth exploration of the meanings constructed by individuals, using strategies such as case studies, phenomenology, and ethnography (Creswell, 2021). emphasise the importance of context and subjectivity in qualitative research, in which researchers play a key role in both collecting and interpreting data (Cohen et al., 2018). In this study, this approach was implemented through in-depth interviews and document analysis to produce a holistic and contextual understanding of the reality being studied.

Participant

This study examined five primary schools in the suburban district of Bone in South Sulawesi, Indonesia. The nearest school is 17 km from the city centre. This study was conducted in a suburban area representing a transitional zone between rural and urban communities. The majority of residents are engaged in farming, while some teachers commute from urban areas. Each school has sufficient teaching staff, with student enrolment ranging from 85 to 120 pupils. The participants in this study consisted of nine individuals, comprising six classroom teachers and three principals. A general description of the research participant is provided below.

Table 1. The Participant Profile

No	Code	Sex	Age	Teaching Experience (years)	Description
1	ASY	M	58	37	Headmaster
2	NRL	F	55	30	Headmaster
3	HMS	F	50	29	Headmaster
4	RDG	M	48	25	4th grade teacher
5	AHJ	F	42	20	5th grade teacher
6	RNR	F	36	15	2nd grade teacher
7	NRM	F	39	18	3rd grade teacher
8	RAL	F	30	3	6th grade teacher
9	STA	F	55	12	1st grade teacher

Data Collection

The data for this study comprised information regarding teachers' readiness to implement the curriculum through a deep learning approach in primary schools. Data were collected through in-depth interviews with nine primary school teachers who were purposively selected based on predetermined criteria. Respondents

were selected through purposive sampling, taking into careful consideration that they had sufficient and relevant experience and knowledge, thereby enabling comprehensive data collection in line with the research objectives. Data were collected through in-depth interviews conducted using a structured protocol with probing questions where necessary. This allowed respondents flexibility to explain their experiences in greater detail. Each interview was conducted individually, with an average duration of 50 minutes per participant, providing sufficient time for a comprehensive exploration of the research themes.

Probing techniques were applied systematically to encourage participants to provide more profound reflections and to capture nuanced perspectives that might not have emerged from surface-level responses. The interview process was recorded in full with the respondent's permission to obtain reliable and accurate information. This technique ensured the reliability of the transcripts, which in turn impacted the credibility and reliability of the findings. Method and source triangulation were employed to ensure the validity of the collected data.

Data Analysis

Data analysis begins with carefully examining the interview data by reading it repeatedly to capture its whole meaning and context. Next, the data is reduced (Miles & Huberman, 2020) to extract information relevant to the research focus. The next stage is coding, which involves labelling according to the ideas or themes that emerge. This coding is done using NVivo software. This tool generates codes in the form of words and phrases that represent specific concepts. Codes with similar characteristics are then grouped into categories and themes that support the research questions. Once the themes and categories have been clearly identified, the researcher conducts a comprehensive and in-depth interpretation of the research findings.

The interpretation process focuses on contextual analysis, readiness identification, and in-depth exploration of meaning. Critical interpretation is carried out so that the findings are not only descriptive, but also analytical and reflective. The validity of the analysis is strengthened through respondent verification, data triangulation by comparing evidence from various sources, and discussion with the research team to reduce personal bias. This procedure produces a descriptive-analytical narrative that presents the findings systematically. In this way, the analysis results can accurately describe the facts in accordance with actual reality, thereby providing a more meaningful understanding.

FINDINGS

The following table summarises the main themes and subthemes derived from the data analysis, reflecting teachers’ perceptions, readiness, and responses regarding the implementation of deep learning.

Table 2. Themes and Subthemes of Deep Learning Implementation

No	Themes	Categories	Included Codes
1	Understanding the Concept of Deep Learning	Definition, Purpose	Active Learning, Deep Understanding, Discovery Learning
2	Teacher Readiness	Individual and Group	Low Teacher Readiness, Initiative in Seeking Information, Collaborative Learning
3	Challenges	Time, Knowledge	Lack of Training, Implementation Challenges, Limited Official Dissemination
4	Support and Expectations	School & Government	School Support, Expectations towards Government
5	Response to Innovation	Positive, Conditional	Positive Views on Deep Learning, Urgent Need for Training

According to the Table 2 that the key perspectives on deep learning in teaching and learning encompassing its conceptualization as active and discovery-based learning, the limited readiness of teachers alongside their willingness to collaborate, challenges such as insufficient training and limited dissemination, the necessity for more substantial support from schools and government, and predominantly positive yet conditional responses to new policies that underscore the urgent need for training. Teacher readiness can be seen not only in the teachers themselves, but also in other factors that encourage them to take action, such as their colleagues, the principals, the local community, and the government. The visualization below illustrates teachers' readiness for implementing the deep learning approach.

