

Teachers' Perceptions of the Deep Learning Approach and Its Implementation in School Learning

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Abstract. This study aims to analyze teachers' perceptions of the deep learning approach and its implementation in learning at the elementary and secondary school levels in Melawi Regency. The research was carried out in January-March 2025 and used a mixed methods method with a sequential explanatory design that combines quantitative and qualitative analysis. Quantitative data was collected through questionnaires to 20 teachers at SD Negeri 13 Nanga Pinoh and SMP Negeri 2 Pinoh Utara, while qualitative data was obtained through in-depth interviews with four teachers who were selected purposively. The results showed that teachers' perception of deep learning was in the very positive category with an average percentage of 84.64% in the dimensions of concept understanding, attitude, implementation, as well as supporting factors and obstacles. Teachers understand that deep learning emphasizes meaningful experiences, reflection, collaboration, and the relevance of the material to students' real lives. The implementation of deep learning is considered quite good even though it still faces several obstacles such as time constraints, authentic assessments, and the use of learning technology. Qualitative findings reinforce quantitative outcomes through real-world descriptions of exploratory and project-based learning practices in the classroom. This study concludes that teachers have a high readiness to implement deep learning as part of the learning transformation in the Independent Curriculum, and emphasizes the need for continuous training and school support.

Keywords: Deep learning, Teacher perception, Learning implementation, Independent Curriculum, Meaningful learning

1 Introduction

Deep learning-based learning is an important approach in developing the quality of education in the era of the Independent Curriculum. This approach emphasizes a learning process that is aware, meaningful, and contextual so that students not only memorize but understand concepts in depth. Deep learning drives the transformation of learning paradigms through active engagement, creativity, and problem-solving skills [1]. Deep learning also requires teachers to design a holistic learning experience through the integration of thinking, taste, heart, and sports. In elementary and secondary schools, this approach is considered relevant to improve students' critical thinking abilities and 21st century skills. Meaningful learning is at the core of the Independent Curriculum. This shows that teachers must understand the concepts and practices of

implementing deep learning in learning. Therefore, the study of teachers' perceptions of this approach is very important to ensure alignment between theory and educational practice in schools.

However, in reality, deep learning adoption in schools frequently encounters a number of difficulties. Many educators continue to adhere to conventional teaching methods that prioritise content delivery over in-depth concept exploration. Teachers must be prepared for changes in pedagogical approaches in terms of both competence and mindset [2]. Furthermore, establishing meaningful learning is frequently hampered by the facilities and support of the learning environment. Due to time restrictions and administrative responsibilities, teachers also struggle to administer meaningful assessments that facilitate deep learning. Reflective and critical learning are frequently hampered by a student learning culture that is still focused on quick fixes and grades. Curriculum objectives and classroom learning techniques are at odds because of this circumstance. As a result, it's critical to ascertain how educators view the deep learning strategy in classrooms.

The term deep learning in this study expressly refers to the deep learning approach in a pedagogical context, which is a learning process that emphasizes conceptual understanding, meaning construction, high-level reasoning, reflection, and the ability to relate knowledge to real-life contexts. The use of this term is not related to deep learning in the realm of artificial intelligence (AI) which is generally understood as a computational technique based on artificial neural networks to process large-scale data. Thus, the focus of the research is entirely on deep learning as a learning approach that encourages deep cognitive engagement and meaningful learning, rather than on algorithms or AI models, so that there is no overlap between the pedagogical conceptions used in this study and the deep learning concepts known in the computing technology literature.

There is a disconnect between the Independent Curriculum policy's emphasis on deep learning and how it is actually implemented in the field. According to numerous research, teachers' comprehension of deep learning concepts is still varied, often focusing just on project-related elements without delving further into the idea. Because they lack the necessary training, some teachers are unable to implement meaningful learning [3]. Teachers who claim to comprehend topics but whose application does not completely reflect true deep learning are increasingly demonstrating this gap. Additionally, teachers have not made the best use of the integration of technology as a support for creative learning. These challenges demonstrate the gap between the curriculum's expectations and the actual learning that takes place in the classroom. This disparity necessitates a more thorough assessment of how teachers view the application of deep learning techniques. It is challenging to regularly achieve deep learning goals without a thorough grasp of teachers.

