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# Analysis of Primary School Teachers' Pedagogical Competence in Integrating Digital-Based Deep Learning Through the Use of the Home Education Platform

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## ABSTRACT

This study aims to analyze: teachers' pedagogical competence in integrating digital-based Deep Learning through the Rumah Pendidikan Platform, the implementation of digital-based Deep Learning, the utilization of the Rumah Pendidikan Platform's features, the obstacles faced by teachers, and efforts to improve teachers' pedagogical competence. The study used a qualitative approach with a case study method. The study was conducted at Lopang Domba Public Elementary School, Serang City, with Sepang Public Elementary School as a comparison school. Research informants consisted of the principal, eight teachers, and school operators who were selected purposively. Data were collected through observation, in-depth interviews, and documentation. Data analysis used the Miles and Huberman model which includes data reduction, data presentation, drawing conclusions, and verification. Data validity was carried out through triangulation of sources, techniques, and time. The results of the study indicate that teachers' pedagogical competence in integrating digital-based Deep Learning is still in the development stage. Learning planning has referred to the Independent Curriculum, but has not optimally integrated the principles of mindful, meaningful, and joyful learning. Learning implementation shows that digital technology has been used by some teachers, but is still predominantly a medium for delivering material and has not been able to encourage student-centered learning. Utilization of the Rumah Pendidikan Platform is also not optimal because teachers have only utilized some of the features, especially Learning Resources and Teaching Tools, while other features have not been utilized optimally. Efforts to improve competency are carried out through training, mentoring, academic supervision, strengthening the Teacher Working Group (KKG), and support from the principal in teacher professional development. The experience of Sepang Public Elementary School shows that policy support, infrastructure, and strengthening teacher competency are important factors in the successful implementation of the Rumah Pendidikan Platform as a best practice for Lopang Domba Public Elementary School. This study concludes that the successful integration of digital-based Deep Learning is not only determined by the availability of technology, but also by the teacher's pedagogical competence in designing, implementing, and evaluating meaningful learning through the use of the Rumah Pendidikan Platform.

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***Keywords:***

*Kompetensi pedagogik, Pembelajaran Mendalam, pembelajaran berbasis digital, Platform Rumah Pendidikan.*

## ABSTRACT

Penelitian ini bertujuan untuk menganalisis: kompetensi pedagogik guru dalam mengintegrasikan Pembelajaran Mendalam berbasis digital melalui Platform Rumah Pendidikan, pelaksanaan Pembelajaran Mendalam berbasis digital, pemanfaatan fitur-fitur Platform Rumah Pendidikan, hambatan yang dihadapi guru, dan upaya peningkatan kompetensi pedagogik guru. Penelitian menggunakan pendekatan kualitatif dengan metode studi kasus. Penelitian dilaksanakan di Sekolah Dasar Negeri Lopang Domba, Kota Serang, dengan Sekolah Dasar Negeri Sepang sebagai sekolah pembanding. Informan penelitian terdiri atas kepala sekolah, delapan orang guru, dan operator sekolah yang dipilih secara purposive. Data dikumpulkan melalui observasi, wawancara mendalam, dan dokumentasi. Analisis data menggunakan model Miles dan Huberman yang meliputi reduksi data, penyajian data, penarikan kesimpulan, dan verifikasi. Keabsahan data dilakukan melalui triangulasi sumber, teknik, dan waktu. Hasil penelitian menunjukkan bahwa kompetensi pedagogik guru dalam mengintegrasikan Pembelajaran Mendalam berbasis digital masih berada pada tahap pengembangan. Perencanaan pembelajaran telah mengacu pada Kurikulum Merdeka, tetapi belum mengintegrasikan secara optimal prinsip pembelajaran berkesadaran (mindful), bermakna (meaningful), dan menggembirakan (joyful). Pelaksanaan pembelajaran menunjukkan bahwa teknologi digital telah digunakan oleh sebagian guru, namun masih dominan sebagai media penyampaian materi dan belum mampu mendorong pembelajaran yang berpusat pada peserta didik. Pemanfaatan Platform Rumah Pendidikan juga belum optimal karena guru baru memanfaatkan sebagian fitur, terutama Sumber Belajar dan Perangkat Ajar, sedangkan fitur lainnya belum digunakan secara maksimal. Upaya peningkatan kompetensi dilakukan melalui pelatihan, pendampingan, supervisi akademik, penguatan Kelompok Kerja Guru (KKG), serta dukungan kepala sekolah dalam pengembangan profesional guru. Pengalaman Sekolah Dasar Negeri Sepang menunjukkan bahwa dukungan kebijakan, infrastruktur, dan penguatan kompetensi guru menjadi faktor penting dalam keberhasilan implementasi Platform Rumah Pendidikan sebagai praktik baik (best practice) bagi Sekolah Dasar Negeri Lopang Domba. Penelitian ini menyimpulkan bahwa keberhasilan integrasi Pembelajaran Mendalam berbasis digital tidak hanya ditentukan oleh ketersediaan teknologi, tetapi juga oleh kompetensi pedagogik guru dalam merancang, melaksanakan, dan mengevaluasi pembelajaran secara bermakna melalui pemanfaatan Platform Rumah Pendidikan.

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## 1. INTRODUCTION

The development of digital technology has driven a paradigm shift in learning, from one focused on delivering content to one that is active, meaningful, contextual, and student-centered. In this context, teachers are required not only to master the material but also to possess pedagogical competence to understand student characteristics, design, implement, and evaluate learning using technology appropriately. Pedagogical competence is becoming increasingly important in the implementation of Deep Learning, which emphasizes meaningful understanding, critical thinking, problem-solving, collaboration, exploration, and reflection.

Technology integration in Immersive Learning is demonstrated not only by the use of digital devices or applications, but also by teachers' ability to connect technology with learning objectives, pedagogical strategies, student characteristics, and meaningful learning experiences. However, various studies show that the use of digital technology in elementary schools still faces obstacles in the form of limited teacher digital and pedagogical competencies, infrastructure, internet access, training, mentoring, and school support. Technology use is also often limited to delivering materials, giving assignments, and administering learning, thus not fully encouraging student exploration, collaboration, problem-solving, and reflection.