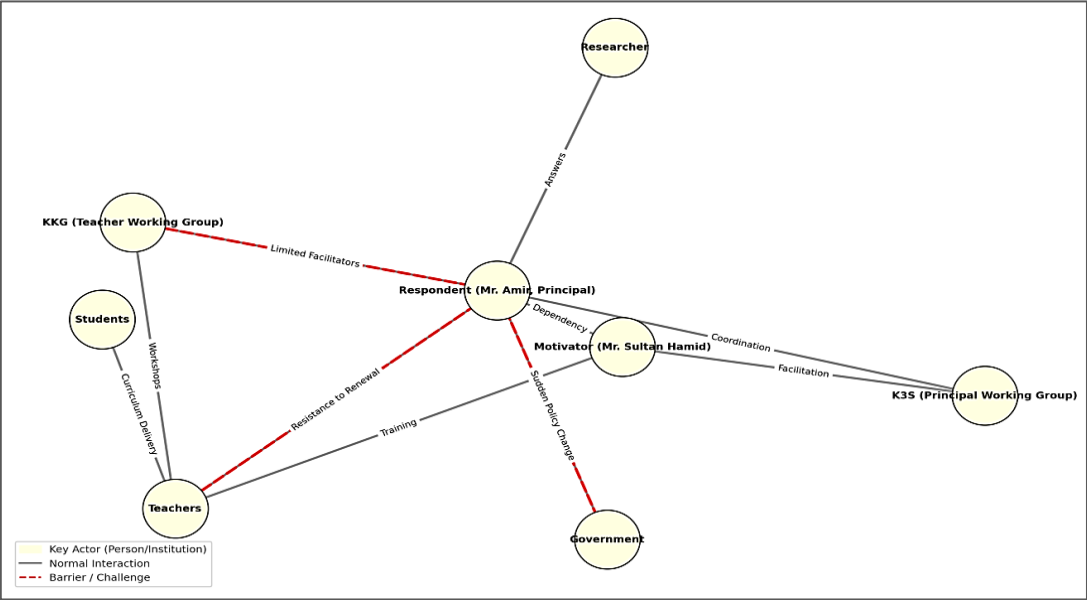


Figure 1. A Sociometric Map of the Teacher Readiness

Overall, the sociometric mapping portrays a system where support networks exist but are not yet strong enough to ensure smooth curriculum adoption. The reliance on a few key facilitators, combined with teacher resistance and logistical gaps, suggests that without strengthened collaboration and sustained professional development, the transition towards a Deep Learning approach risks being uneven and delayed. The detailed research findings from direct respondent interviews are summarized in Table 3 below.

Table 3. The Results of Respondent Interviews

Research Questions	Respondent Opinion (The Result of Interview)
How do teachers understand the concept of deep learning in the implementation of the primary school curriculum?	<i>In this cluster, the term deep learning has previously been encountered. However, it must be acknowledged that a complete comprehension of the concept is still lacking. As recalled, the term was first mentioned in the Teachers' Working Group (Kelompok Kerja Guru) by a Guru Penggerak, who explained that deep learning referred to mastery learning, meaning that learning should be accomplished in its entirety. (ASY, 03/05/2025)</i> <i>As far as I understand, deep learning is not a curriculum. Rather, it is a pedagogical approach that enables pupils to learn profoundly. Thus, it is not merely about memorisation but about achieving genuine understanding. That, Sir, is what I know. (NRL, 03/05/2025)</i>
How prepared are teachers to implement a deep learning-based curriculum in primary schools?	<i>In terms of teaching, Sir, there were previously teachers who taught thematic Subjects. Thematic is a combination of several subjects, Sir. Later,</i>