To improve the use of deep learning in classrooms, a number of different approaches must be looked for. Building teacher capacity can be accomplished by ongoing training that emphasises practical application rather than just theory [4]. In order for instructors to create meaningful learning based on projects, issues, and reflections, they also require intensive support in the classroom. Additionally, teacher collaboration via MGMP or KKG can enhance pedagogical abilities and create a forum for the exchange of best practices. In order to provide learning facilities that are pertinent to the demands of deep learning, the principal's support is also essential. Another key tactic to assist this approach is to fortify a school culture that promotes innovation, cooperation, and

communication. Teachers can create a more contextual learning experience by utilising interactive learning technologies. Deep learning implementation issues can be reduced using these several approaches.

Several previous studies have discussed the implementation of deep learning in the context of Indonesian education. Teachers have a high interest in meaningful learning, but still face limitations in planning and assessment [5]. Project-based learning as part of deep learning is able to improve students' understanding of concepts and motivation [6]. Digital technology support helps deep learning succeed in science learning [7]. However, these studies focus more on the effectiveness of deep learning implementation, rather than on teachers' perceptions and readiness. Research related to teacher perception is still limited only to the aspect of conceptual understanding without measuring implementation holistically. Therefore, research is still needed that integrates teachers' perceptions, implementation in the classroom, and supporting factors and obstacles comprehensively. This gap strengthens the urgency of research conducted in primary and secondary schools.

The novelty of this research lies in a comprehensive approach in measuring teachers' perceptions of deep learning through four dimensions: cognitive, affective, implementive, and contextual. Not many previous studies have explored teachers' perceptions by combining questionnaire analysis and in-depth interviews simultaneously. This research also provides a real picture of teachers' experiences in implementing deep learning in the context of the Independent Curriculum. In addition, this research involves two levels of education, namely elementary and junior high school, so as to provide a comparative perspective on teacher perception. This method provides a more comprehensive mapping of teachers' preparedness for deep learning implementation. To comprehend the elements influencing learning behaviours, integrative education is required [8]. As a result, this study adds to the originality of examining teachers' perceptions from several angles. This adds to the body of knowledge regarding deep learning implementation in Indonesia.

The most recent theories and research on deep learning, meaningful learning, and the requirements of the Independent Curriculum serve as the foundation for this cutting-edge study. The fundamental basis for comprehending how schools should organise meaningful learning [9]. The significance of 21st century capabilities, such as creativity, communication, teamwork, and critical thinking abilities, is emphasised by current research. According to a number of recent research, there is a pedagogical shift in Indonesia that calls for teachers to be more than just content presenters they must also be learning facilitators. Authentic evaluations and the incorporation of digital technology are also crucial elements in promoting deep learning. Based on teachers' perspectives, this study charts the current state of deep learning adoption in primary and secondary schools. The degree to which deep learning has been incorporated into educational procedures in schools is thus accurately depicted by this study.

This study's urgency stems from the country's desire to raise educational standards through meaningful learning. Indonesia must generate a generation capable of critical, creative, collaborative, and communicative thinking in the global age. Teachers play a crucial role in enabling the successful implementation of deep learning approaches. Learning transformation can only be achieved if teachers understand the basic philosophy and practices of deep learning [10]. Data shows that there are still many teachers who need assistance to implement meaningful learning. Without a deep understanding

of this approach, the learning process will remain superficial and less contextual. This research is very important to map teachers' perceptions so that it can be used as a basis for improving policies and teacher training. Therefore, research on teachers' perceptions of deep learning is an urgent need to improve the quality of education.

This study aims to describe teachers' perceptions of the deep learning approach and its implementation in learning in schools. This objective includes an analysis of the teacher's understanding of concepts, teachers' attitudes towards deep learning, and teachers' assessments of the implementation of the learning. This study also aims to look at the supporting factors and obstacles that affect the success of the implementation of deep learning in the classroom. In addition, this study aims to identify teachers' experiences in implementing meaningful learning through in-depth interviews. Another purpose of this study is to provide a comprehensive picture of teachers' readiness to the demands of the Independent Curriculum. This research is expected to produce strategic recommendations for improving teacher training regarding deep learning. The findings of the research can also be the basis for schools and the government in designing policies to strengthen teacher competence. Thus, this research not only contributes academically but also practically to improving the quality of learning.