In the context of Indonesia's digital transformation of education, the Rumah Pendidikan Platform is a tool that can support teachers in accessing learning resources, teaching tools, assessments, and digital learning services. Utilizing this platform has the potential to support in-depth learning if pedagogically integrated according to learning objectives and student needs. Therefore, the success of the Rumah Pendidikan Platform is determined not only by the availability of technology, but also by teacher competence and the readiness of the school ecosystem.

This situation was also found based on initial observations at Lopang Domba State Elementary School in Serang City. Some teachers have begun using digital devices or media, but others are not yet accustomed to implementing digital-based learning. Learning still tends to use conventional, teacher-centered methods, while student exploration, discussion, reflection, and problem-solving activities are not optimal. Utilization of the Rumah Pendidikan Platform is also not optimal, while limited devices, internet access, and teacher skills in using technology are obstacles to its implementation. This situation indicates a gap between the demands of digital-based in-depth learning and learning practices in the field.

Previous research studies have shown that research on educational technology generally focuses on the general use of ICT and has not specifically examined the relationship between teacher pedagogical competence, Immersive Learning, and the Rumah Pendidikan Platform at the elementary school level. Previous research also indicates that the implementation of digital learning is influenced by teacher competence, limited infrastructure, low digital literacy, and a lack of support and mentoring. Therefore, there is still room for further research to analyze how teacher pedagogical competence is used to integrate digital-based Immersive Learning through the Rumah Pendidikan Platform, particularly in schools with limited facilities.

Based on these conditions, this study aims to analyze the pedagogical competence of elementary school teachers in integrating digital-based Deep Learning through the use of the Rumah Pendidikan Platform at Lopang Domba Public Elementary School, Serang City. The study focuses on teachers' abilities in designing, implementing, and evaluating digital-based learning, the use of Rumah Pendidikan Platform features, the obstacles faced, and the efforts of teachers and schools in improving digital-based pedagogical competence. The results of the study are expected to provide theoretical contributions to the development of studies on pedagogical competence and digital learning as well as practical benefits for teachers and schools in improving the quality of active, meaningful, and learner-centered learning.

## LITERATURE REVIEW

### Teacher Pedagogical Competence

Pedagogical competence is a teacher's professional ability to manage learning comprehensively, from understanding student characteristics, planning and implementing learning, building effective communication, to conducting assessments and evaluations. This competency is one of the key competencies that distinguishes the teaching profession from other professions because it is directly related to a teacher's ability to create educational, student-centered, and developmentally appropriate learning (Cahyana & Agustin, 2024; Agnes et al., 2025; Yusuf et al., 2026).

In this study, pedagogical competence is understood through several key aspects, namely the teacher's ability to understand differences in students' abilities, interests, talents, learning styles, and social and cultural backgrounds. This understanding forms the basis for determining appropriate approaches, methods, media, and learning strategies so that learning can take place effectively, inclusively, and meaningfully (Fadila et al., 2026; Alifah et al., 2025).

Teachers need to understand various learning theories, including behaviorism, cognitive, constructivism, and humanism. Behaviorism emphasizes the formation of behavior through stimulus, response, reinforcement, and habituation; cognitive theory emphasizes the process of thinking and information processing; constructivism positions students as builders of knowledge through experience and interaction; while humanism emphasizes the development of students' full potential, including intellectual, emotional, social, and spiritual aspects. These four theories provide a foundation for teachers to choose a learning approach according to student characteristics and learning objectives (Kenargi & Sanjiwani, 2025; Chairunnisa et al., 2026; Nurjamilah et al., 2025; Hariyasasti et al., 2025).

Planning includes setting objectives, materials, strategies, methods, media, and assessment techniques, taking into account student characteristics and needs. Meanwhile, learning implementation is the implementation of planning through preliminary, core, and closing activities. In its implementation, the teacher acts as a facilitator, motivator, guide, and evaluator, encouraging active, student-centered learning (Diana et al., 2023; Audina & Irawan, 2026; Sholihah Rosmana et al., 2024).

Teachers need to be able to convey material and instructions clearly, using language that is easy to understand, listen to students, provide feedback, and foster two-way interaction. Effective communication can increase student attention, motivation, confidence, and engagement. In digital learning, these skills also include the use of media and technology to convey information interactively (Hidayat & Hardianto, 2023; Teguh et al., 2024).

Teachers must be able to carry out systematic, objective, and

continuous assessments to determine the achievement of learning objectives and improve the learning process. Assessments can encompass cognitive, affective, and psychomotor aspects and are conducted through diagnostic, formative, and summative assessments. In modern learning, assessments are also directed at authentic assessment and the development of higher-order thinking skills (HOTS) (Gazali & Astuti, 2025; Rangkuti & Albina, 2025; Mustika et al., 2026).
Thus, pedagogical competence is not only related to the ability to deliver material, but also encompasses the teacher's overall ability to understand students, design learning experiences, implement instruction, communicate, and assess and follow up on learning outcomes. In the context of digital learning, these competencies need to be supported by the teacher's ability to integrate technology pedagogically.

**Deep Learning (Deep Learning)**
Deep learning is a learning approach that emphasizes mindful, meaningful, and joyful learning. This approach not only directs students to master material by rote, but also encourages them to understand concepts holistically, connect knowledge to real life, think critically and creatively, collaborate, and reflect on their learning experiences (Lumbantobing & Gampu, 2025; Ratri et al., 2026).
Immersive learning places students at the center of the learning process, while teachers act as facilitators who design active, contextual, reflective, and enjoyable learning experiences. This approach also supports the development of 21st-century skills and higher-order thinking skills. Therefore, implementing immersive learning requires teachers' pedagogical skills in selecting strategies, media, activities, and assessments that are appropriate to students' needs (Hasanah & Pujiati, 2025; Komara et al., 2026).
In a digital context, immersive learning can be supported through the use of technology and educational platforms. Technology enables teachers to provide diverse learning resources, interactive activities, collaboration, and assessments that provide faster feedback. Thus, digital-based immersive learning integrates the principles of mindful, meaningful, and joyful learning with the use of technology to create an active, contextual, and holistic learning experience.