	<i>this is almost the same as the independent curriculum, so the learning is separate. (RDG, 17/05/2025)</i> <i>According to Sir, teachers must master this approach, beginning with an initial assessment of students to identify their abilities, followed by designing learning activities that are both engaging and enjoyable. (HMS, 17/05/2025)</i> <i>The application should be implemented directly with students, rather than through micro-teaching. However, teachers must first be equipped with the necessary knowledge and skills before engaging in classroom practice. (AHJ, 17/05/2025)</i>
What are the challenges and expectations of teachers in implementing the deep learning approach in primary schools?	<i>The obstacles for us here are that we lack a book to guide us, and we are constrained because we still lack knowledge about the Deep Learning curriculum. Therefore, we need to consider that KKG does exist in the form of training. (NRL, 17/05/2025)</i> <i>The obstacle means that Sir teachers may continue to carry out their duties as usual, which is what they have been doing, and teachers who find it challenging to accept updates. He works on what is already considered good, even though it does not match the values of novelty. (RAL, 03/05/2025)</i>
How do teachers respond to and strategise for the implementation of a deep learning-based curriculum?	<i>I believe that curriculum understanding is crucial for teachers. Without a sufficient understanding of the curriculum to be applied, I am convinced that teachers will struggle to carry out their duties and deliver effective learning. (RNR, 17/05/2025)</i> <i>Perhaps it would be more beneficial if a new policy, such as the application of deep learning, were incorporated into the Teachers' Working Group (KKG). At the same time, we continue to engage in independent learning. (STA, 17/05/2025)</i> <i>We may be able to gain better knowledge through training. Although there is no formal training, we can still learn through various media. (RDG, 24/05/2025).</i> <i>We will undoubtedly learn from various media," and "We learn together; for instance, when a learning community is organized on Saturdays, we can share experiences with colleagues about deep learning." (NRM, 24/05/2025)</i>

The findings of this study suggest that teachers are familiar with the term 'deep learning,' but their understanding of it remains limited. They tend to equate it with mastery learning rather than a more in-depth pedagogical approach. They know that the deep learning approach is not just about memorising and knowing. However, a lack of specific deep learning training, inadequate resources, and insufficient technical guidance hampers their readiness to apply this approach to its fullest potential. They have a sufficient willingness to adapt, but resistance to change and gaps in professional knowledge remain difficult to overcome. They also express a strong desire to gain a structured understanding through professional communities, training, and collaboration. They believe that these activities will help enhance the conceptual and empirical experience required to implement the deep learning approach in the learning process.

DISCUSSION

How Do Teachers Understand the Concept of Deep Learning in The Implementation of The Primary School Curriculum?

Mastery of the concept of deep learning constitutes a fundamental prerequisite for teachers prior to its implementation. Without sufficient conceptual understanding, teachers risk encountering obstacles in designing instructional strategies that are responsive to pupils' needs. As an approach that emphasises critical and reflective thinking as well as active participation, deep learning requires teachers to foster a transformative learning ecosystem. Accordingly, teachers must strengthen their theoretical foundation and practical skills to ensure the effective integration of deep learning into pedagogical practice.

According to the interview transcripts, it was found that only two of the nine informants were able to provide argumentative responses regarding the deep learning approach. However, their responses were limited to the literal meaning of deep learning. This indicates a significant gap between the knowledge that teachers are expected to have and the reality in the field. The results of a survey by Isnaeni et al. (2025) support this finding, showing that 45% of teachers do not understand the basic concepts, while another 30% demonstrate only limited understanding. As a result, teachers' readiness to apply deep learning in their classroom teaching practices remains very low. In addition, teachers' limited understanding of this innovation is exacerbated by their limited knowledge of technology, which is a significant factor hindering their readiness to teach innovative concepts optimally (Lindner & Berges et al., 2024).

Based on the accounts of the respondent (ASY and NRL), it can be concluded that teachers' understanding of the concept of deep learning in the implementation of the primary school curriculum remains limited to a general interpretation, namely as "learning in depth." This understanding does not yet fully reflect the true essence of deep learning, which, in fact, requires the application of a pedagogical approach that is mindful, meaningful, and joyful, in accordance with the orientation of modern curricula. Consequently, the development of a deep learning mindset among teachers is of paramount importance. This can be achieved through professional development programmes, structured interactive teaching strategies, and the adoption of active student learning (Hendrianty et al., 2024). Furthermore, a comprehensive pedagogical understanding is required so that teachers may effectively integrate this approach into the curriculum, while taking into account pupils' needs and local contexts (Arina & Isyanto, 2025).

How Prepared are Teachers to Implement a Deep Learning-Based Curriculum in Primary Schools?