2 Method

2.1 Research Design

This study uses a mixed methods approach with a sequential explanatory model, which combines quantitative and qualitative analysis sequentially. A quantitative approach was used to measure teachers' perceptions through the distribution of questionnaires consisting of 24 statements. A qualitative approach was used to deepen quantitative findings through semi-structured interviews with four respondents. This model is used because it is able to provide a comprehensive picture of teacher perception, both in terms of numerical tendencies and the meaning of teachers' experiences. Mixed methods design allows researchers to understand phenomena more fully than just one approach [11]. Thus, the design of this study is aligned with the goal of gaining a comprehensive understanding of teachers' perceptions of deep learning and its implementation in learning.

This study applies a *mixed methods* approach by combining the use of quantitative questionnaires and qualitative in-depth interviews to obtain a comprehensive picture of teacher perception. The mixed method design used tends to be a convergent parallel **design**, where quantitative and qualitative data collection is carried out relatively simultaneously to allow direct triangulation between statistical results and narrative findings. The integration of the two types of data is carried out through *the merging* process, which is comparing quantitative patterns (the level of perception in each dimension) with qualitative explanations arising from interviews to strengthen or clarify interpretations. Thus, qualitative findings do not stand alone, but function to expand, deepen, and explain quantitative results so that research conclusions are more methodologically robust.

2.2 Location and Research Subject

The research was conducted in two educational units, namely SD Negeri 13 Nanga Pinoh and SMP Negeri 2 Pinoh Utara, Melawi Regency. The research subjects of the quantitative part consisted of 20 teachers, 14 teachers each from SDN 13 Nanga Pinoh and 6 teachers from SMPN 2 Pinoh Utara. The research subjects of the qualitative section consisted of 4 teachers who were selected based on a variety of teaching backgrounds, experiences, and involvement in the application of deep learning. The selection of the location was based on the consideration that the two schools had participated in a deep learning strengthening program by the superintendent and the education office. In addition, teachers in both schools have different experiences in implementing the Independent Curriculum so it is relevant to compare their perceptions.

This study used purposive sampling method to select primary and junior high school teachers who have actively implemented the Independent Curriculum, taking into account teaching experience, participation in curriculum training, and involvement in the project-based learning process. This approach was chosen because not all schools are at the same level of implementation readiness, so the selection of participants needs to be directed to teachers who really have relevant experience in the research phenomenon. The sample size used was then evaluated based on its adequacy for analytical generalizations, rather than statistical generalizations, given the study's focus on an in-depth understanding of teachers' perceptions and practices. However, if the study intends to draw representative conclusions for the teacher population using the Independent Curriculum nationally, the limited sample size needs to be recognized as one of the methodological limitations that potentially affect the generalization scope of the findings.

2.3 Data Types and Sources.

1. Quantitative data was obtained through a questionnaire of teachers' perceptions of the deep learning approach which includes four dimensions: understanding of concepts, attitudes, implementation, as well as supporting factors and obstacles.
2. Qualitative data were obtained through semi-structured interviews that delved deeper into teacher experience, implementation constraints, and deep learning implementation strategies.

The primary data source came from teachers who were research respondents, while secondary data came from literature related to deep learning, the Independent Curriculum policy, and previous research documents.

2.4 Data Collection Techniques.

Questionnaire (Quantitative Instrument)

The questionnaire contains 24 statements with four answer options using the Likert scale:

- 1 = Not Appropriate
- 2 = Less Suitable
- 3 = Compliant

4 = Very Suitable

The questionnaire is divided into four dimensions:

1. Cognitive dimension (6 items)
2. Affective dimension (5 items)
3. Implementation dimensions (5 items)
4. Contextual dimensions (8 items)

Negative statement items (item 20) are scored inversely according to the Likert scaling rule.

The selection of four dimensions of perception cognitive, affective, implementive, and contextual in this study is based on an established framework of educational psychology as well as empirical findings on how teachers' perceptions affect learning practices. The cognitive dimension refers to the conceptual understanding of teachers, in line with teacher belief systems theory which emphasizes that cognitive beliefs shape the way teachers interpret pedagogical approaches. The affective dimension is based on an attitude-behavior model that places attitudes, interests, and emotional acceptance as predictors of teachers' readiness to adopt learning innovations. The implementative dimension refers to empirical research on the transfer of perception to action, which shows that teacher perception is manifested through classroom practice, activity design, and teaching-learning interactions. Meanwhile, the contextual dimension is supported by the literature on school environmental factors such as leadership, facilities, and training support that have been shown to influence the effectiveness of adopting new approaches. Thus, these four dimensions were chosen because they conceptually and empirically reflect a comprehensive and relevant teacher perception structure to analyze the readiness of the implementation of deep learning in the context of the Independent Curriculum.