**Digital Learning**
Digital learning is a learning process that utilizes digital technology for material delivery, interaction, learning management, and assessment. The use of digital media such as video, interactive multimedia, educational applications, and learning platforms can make learning more engaging, flexible, interactive, and student-centered (Adventyana et al., 2023; Ervianti & Adrias, 2025).
Implementing digital learning involves several stages: planning, implementation, interaction and collaboration, and evaluation. In the planning stage, teachers determine objectives, strategies, and digital media based on student characteristics. In the implementation stage, technology is used to support the delivery of materials and learning activities. Digital interactions can occur through discussions, assignments, and various collaborative activities. Furthermore, evaluation can be conducted using online quizzes, digital assignments, or assessment applications.
Digital-based evaluation offers advantages in efficiency, flexibility, interactivity, data processing, and feedback. However, its success still depends on teachers' ability to integrate technology, pedagogy, and learning materials. Limited devices, internet access, digital literacy, and teacher training are factors that can hinder the implementation of digital learning (Anisah et al., 2025; Anggraini et al., 2025).
Thus, digital learning is not just the use of technological devices, but is a pedagogical process that utilizes technology in a targeted manner to improve the quality of students' learning experiences.

**Home Education Platform**
The Rumah Pendidikan platform is an integrated digital system developed by the Indonesian government to support technology-based educational transformation. This platform provides a variety of educational services for teachers, students, and education stakeholders, including learning resources, teacher competency development, learning activities, and assessments (Kemendikbudsdamen, 2025).
In learning, the use of Rumah Pendidikan can be done through several stages: platform access, selecting services according to needs, utilizing learning resources, implementing learning activities, and conducting assessments and evaluations. Teachers can utilize the platform to access teaching materials, videos, articles, interactive media, and other learning resources. Meanwhile, students can use it to access learning materials and activities more flexibly.
Some features relevant to learning include Learning Resources, the Teachers' Room ( Ruang GTK), the Student Room ( Ruang Siswa), and assessment and evaluation features. Teachers can use Learning Resources to enrich material; the Teachers' Room ( Ruang GTK) supports teacher competency development; the Student Room supports student access to learning materials and activities; and digital assessments help teachers implement and document learning assessments.
The integration of the Education House into learning can be implemented from the planning, implementation, and evaluation stages. During the planning stage, teachers can search for learning resources and prepare instructional media. During the implementation stage, the platform is used to support learning activities, material exploration, discussions, and collaboration. During the evaluation stage, digital features can be utilized to conduct assessments and monitor student progress.
From an immersive learning perspective, the Education House is positioned not only as a medium for delivering material, but also as a means to create active, contextual, collaborative, reflective, and student-centered learning. However, its optimal use is influenced by teachers' digital competence, device availability, internet network quality, student readiness, training, and school support (Harjanto, 2026).

**Integration of Pedagogical Competence, Deep Learning, and the Home Education Platform**
Based on the literature review, there is a close relationship between teacher pedagogical competence, in-depth learning, digital learning, and the use of the Rumah Pendidikan platform. Pedagogical competence is the primary foundation, as teachers must be able to understand student characteristics, design learning, select appropriate strategies and media, establish communication, and conduct assessments. These skills are then directed toward implementing the principles of in-depth learning that is conscious, meaningful, and enjoyable.
In its implementation, digital technology and the Rumah Pendidikan Platform serve as a support system to expand

learning resources, enhance interaction, provide learning activities, and facilitate assessments. Therefore, the success of technology integration is determined not solely by the availability of the platform, but by teachers' ability to use it pedagogically, contextually, and in accordance with learning objectives.

Previous research studies have shown that teachers' digital competence, pedagogical readiness, experience using technology, training, infrastructure availability, and school support are important factors in implementing digital learning and deep learning. Several studies also show that implementing deep learning can improve critical thinking skills, creativity, and student engagement, but teachers still face challenges in optimally integrating deep learning principles and technology.

**Relevant Research and Research Position**

Previous research has shown that numerous studies have been conducted on teachers' digital competencies, immersive learning, and technology-based learning. Khaerunnisa et al. (2025) demonstrated that teachers' skills in creating digital learning media are influenced by digital resources, technological devices, and collaboration. Allolinggi et al. (2025) found that teachers' readiness to implement deep learning is related to conceptual understanding, pedagogical readiness, technological readiness, motivation, and school support.

Research by Syahid et al. (2022) shows that elementary school teachers' digital competencies still need improvement, particularly in mastering applications and utilizing learning technology. Meanwhile, Putra and Rizqi (2024) demonstrated that mentoring in the development of deep learning-based teaching modules can improve teachers' pedagogical competencies. Zainuddin et al. (2026) found, through a literature review, that deep learning has the potential to enhance critical thinking, creativity, and student engagement.

Research by Sasabillah and Hariandi (2025) also showed that teachers' digital competence in utilizing learning platforms is influenced by experience, training, and school support. Khafizah and Sayekti (2026) found teachers struggled to apply deep learning principles and competencies. Meanwhile, Nurbaya and Suryadi (2025) showed that the implementation of deep learning positively impacted learning quality, although teachers' digital competence did not demonstrate a significant direct impact.

Previous research has provided an important foundation for understanding teacher competency and the use of technology in learning. However, the focus and unit of analysis of these studies need to be more specifically differentiated from the focus of this study. Khaerunnisa et al. (2025), for example, examined teacher skills in developing digital learning media by emphasizing the role of digital resources, technological devices, and collaboration. This focus is relevant for explaining the supporting factors for digital media development, but it does not specifically explain how elementary school teachers' pedagogical competency is realized through the planning, implementation, and evaluation of Deep Learning using the Rumah Pendidikan Platform in schools facing limited facilities. Allolinggi et al. (2025) highlighted teacher readiness in implementing Deep Learning based on conceptual understanding, pedagogical and technological readiness, motivation, and school support. Different from this focus on readiness, this study examines how teacher readiness and pedagogical competence are reflected in actual learning practices, including the gap between teachers' understanding of the principles of mindfulness, meaningfulness, and joy and their implementation in the classroom.