To meet the demands of a deep learning-based curriculum, teachers must understand the true philosophy of deep learning, which emphasizes critical thinking, problem-solving, and contextualization. The most critical thing is that teachers must shift their role from being conveyors of material to facilitators of learning. As facilitators of learning, teachers need relevant technological tools, so digital literacy is also crucial for them to possess. Teachers are even capable of using technology effectively for meaningful learning, but inadequate preparation hinders their ability to meet the demands of modern education (Ogunseemi & Idowu, 2022).

Respondents' views on the similarity between the deep learning approach and the independent curriculum do exist. However, its implementation must be proven through a learning process that incorporates mindful learning, meaningful learning, and joyful learning in the deep learning approach. In this case, teachers need to demonstrate their pedagogical experience in learning practices. Pedagogical knowledge only has meaning when applied in real classrooms (Rincon et al., 2024). Through learning practices, teachers can evaluate strategies, adapt to diverse needs, and develop reflective and adaptive skills that are essential for professional teacher development (Rincon, 2025; Yue et al., 2024; Kolajo, 2025). Recent studies also show that artificial intelligence (AI)-based tools can enrich reflection and support more flexible strategies (Sanyal et al., 2025). Therefore, the presence of AI in the classroom needs to be considered wisely to help facilitate the learning process. Thus, implementation bridges theory and practice while continuously strengthening teachers' pedagogical capacity for 21st-century education

The capacity of a resource person in a training programme, including within a Teacher Working Group (*Kelompok Kerja Guru/KKG*), is a crucial aspect that requires careful consideration. Teachers, as facilitators, are not only required to master the subject matter but are also expected to present the material using methods that are appropriate to the students' characteristics. To this end, teacher training should be conducted by reliable and high-quality resource persons. Teacher training is not only about administrative matters, but the application of these concepts is even more important. It is understood that maximising the role of teachers requires training and guidance so that they can facilitate student learning effectively (Nisa et al., 2024). Therefore, it is essential to carefully select speakers for teacher training, taking into account their track record, experience, and pedagogical approach. As emphasised by Sari (2021), the effectiveness of teacher training is greatly influenced by the professional capacity of the facilitators, encompassing both subject mastery and pedagogical competence.

What are The Challenges and Expectations of Teachers in Implementing the Deep Learning Approach in Primary Schools?

Not every educational innovation leads to outcomes that align with initial expectations. Although innovations are often designed to enhance the quality of education, their implementation by teachers often faces complex challenges in their practice. Teachers face challenges because they are expected to develop students' critical and analytical thinking skills, in addition to mastering the concepts themselves. Although deep learning strategies have been proven to strengthen these skills in students, their practical implementation is often hampered by limited learning time, inadequate contextual learning resources, and insufficient professional training (Wahyuni, 2025).

In particular, within the framework of the *Kurikulum Merdeka*, this approach emphasises deep exploration of concepts through reflection and real-life application; however, the readiness of teachers and the persistence of a rote-learning culture remain significant obstacles (Putra & Sari, 2025). Additionally, research in the field of sociology indicates that deep learning through reflective discussions and case studies can enhance students' analytical skills. However, overcoming the challenges that arise requires increased teacher professionalism and sustained policy support (Santoso, 2025).

NRL respondents identified two main challenges in implementing Deep Learning in schools: first, the absence of guidelines for designing learning and evaluating learning outcomes systematically. Without standardised written guidelines, teaching materials remain prone to inconsistency and subjective interpretation by teachers. Second, teachers' limited conceptual knowledge of deep learning. This is a strong indication of the need for capacity building, both through formal training and regular professional forums such as Teacher Working Groups (KKG). Participation through KKG will allow teachers to access structured learning modules, pedagogical strategies, and hands-on practice. Therefore, the ideal solution includes the provision of official guidelines supported by ongoing training programmes, so that teachers' professional competencies can be significantly improved.

According to NRM, the main challenge in implementing new approaches lies in cultural barriers and teachers' attitudes. Many teachers are resistant to adaptation and innovation. They rely on conventional methods and old ways of doing things. They feel that they have been in their comfort zone, where past successes are considered successes in the present. Resistance will limit creativity, reduce the quality of learning, and delay the adoption of modern pedagogical strategies such as active and project-based learning (Tariq et al., 2024; Tabulawa, 2021; Al-Saleem et al., 2025). To overcome this, sustained professional development, motivational leadership, and supportive institutional climates are needed to foster greater teacher openness to change.