Semi-Structured Interviews

Interviews were conducted with four teachers from both schools to:

1. Clarifying quantitative findings
2. To gain the authentic experience of the teacher
3. Identify deep learning constraints and strategies.

Each interview session lasted 30–40 minutes and was recorded with the respondent's permission.

2.5 Instrument Validity and Reliability.

Content Validity

The validity of the content is carried out through expert judgment from school supervisors and Educational Technology lecturers who assess the suitability of the items with the indicators of the deep learning concept.

Reliability

The reliability of the instruments was tested using Cronbach's Alpha, in accordance with the reliability standards of educational instruments. An alpha value of ≥ 0.70 indicates high reliability and is suitable for use in the study.

The development of questionnaire items in this study was carried out through an instrument development process that refers to the four dimensions of teacher perception, namely cognitive, affective, implementive, and contextual, which are compiled based on theoretical studies of perception in educational psychology and attitude-behavior models. All instrument items are developed independently (newly constructed items) with reference to the characteristics of deep learning in the Independent Curriculum, but still follow the general structure of the perception instruments used in previous studies related to teacher beliefs and pedagogical practices. To ensure the suitability of the substance, the instrument is validated through content validity by experts including school supervisors and Educational Technology lecturers through an assessment of the relevance of the item to the conceptual indicators of each dimension. In addition, a reliability test was carried out using Cronbach's Alpha coefficient which showed a value greater than 0.70, so that the instrument met the high reliability criteria. The analysis of exploratory factors has not been carried out because the focus of the research is only on the validity of the content and internal consistency of the instrument, but the dimensional structure has been confirmed through the process of expert judgment and theoretical suitability within the framework of teachers' perceptions of deep learning.

The implementation of deep learning was measured through a series of classroom practice indicators formulated in observation instruments and teacher questionnaires, which assessed the extent to which high-level thinking-oriented learning strategies were applied in teaching and learning activities. Measurement includes the frequency, quality, and consistency of application of an approach that focuses on meaning construction, conceptual dialogue, and students' deep cognitive engagement. In addition, the study assesses whether teachers actively integrate pedagogical models such as project-based learning, problem-based learning, structured reflective activities, and authentic assessments as part of efforts to present learning experiences that demand analysis, synthesis, and evaluation. By assessing the existence and quality of these practices, the research can describe the actual degree of deep learning in the classroom and its consistency with the objectives of the Independent Curriculum.

2.6 Data Analysis Techniques

Quantitative Data Analysis

Quantitative analysis is carried out through the following steps:

1. Calculate the score of each statement item for each respondent.
2. Summing the scores of each dimension to obtain the teacher's perception score.
3. Convert a raw score to a percentage using the formula:
4. Interpreting the perception category using the criteria :
 - a. $\geq 81\%$ = Very positive
 - b. 63–80% = Positive
 - c. 44–62% = Less positive
 - d. $< 44\%$ = Not positive

5. Analyze the average per dimension and total to find out the overall perception tendencies of teachers.

Qualitative Data Analysis

Qualitative analysis is carried out through thematic analysis with the following steps:

1. Interview transcription
2. Initial coding
3. Identify themes
4. Withdrawal of meaning and interpretation
5. Triangulation between interview data and questionnaire results to ensure consistency of findings.

The results of qualitative analysis are used to strengthen and explain quantitative data, especially on problems, implementation, and expectations of teachers.

3 Results and Discussion

3.1 Results

The results of this study are presented in two main parts, namely (1) the results of quantitative analysis based on teacher perception questionnaires and (2) the results of qualitative analysis based on in-depth interviews. The presentation of results was prepared based on four dimensions of teacher perception, namely concept understanding (cognitive), attitude and view (affective), implementation assessment (behavioral), and supporting factors and obstacles (contextual). The results of the research were submitted in stages for SD Negeri 13 Nanga Pinoh, SMP Negeri 2 Pinoh Utara, and a combination of the two schools.