Syahid et al.'s (2022) study positions elementary school teachers' digital competence as a matter of mastery of learning technology applications and utilization. Meanwhile, Putra and Rizqi (2024) discuss mentoring in the development of Deep Learning-based teaching modules to support the improvement of teachers' pedagogical competence. These two focuses provide different contributions: the first study emphasizes digital skills, while the second highlights competency development through mentoring. This study expands the discussion by positioning pedagogical competence as the primary construct observed through the ability to understand student characteristics, design learning, implement learning interactions, utilize media and learning resources, and conduct assessments and follow-up. Thus, technological mastery is not treated as a sole indicator of success, but rather is assessed based on its suitability to learning objectives and the application of Deep Learning principles.

The next difference lies in the use of the Rumah Pendidikan Platform. Research on digital media in general does not necessarily explain how services within an educational platform are integrated into teachers' pedagogical practices. In this study, the Rumah Pendidikan Platform is examined specifically through the use of the Learning Resources and Teaching Tools features to support planning, as well as tracking the use of assessment features and teacher competency development services. The focus is not simply on determining whether teachers use the platform, but rather on identifying the features used, their purpose, their relationship to learning activities, and any obstacles that hinder their use. This distinction is important because access to the platform does not in itself indicate that teachers have been able to integrate technology with active, contextual, collaborative, and reflective learning.

The contextual novelty of this research also lies in the case study at Lopang Domba Public Elementary School, Serang City, which faces limited facilities and varying teacher digital competencies. Based on the research findings, the internet connection is unstable and is only available in the office space, while four laptops and one LCD projector must be used alternately. Furthermore, some students do not yet have their own digital devices, five of the eight teachers who served as informants are not yet able to use technology independently, and utilization of the Rumah Pendidikan Platform is still limited. These conditions allow the research to explain not only the competencies needed to integrate technology, but also how infrastructure limitations, student access, teacher experience, and school support influence the application of these competencies in learning practices. Sepang Public Elementary School is used as a contextual comparison to enrich interpretations of infrastructure readiness, digital learning culture, and platform utilization experiences, not as a basis for statistical generalization of the results.

Based on these differences, the contribution of this research lies in the contextual analysis of the relationship between teacher pedagogical competence, the principles of Deep Learning, and the utilization of the Rumah Pendidikan Platform at the level of elementary school learning practices. This contribution is operationalized through four focuses: (1) the suitability of learning planning to student characteristics and the principles of Deep Learning; (2) the application of mindful, meaningful, and joyful principles in learning activities; (3) the utilization of the

Rumah Pendidikan Platform features to support the planning, implementation, assessment, and development of teacher competence; and (4) the contextual influence of limited facilities, digital competence, and school support on the implementation of this integration. With this focus, the research is expected to provide a more concrete understanding of the gap between technology availability, teacher pedagogical abilities, and the implementation of Deep Learning in elementary schools with limited resources.

## 2. RESEARCH METHODS

This research uses a qualitative approach with a case study design to analyze the pedagogical competence of elementary school teachers in integrating digital-based Deep Learning through the use of the Rumah Pendidikan Platform. This approach was chosen because the research is oriented towards an in-depth understanding of the processes, experiences, abilities, obstacles, and efforts of teachers in integrating technology pedagogically in real-life learning contexts. The research focuses on Lopang Domba State Elementary School, Serang City, as the main case. Sepang State Elementary School is used in a limited way as a contextual comparison (benchmark) to enrich interpretations regarding teacher readiness, school support, infrastructure, collaborative culture, training, and the use of digital platforms.

The research was conducted from April to July 2026 at Lopang Domba State Elementary School, Serang District, Serang City, Banten Province. The location was selected based on preliminary studies showing that the integration of digital-based immersive learning and the utilization of the Rumah Pendidikan platform was suboptimal. This condition was characterized by variations in teachers' digital competencies, limited facilities and internet access, and unequal use of technology to support conscious, meaningful, and enjoyable learning.

This study focuses on the analysis of teachers' pedagogical competencies in integrating digital-based Deep Learning through the use of the Rumah Pendidikan Platform at Lopang Domba Public Elementary School, Serang City, Banten. Primary data collection was conducted at Lopang Domba Public Elementary School through in-depth interviews, observation, and documentation involving 10 informants, consisting of the principal, eight teachers, and one school operator. The selection of informants was based on their involvement in planning, implementing, evaluating learning, managing technology, and developing digital learning at the school.

Sepang Public Elementary School was not positioned as the primary research site with equivalent primary data collection procedures as Lopang Domba Public Elementary School, but rather as a contextual comparison to help interpret the implementation of digital learning. Therefore, the discussion of Sepang Public Elementary School is limited to verifiable information from sources actually used in the research. This information is not treated as field findings equivalent to the results of interviews, observations, and documentation at Lopang Domba Public Elementary School. With this limitation, the comparison of the two schools is intended to provide context for the challenges of digital learning implementation, not to produce an equivalent empirical comparison or generalization regarding the superiority of one school over the other.

Data collection was conducted through observation, semi-structured interviews, and documentation. Observations were used to directly identify teachers' pedagogical competencies in planning and implementing learning, managing classes, using digital media and technology, utilizing the Rumah Pendidikan Platform features, building interactions with students, and conducting assessments. Interviews were used to explore teachers' understanding and experiences related to student characteristics, planning and implementing digital-based in-depth learning, platform utilization, assessments, obstacles, and efforts to improve pedagogical competency. Interviews with school principals and operators were used to obtain information regarding policies, institutional support, infrastructure, and platform implementation. Documentation was used to obtain supporting evidence in the form of learning tools, assessments, photos or videos of activities, and documents on the use of the Rumah Pendidikan Platform.