Akdeniz and Konaklı (2022) assert that teacher resistance, both at the personal and organisational levels, may engender passive attitudes and obstruct the transfer of knowledge among peers. Accordingly, Anderson et al. (2022) identified creative thinking and anxiety as significant obstacles to professional development; however, it is an empirical fact that comprehensive professional development can increase self-confidence and

lead to more innovative pedagogical practices. Eickholt (2018). On the other hand, time constraints are often cited as the main reason for maintaining existing teaching methods. For this reason, teachers feel it is important to allocate specific time for training. In general, these studies suggest that continuous professional development, motivational leadership, and a school culture that encourages experimentation are essential for cultivating teachers' openness to change and pedagogical innovation.

How do Teachers Respond to and Strategy for The Implementation of a Deep Learning-Based Curriculum?

The continuous development of professional and pedagogical competencies is a key strategy for improving teachers' readiness to implement deep learning-based curricula, particularly in this research area. The active participation of teachers in the competency development process greatly supports their mastery of the material being discussed. Not only that, but critical reflection on learning practices is also necessary to ensure that the methods used align with the characteristics of the students. Through these strategies, teachers are not only technically prepared but are also capable of fostering meaningful, contextualised learning that promotes critical and creative thinking among students.

RNR respondents emphasised that teachers' readiness to implement innovations is a determining factor for success. Teachers' readiness is necessary, given that the dynamic nature of the curriculum requires an adaptive attitude and pedagogical flexibility in response to ongoing changes. In this context, an adaptive attitude is not merely an option, but a fundamental prerequisite for keeping up with the increasingly complex dynamics of education. Being adaptable to change is a strong foundation for embracing real-world work in the classroom. Only through real practice in the classroom can the implementation of an innovative curriculum be measured. Teachers not only understand the concepts, tools, and methods of deep learning, but can also integrate them into classroom learning practices (Alqahtani et al., 2025; Kim & Kim, 2024), so that the deep learning-based teaching process has a significant impact on improving the quality of teaching and preparing students to face global challenges (Yang et al., 2024).

Another important point is that teachers' commitment to implementing innovative curricula should not depend entirely on government intervention, but rather on the teachers' own initiative. They are expected to explore resources, design data-based learning modules, and use technology creatively. Hammond et al. (2017) state that efforts initiated by teachers themselves, combined with collaboration, reflection, and training, can foster the development of an adaptive learning ecosystem. Without a proactive attitude and strong initiative from teachers, deep learning risks becoming nothing more than policy rhetoric. Hammond et al.'s (2017) statement supports the strategy of teachers implementing deep learning approaches in primary schools. Respondents agreed on the importance of having a positive perspective on deep learning as a pedagogical innovation. To that end, adequate preparation is necessary, not only in terms of formulating relevant strategies and concrete steps, but also in terms of mental readiness. Psychological readiness is even a crucial factor for teachers in responding to the challenges that arise from the adoption of deep learning. Mental readiness equips individuals to deal with the uncertainty, obstacles, and inherent complexity of integrating deep learning practices (Miller et al., 2025; Fernández et al., 2024; Chen, 2025).

In practice, teachers formulated two primary strategies for implementing deep learning: the individual approach, through independent learning, and the collective approach, through Teacher Working Groups (*Kelompok Kerja Guru/KKG*). The majority of informants expressed a preference for the collective approach, as it provides a platform for mutual support and complementarity among teachers. This preference is well-grounded, given that deep learning remains a relatively novel practice for educators within the cluster. As with the implementation of previous policies, teachers also expressed the expectation of a shared platform that could serve as a common reference point for classroom practice.

CONCLUSION

This study emphasises that teachers' understanding of deep learning in primary schools remains conceptual and is often equated with mastery learning. This misconception suggests that teachers'

understanding of the theoretical essence of deep learning, which emphasizes critical and analytical thinking in students, remains superficial. Teachers' readiness to effectively implement a deep learning-based curriculum is constrained by their limited pedagogical competence, low digital literacy, and reliance on traditional teaching practices. These challenges provide empirical evidence for the need for quality professional development to bridge the gap between conceptual understanding and classroom application. Likewise, institutional support that facilitates collaborative and innovative practices is also highly desired by teachers. In principle, fostering teachers' adaptability and technological literacy is an essential key to sustaining meaningful curriculum reform. It is recommended that training programmes prioritise contextualised, practice-oriented modules and that schools establish continuous mentoring systems to strengthen teachers' capacity for deep learning pedagogy.

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