Perception of the 13th Grade Elementary School Teacher Nanga Pinoh

Cognitive Perception Dimension

The results of the analysis showed that the teachers of SD Negeri 13 Nanga Pinoh had a very positive understanding of the concept of deep learning. All indicators in this dimension obtained a percentage above 78%, with a very positive category. The highest indicator is understanding meaningful learning and awareness with a percentage of 96.43%. The indicator of understanding of deep learning objectives is also high, which is 92.86%. Teachers' understanding of the contribution of deep learning to the Pancasila Student Profile reached 82.14%. Meanwhile, the understanding of the role of teachers as facilitators in the Independent Curriculum obtained a percentage of 78.57%. The overall average in this dimension is 89.29%, which is in the very positive category.

Dimension of Attitude and Perception (Affective Perception)

Teachers show a very positive attitude and outlook on the application of deep learning. The indicator of teachers' interest in implementing deep learning reached 85.71%. The view indicator that deep learning helps students understand the meaning of learning reached 83.93%. Teachers feel that this approach makes them more reflective with a

percentage of 82.14%. Teachers also enjoyed the process of exploration, discussion, and reflection of students with a score of 80.36%. The strongest attitude is shown through the belief that deep learning creates an encouraging learning atmosphere, with a score of 89.29%. The average of this overall dimension is 84.29%, which is very positive.

Dimensions of Implementation Assessment (Behavioral Perception)

This dimension also shows very positive results with an average of 82.86%. The teacher assessed that deep learning had been applied to most learning activities with a score of 80.36%. Collaboration between teachers in designing learning means obtaining a score of 83.93%. The active participation of students in contextual and project-based activities was also rated high, which was 83.93%. Teachers see that deep learning encourages students' courage to express their opinions (83.93%). Students' reflection activities after learning were also considered very positive with a score of 82.14%.

Contextual Dimensions (Supporting Factors and Barriers)

This dimension shows a very positive perception with an average of 84.60%. The principal's support received a very high score of 92.86%. The learning facilities and environment are considered to support deep learning with a score of 87.50%. Teachers who participated in deep learning training achieved a score of 80.36%. Although there are time constraints in the implementation of deep learning (69.64%), other indicators such as the expectation of continuous training, the need for learning resources, and the expectation of feedback from supervisors are in the very positive category. Overall, the perception of SDN 13 Nanga Pinoh teachers towards deep learning is 85.34% (very positive).

Perception of Teachers of SMP Negeri 2 North Pinoh

Dimension of Concept Understanding

Junior high school teachers showed a very positive understanding of concepts with an average of 86.11%. Understanding meaningful learning and being aware of getting a perfect score of 100%. Indicators related to the understanding of deep learning functions in the Pancasila Student Profile reached 95.83%. However, the understanding of the role of teachers as facilitators and the implementation of the deep learning framework is still at 75%, although it remains in the positive category.

Dimensions of Attitude and Outlook.

Teachers showed a very positive attitude with an average of 87.50%. Most of the indicators were at 95.83%, especially on the indicators of teacher reflection and a pleasant learning experience. Teachers' interest in deep learning showed a positive score of 75%. This means that teachers in junior high schools show high enthusiasm for deep learning even though their technical understanding is still diverse.

Implementation Assessment Dimensions

The average value of this dimension is 75.00% (positive). All indicators obtained the same score, namely 75%, indicating that teachers assessed that the implementation of deep learning was already running but not optimal. Teachers assessed that students were active and collaborative, but their application still needed to be strengthened, especially in project-based reflection and learning activities.

Contextual Dimension

The average in this dimension is 84.38% (very positive). The facilities and support of the principal received very high scores, even reaching 100% on one of the indicators. Teacher training, supervisor support, and learning resource needs are also in the very positive category. However, partnerships with external parties such as universities or industry are still low (62.50%). The overall perception of junior high school teachers is 83.51% (very positive).

Perception of Elementary and Junior High School Teachers (Combined)

Dimension of Concept Understanding

The combined average was 88.13% (very positive). Teachers understand that deep learning emphasizes meaningful learning, critical thinking, and relevance to the Pancasila Student Profile. The highest indicator is the understanding of conscious learning with a score of 97.50%.

Dimensions of Attitude and Outlook.

Teachers showed a very positive attitude with an average of 85.25%. Teachers enjoy the process of discussion, exploration, and reflection of students. They believe that deep learning increases motivation and a fun learning atmosphere.

Learning Implementation Dimensions

The average of the implementation category was 80.50% (positive). Teachers assessed that deep learning has been implemented, but some aspects such as reflection and meaningful learning design still need to be strengthened. Indicators of project-based learning and student discussion showed high scores.