Data collection on teachers' pedagogical competence refers to several key aspects: understanding student characteristics, applying learning theories and principles, planning and implementing learning, communicating with students, and assessing and evaluating learning. These aspects form the basis for developing interview, observation, and documentation instruments.

Data were analyzed using Miles and Huberman's interactive model through three interrelated stages: data reduction, data presentation, and conclusion drawing and verification. The analysis was conducted by connecting the results of semi-structured interviews, learning observations, and documentation to identify patterns of teacher pedagogical competency in integrating digital-based Deep Learning through the Rumah Pendidikan Platform.

In the data reduction stage, interview results, observation notes, and learning documents were reviewed for their relevance to the research focus. The data were then initially coded based on the substance of the information found. Codes related to teachers' understanding of Deep Learning, for example, were grouped into categories based on level of understanding and readiness for implementation. Data regarding platform feature usage were grouped based on the type of service utilized and its function in the learning process. Meanwhile, information on planning, implementation, learning interactions, assessments, and follow-up were grouped based on the pedagogical competency aspects that were the focus of the research. This grouping was used to identify recurring patterns while maintaining differences in experiences between informants.

In the data presentation stage, the grouping results were arranged thematically by connecting information from the three data sources. Teachers' statements regarding their understanding and experiences were compared with observations of learning practices and documentary evidence, such as teaching materials, assessment tools, and available documents on the use of the Rumah Pendidikan Platform. This process allowed researchers to assess whether the informants' understanding was reflected in learning planning and implementation. Discrepancies between data sources were not immediately eliminated but were considered as part of the interpretation of implementation conditions in schools.

In the conclusion-drawing and verification stages, the thematic patterns formed were re-examined based on consistency across data sources and their suitability to the research focus. The teacher understanding category was used to explain variations in readiness to apply Deep Learning principles, while the platform utilization category was used to assess the extent to which technology had been pedagogically integrated, rather than

simply used as a means of delivering material. Further interpretations were linked to aspects of pedagogical competence, including understanding student characteristics, application of learning principles, planning and implementing learning, communication with students, and assessment and evaluation. Triangulation of sources, techniques, and time was used according to data availability to strengthen the credibility of the interpretations.

As an example of the application of analysis, interview results revealed variations in teachers' understanding of Deep Learning. Teachers G1 and G2 were still at the conceptual introduction stage and reported having never received any specific training, while G3, G5, and G6 demonstrated a more comprehensive understanding by linking learning to critical thinking, discussion, problem-solving, and everyday life. These findings were interpreted as variations in teachers' conceptual readiness, which were then linked to the need for developing learning planning and implementation.

Another example is the use of the Rumah Pendidikan platform. Research findings indicate that platform use is still limited to certain features, particularly Learning Resources and Teaching Tools, while technology utilization in learning still tends to function as a medium for delivering material. When the interview findings are read in conjunction with learning observations, the tendency for technology use to be unaccompanied by changes in learning interaction patterns becomes one basis for interpreting that digital integration does not fully reflect learner-centered learning. Therefore, research conclusions are constructed through thematic grouping and cross-checking between data sources, not solely based on individual informant statements.

Data validity was maintained through source and technique triangulation. Source triangulation was conducted by comparing information obtained from different informants, namely principals, teachers, and school operators, according to the relevance of the information provided to the research focus. Technique triangulation was conducted by comparing data from interviews, observations, and documentation to identify any correspondence or discrepancies in information regarding teacher pedagogical competence, the implementation of Deep Learning, and the use of the Rumah Pendidikan Platform. If discrepancies were found between sources or techniques, the information was re-examined before being used as a basis for drawing conclusions. Thus, interpretation of findings is based on cross-checking of available evidence, without claiming time triangulation procedures that were not specifically implemented.

## 3. RESULTS AND DISCUSSION

### Research result

Categorization of teachers' understanding of Deep Learning was conducted based on thematic analysis of interview data, learning observations, and learning device documentation. Categorization was not solely based on teachers' recognition of their level of understanding, but also considered the congruence between teachers' conceptual explanations and evidence of their application in learning practices. Analysis indicators included teachers' understanding of the objectives of Deep Learning, their ability to explain learning characteristics that foster conceptual understanding, critical thinking, problem-solving, and the relevance of the material to everyday life, as well as evidence of the application of these characteristics in learning planning and implementation.

Based on these indicators, teacher understanding is analyzed in stages. The conceptual introduction stage is characterized by the ability to explain learning objectives in general, but without a comprehensive explanation of the characteristics and strategies for implementing Deep Learning. A more comprehensive understanding is characterized by the ability to explain the relationship between conceptual understanding, critical thinking, discussion, problem-solving, and everyday life contexts. Meanwhile, observational and documentary evidence is used to examine the extent to which this understanding is reflected in learning practices. Thus, conceptual understanding and application in learning are analyzed as two interrelated aspects, but not automatically considered the same.

The categorization process was conducted by comparing the results of each teacher's interviews with observation notes and available learning documents. Discrepancies between teacher explanations and learning practices were retained as analytical findings, rather than eliminated to adjust categories. This procedure was used to clarify the basis for the researchers' interpretations and increase the traceability of the relationship between empirical data and conclusions regarding teachers' understanding of Deep Learning.

Teachers' abilities in designing digital-based learning are still varied. Five teachers (G1, G2, GA, GO, and GP) are still developing learning materials conventionally based on teacher textbooks, student textbooks, and examples from the Teacher Working Group (KKG) without integrating digital elements. They have never developed digital-based learning modules because they do not yet understand how to integrate technology into learning planning. Meanwhile, three teachers (G3, G5, and G6) have begun developing learning modules by integrating digital media such as learning videos, PowerPoint presentations, and electronic learning resources. They use teacher textbooks, the internet, and examples of learning materials from the Rumah Pendidikan Platform as references. However, the integration of deep learning principles and the consistent use of Rumah Pendidikan Platform features in the learning materials have not been optimally seen because teachers do not yet understand the concept of digital-based deep learning comprehensively. Document analysis also shows that the learning materials developed do not include the use of Rumah Pendidikan Platform features, such as digital learning resources, digital assessments, question banks, or collaboration spaces, and have not yet designed activities that encourage exploration, collaboration, and reflection.

Identification of learning practices is carried out by examining the use of learning methods and media, as well as the interaction patterns of teachers and students. Analysis of teacher-centered practices needs to be distinguished from identifying the media used. The use of lectures, textbooks, whiteboards, student worksheets, or teaching aids is often used.

The principles of mindful, meaningful, and joyful learning are used as an analytical framework to examine the planning and implementation of learning. These three principles are explored through interviews with teachers, observations of learning activities, and analysis of available learning documents. Interview data is used to understand the learning objectives, considerations, and strategies explained by teachers; observation data is used to identify actual classroom practices; and learning documents are used to examine whether these principles are reflected in the learning plans and tools.

The mindful principle is examined through evidence

demonstrating students' conscious engagement in the learning objectives, process, and reflection. The meaningful principle is examined through the connection of the material to prior knowledge, experiences, contextual problems, or the application of concepts in everyday life. The joyful principle is examined through evidence of active engagement, positive interactions, opportunities for participation, and a learning environment that supports enjoyable learning experiences. These indicators are used to interpret data, not as evidence that a principle has been implemented simply because the teacher mentioned it in an interview or included it in the learning materials.

The analysis distinguishes partial implementation from no evidence of implementation. Partial implementation is defined when relevant evidence is present, but implementation is limited, inconsistent, or not yet supported by an adequate set of learning activities. Conversely, the category "not identified in the data" is used when the available evidence does not indicate relevant indicators. The absence of evidence in the collected data does not necessarily mean that the practice has never been implemented at all. The final interpretation is based on a comparison of interviews, observations, and available documentation. The limited use of digital assessment in learning needs to be understood by distinguishing between teacher competency factors and technology access factors. In terms of competency, the study found that teachers' ability to use technology is uneven. The manuscript reports that three of eight teachers are able to use technology independently, while the remaining five teachers still require assistance and are not yet confident in using computers or learning applications. These findings indicate a need to develop teachers' digital capacity. However, these limitations can only be interpreted as pedagogical competency gaps in assessment if supported by evidence that teachers experience difficulties designing instruments, selecting assessment formats appropriate to learning objectives, interpreting results, or using assessment results to provide feedback and improve learning.

In terms of access and infrastructure, the study reported that the internet network was unstable and only available in the office space, the school's digital devices were limited to four laptops and one LCD projector, which were shared, and some students did not yet have their own digital devices. These conditions limited the opportunities for teachers and students to access and use digital-based assessments consistently. In such situations, low use of Google Forms, Quizizz, or the Rumah Pendidikan Platform assessment feature cannot be directly considered an indicator of weak teacher competency because their implementation is also influenced by device availability, connection stability, and student access.

Thus, the limitations of digital assessment are understood as issues that can involve two distinct but interacting dimensions. Competency gaps relate to teachers' pedagogical and technical abilities in designing and utilizing assessments, while infrastructure constraints relate to the feasibility of implementing these assessments in real-world settings. This distinction is important so that recommendations for improvement do not focus solely on teacher training, but also consider increasing device access, network stability, and assessment alternatives that are appropriate to students' conditions. Conclusions regarding the contribution of each factor remain based on available interview, observation, and documentation evidence. Utilization of the Rumah Pendidikan Platform is still in its early stages. All teachers have belajar.id accounts and are aware of the platform's existence through outreach from the Education Office and the Teacher Working Group (KKG). However, five teachers have never accessed the platform because they do not understand how to use it and still experience difficulties accessing it due to limited internet connection. Three teachers who have used the platform are still limited to the Learning Resources and Teaching Tools features for searching for reference materials and learning videos, while the Student Assessment, Collaboration Space, Practice Ideas, Evidence of Work, Inspirational Videos, and other competency development services have not been optimally utilized. Low platform utilization is due to teachers' lack of understanding of the function of each feature, limited outreach, and the lack of ongoing mentoring. Research findings indicate that the GTK Room on the Rumah Pendidikan Platform provides various professional development services such as Independent Training, Learning Communities, and Competency Reflection, which are directly related to the development of teachers' pedagogical competencies. However, utilization of these features remains very limited.

A cross-informant analysis shows that barriers to digital learning integration cannot be explained by a single factor. Teachers' limited understanding of platform usage can hinder the use of digital features, while unstable internet connections and limited devices can reduce teachers' opportunities to experiment, develop, and apply these skills in their lessons. Both factors have the potential to reinforce each other: inadequate skills require opportunities for practice and mentoring, while limited access can reduce the frequency of practice and opportunities for hands-on experience.

Information from principals and school operators indicates institutional support through the provision of devices, account facilitation, training, and technical assistance. However, the lack of intensive mentoring due to time constraints and administrative burdens suggests that the availability of support does not necessarily equate to the availability of ongoing mentoring opportunities. This situation helps explain why socialization and account ownership have not automatically translated into utilization of all platform features.

To distinguish competency gaps from opportunity constraints, research examines whether teacher difficulties persist when access and support are available, or whether they primarily occur when devices, networks, and mentoring are lacking. Evidence regarding the ability to design assessments, select features appropriate to learning objectives, interpret results, and provide feedback is needed to identify dimensions of pedagogical competency. Conversely, evidence about access gaps, device limitations, and usage needs is used interchangeably to identify infrastructure barriers. When both types of evidence coexist, findings are interpreted as multidimensional barriers, rather than being squeezed into a single causal category.

Thus, the limitations in digital technology utilization in this study are understood as the result of the interaction between teacher readiness, practical opportunities, technical support, and infrastructure conditions. This interpretation does not equate low frequency of platform use with low pedagogical competence, but rather positions both as dimensions that need to be examined through separate empirical evidence. The principal demonstrated a strong commitment to improving teacher pedagogical competence through various efforts, including involving teachers in training, workshops, and Teacher Working Groups (KKG); providing access to belajar.id accounts;

providing available technological devices; and encouraging teachers to share good practices in using digital media. The school operator played a role in providing technical assistance related to the use of belajar.id accounts, helping to resolve login issues, providing information about system updates, and assisting teachers when experiencing difficulties accessing the internet or using digital learning support applications. However, time constraints and the large number of administrative tasks meant that intensive mentoring for teachers was not possible. Future development plans include socializing the immersive learning policy and the Rumah Pendidikan Platform, ongoing training and mentoring, academic supervision, strengthening KKGs, and encouraging teachers to participate in competency development programs. Teachers hope for hands-on practical training with ongoing mentoring, provision of adequate facilities and infrastructure, and structured competency development programs to increase their confidence in using the Rumah Pendidikan Platform in their learning.

## 4. Research Discussion

**Efforts to Improve Teachers' Pedagogical Competence**

The findings of this study indicate the need to strengthen teachers' pedagogical competencies in integrating digital-based immersive learning through ongoing professional development support. Socialization of the Rumah Pendidikan platform, Teacher Working Group (KKG) activities, academic supervision, and technical assistance can be considered as alternative strategies to address the teacher needs identified in this study. Socialization can be directed at introducing the platform's functions and features, while the KKG can be used as a space for sharing learning practices and developing teaching tools. Academic supervision can focus on the appropriateness of technology use for learning objectives, active student engagement, assessment implementation, and learning reflection. Meanwhile, technical assistance can help teachers overcome obstacles in using digital platforms and applications.

However, this study was not designed to test the effectiveness of these interventions and did not provide pre- and post-program measurements that could indicate improvements in teacher competency. Therefore, socialization, KKG, academic supervision, and mentoring are positioned as practical implications and contextual recommendations based on identified barriers, rather than as interventions proven effective through this study. Future research could test the contribution of each strategy through an appropriate evaluation design, with indicators that include improvements in digital skills, the quality of lesson planning, the utilization of assessments, and the application of deep learning principles in classroom practice. These findings align with research by Putra & Rizqi (2024) which concluded that mentoring in the development of teaching modules can improve teachers' pedagogical competency, particularly in designing innovative and learner-centered learning. Research by Allolinggi et al. (2025) also emphasized that improving teacher competency in implementing Deep Learning requires the support of principal leadership, ongoing training, teacher learning communities, and a collaborative culture within the school environment. Furthermore, Sasabillah et al. (2025) shows that improving teachers' digital competence will be more effective if it is carried out through continuous training, mentoring in schools, and providing opportunities for teachers to practice using digital platforms in learning activities, so that developing teacher competence is not enough to be done through short-term training, but requires systematic and continuous coaching.

Based on the research results and supported by various previous studies, it can be understood that efforts to improve teacher pedagogical competence at Lopang Domba State Elementary School have a clear direction through strengthening teacher understanding of Deep Learning, improving digital competence, optimizing the role of the principal as a learning leader, and developing a culture of collaborative learning in the school environment. The successful implementation of digital-based Deep Learning does not only depend on the readiness of teachers as learning implementers, but is also greatly influenced by the leadership of the principal in driving change, providing coaching, and creating a school environment that supports innovation. The principal's commitment needs to be supported by a structured socialization program, ongoing training, coaching academic supervision, strengthening teacher working groups and learning communities, and optimizing the use of the Rumah Pendidikan Platform so that teacher pedagogical competence increases so that they are able to realize mindful, meaningful, and joyful learning in accordance with the direction of national education transformation.

**Comparison with Sepang State Primary School**

The findings of this study need to be understood in the context of Lopang Domba Public Elementary School, the primary data collection site. Sepang Public Elementary School can be considered a contextual illustration in the discussion of school readiness to implement digital learning. However, this study did not conduct a systematic empirical comparison between the two schools. Therefore, differences in digital infrastructure, teacher competency, institutional support, or readiness to implement immersive learning cannot be stated as verified comparative findings without supporting evidence from traceable data sources and appropriate comparison indicators. Therefore, this study's analysis focuses on the conditions found at Lopang Domba Public Elementary School, considering that a school's readiness to integrate digital learning can be influenced by the availability of infrastructure, opportunities for teacher professional development, and institutional support.

Differences in school readiness to integrate digital learning need to be understood by considering infrastructure conditions, device availability, technology culture, and teacher experience. However, this study focused on Lopang Domba Public Elementary School and did not systematically collect data at Sepang Public Elementary School using comparable procedures. Therefore, statements regarding internet stability, digital device availability, school digital culture, and teacher experience at Sepang Public Elementary School cannot be treated as verified comparative findings in this study. The discussion focuses on the conditions at Lopang Domba Public Elementary School, supported by research data, including limited internet connectivity, shared device use, and variations in teacher ability in utilizing digital technology. Therefore, differences in readiness between the two schools are not directly inferred, but are positioned as possible contexts that require further research through comparable data collection.

Nevertheless, the principal of Lopang Domba Public Elementary School demonstrated a strong commitment to catching up by developing various strategic programs, such as promoting the concept of Deep Learning and utilizing the Rumah Pendidikan Platform, strengthening digital literacy through internal training,

optimizing the KKG (Community Working Group) as a forum for sharing good practices, implementing academic supervision oriented towards improving the quality of learning, and encouraging teachers to participate in training, webinars, and technical guidance. The principal also planned to provide gradual mentoring to teachers in using the various features of the Rumah Pendidikan Platform so that the platform's implementation was not merely administrative but truly supported the improvement of the quality of the learning process in the classroom. This commitment is a key asset in realizing the digital learning transformation, where the principal not only plays a role as a policy maker but also as a facilitator and motivator who provides support to teachers in facing the changing learning paradigm.

The implementation of the Rumah Pendidikan Platform to support digital-based immersive learning needs to be understood as a process related to various pedagogical and institutional conditions. Research findings at Lopang Domba Public Elementary School indicate a number of challenges, including varying teacher abilities in utilizing technology, limited internet connectivity and devices, and the need for ongoing mentoring. In this context, teacher pedagogical competence is one aspect that requires attention, particularly in integrating technology with learning objectives, student activities, assessments, and learning reflection. However, platform utilization is also related to teacher opportunities for training, principal support, infrastructure availability, and collaboration between teachers.

This study was not designed to isolate the influence of each factor or determine the most dominant factor in the successful implementation of the Rumah Pendidikan Platform. Therefore, the relationship between pedagogical competence, infrastructure, training, leadership, and collaboration is understood as a contextual dimension that needs to be considered collectively, rather than as a relation.

## 5.CONCLUSION AND RECOMMENDATIONS
## Conclusion

Based on the research findings, strengthening teachers' pedagogical competence in integrating digital-based immersive learning needs to be supported through ongoing professional development. Socialization of the Rumah Pendidikan platform, optimization of KKG (Community Working Group), academic supervision oriented toward learning quality, and technical assistance are recommended as contextual strategies that schools and policymakers can consider. These recommendations are based on the needs and barriers identified in the case studies, so their effectiveness in improving teacher competence still needs to be tested through further research.

Based on the research results, data analysis, and discussion regarding the analysis of teachers' pedagogical competencies in integrating digital-based in-depth learning through the Rumah Pendidikan Platform at Lopang Domba State Elementary School, Serang City, it can be concluded that teachers' pedagogical competencies are still in the transition stage towards optimal implementation.

Digital-based immersive learning planning has referred to the Independent Curriculum through the development of teaching modules, learning objectives, learning flow, and assessments. However, teachers have not fully integrated the principles of Deep Learning (mindful, meaningful, and joyful) into learning tools, and utilization of the Rumah Pendidikan Platform during the planning stage remains limited. Learning implementation shows that teachers have begun utilizing digital technologies such as laptops, LCD projectors, and learning videos, but the learning process still tends to be teacher-centered, resulting in suboptimal implementation of Deep Learning principles. Digital technology functions more as a medium for delivering material than as a means of building active, collaborative, reflective, and contextual learning experiences.

The Rumah Pendidikan platform has not been optimally utilized by all teachers. Only a few teachers utilize the Learning Resources and Teaching Tools features, while others still use conventional learning resources. This low platform utilization is influenced by teachers' lack of understanding of the available features, suboptimal socialization and mentoring, and differences in teachers' digital competency levels. Digital-based learning evaluation has also not been implemented evenly; some teachers still use conventional evaluations, while others have utilized Google Forms and Quizizz, but the evaluation features on the Rumah Pendidikan platform have not been optimally utilized.

The research results show that the integration of the Rumah Pendidikan Platform to support digital-based immersive learning at Lopang Domba Public Elementary School faces challenges related to teacher competency and learning support conditions. From a competency perspective, teachers' abilities in using digital technology and differing levels of understanding and utilization of platform features were found. Furthermore, limited internet connectivity, an inadequate number of digital devices, opportunities for competency development, and limited mentoring are also factors that require attention.

Based on these findings, the limitations of the Home Education Platform integration cannot be concluded solely as a matter of human resource competency or as a result of limited infrastructure. Both aspects need to be understood in the context of teachers' opportunities to access, learn, and apply technology in the learning process. This study identified obstacles in competency and supporting conditions for implementation, but was unable to determine the relative contribution of each factor or determine the most dominant factor. Therefore, strengthening teachers' pedagogical and digital competencies needs to be considered in conjunction with improving internet access, device availability, ongoing professional development, and institutional support. This conclusion is limited to the context of Lopang Domba Public Elementary School and is not intended to establish general causal factors.

**Recommendation**

Based on the research results and discussion, the following recommendations can be made. Principals are expected to strengthen their role as instructional leaders by developing targeted programs to support the implementation of digital-based Immersive Learning. This includes systematic outreach regarding the Immersive Learning concept and the Rumah Pendidikan Platform, coaching-oriented academic supervision, strengthening the Teachers' Working Group (KKG), and providing opportunities for teachers to participate in training, webinars, and learning communities. Principals also need to develop a phased implementation plan with measurable targets to ensure all teachers are equally prepared to implement digital-based learning.

Teachers are expected to continuously improve their

pedagogical and digital competencies through independent learning and ongoing professional development activities. They need to thoroughly understand the principles of Deep Learning and integrate them into their learning planning, implementation, and evaluation. They are also expected to utilize the Rumah Pendidikan platform more optimally, not only as a learning resource but also as a digital learning and assessment tool, making learning more interactive, innovative, and student-centered.

Schools need to develop a digital learning culture through mentoring programs, sharing best practices, and fostering sustainable learning communities. Schools are expected to gradually increase the availability of supporting facilities and infrastructure, such as technological devices and adequate internet access, and conduct regular evaluations of the use of the Rumah Pendidikan Platform as part of efforts to improve learning quality.

The Serang City Education Office is expected to provide support through ongoing outreach, training, and mentoring on teacher pedagogical competency in integrating digital-based immersive learning through the use of the Rumah Pendidikan platform. Policies are needed to encourage the strengthening of teachers' digital competencies, the provision of supporting facilities, and the monitoring and evaluation of program implementation in schools to ensure the digital learning transformation is equitable and sustainable.

The Ministry of Primary and Secondary Education is expected to continue developing the Rumah Pendidikan Platform to make it more accessible and usable by teachers, as well as developing more operational guidelines, providing practice-based training, and ongoing mentoring so that teachers gain a comprehensive understanding of the integration of Deep Learning with digital technology.

Future researchers are expected to develop this research using different approaches, such as mixed methods or school action research, to obtain a more comprehensive picture. The research can also be expanded to other educational levels, regions, or variables such as instructional leadership, school culture, digital literacy, and technology readiness to enrich scientific studies and contribute to the development of digital education policies and practices in Indonesia.

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