Contextual Dimension

The contextual dimension obtained an average of 84.22% (very positive). The support of the principal and learning facilities are factors that strengthen the implementation. Teacher training and mentoring are also considered very helpful in understanding the concept of deep learning. Overall, teachers' combined perception of deep learning was 84.64% (very positive).

Interview Results (Qualitative Analysis)

The Meaning of Deep Learning

Teachers interpret deep learning as learning that explores students' potential holistically and encourages them to think critically. Teachers understand that deep learning includes the principles of mindful learning, meaningful learning, and joyful learning.

They emphasize that deep learning helps connect the material to the student's real experience.

Linkage with the Independent Curriculum

Teachers consider that deep learning has a strong relationship with the Independent Curriculum because both are student-centered. The Merdeka Curriculum provides flexibility for teachers to design meaningful, reflective, and contextual learning.

Deep Learning Practices

Teachers provide various examples of deep learning implementations, such as:

1. Human Skeleton Preparation (IPAS)
2. Experiments Fotosintesis
3. Draw two straight line equations
4. Bone Health Case Analysis
5. Problem-based group projects.

The practice involves exploration, discussion, reflection, and the use of authentic assessments.

Implementation Constraints

1. Teachers face obstacles in the form of
2. Differences in students' abilities,
3. Limited learning time,
4. Students' learning habits that are still grade-oriented,
5. Limited technological facilities,

Teachers' understanding of the concept of deep learning is uneven.

Strategies to Overcome Obstacles

1. Teachers carry out strategies such as
2. Differentiated learning
3. Small group discussions
4. Simple media utilization
5. Continuous feedback
6. Regular reflection with students.

Support Needed

Teachers need applicable training, examples of teaching tools, authentic assessment rubrics, direct mentoring, and support from the principal. Teachers also hope that there will be school collaboration with universities or external institutions.

3.2 Discussion

The results of the study show that teachers' perceptions of the deep learning approach are in a very positive category in all dimensions, both at the elementary and junior high

school levels. These findings illustrate that teachers already have a strong basic understanding of the concept of deep learning, especially in the aspects of learning awareness, concept understanding, and critical thinking orientation. Deep learning will only succeed if teachers understand the philosophy of "learning that sticks", which is learning that is rooted in meaning, not just information [12]. Teachers in both schools showed a tendency to understand the meaning of this learning consistently through high indicators in the cognitive aspect. This provides a strong basis for learning transformation in the era of the Independent Curriculum. Thus, the positive perception of teachers is an important capital in improving the quality of the deep learning-based learning process. These findings confirm that teacher understanding is an initial factor that determines the success of the implementation of innovative learning strategies.

The dimension of concept understanding obtained the highest percentage in both elementary and junior high schools, indicating that teachers have internalized the main principles of deep learning. Teachers' understanding of the learning model has a great influence on the effectiveness of implementation in the classroom [13]. Teachers understand that deep learning includes not only academic abilities, but also mental processes such as reflection, analysis, and meaningful experiences. Teachers' understanding of the contribution of deep learning in the Pancasila Student Profile also shows the alignment between curriculum policies and field practice. Meaningful learning directs students to be able to relate knowledge to real life [14]. This is evident from various examples of learning practices given by teachers in interviews. Therefore, a high understanding of concepts is an indicator of teachers' readiness in making deep learning a success.

Teachers at both levels of education show a very positive attitude and view towards the application of deep learning. This attitude is reflected in the teacher's interest in the process of exploration, discussion, and reflection of students in learning. Teachers' attitudes are the most decisive factor in the sustainability of educational innovation [15]. The teacher stated that deep learning allows students to understand the meaning of learning, not just the pursuit of grades. This shows a shift in teachers' pedagogic mindset towards student-centered learning. This view also validates the connection between deep learning and the objectives of the Independent Curriculum, which prioritises hands-on learning. Therefore, the constant application of deep learning is greatly aided by the favourable attitudes of teachers.

Although it tended to be lower than other dimensions, particularly at the junior high school level, the implementation dimension displayed favourable values. This demonstrates that despite instructors' excellent attitudes and comprehension, there are still a number of obstacles to their implementation. One prevalent issue in learning innovation is the disconnect between academic knowledge and practical implementation [16]. Although project-based, problem-based, and collaborative learning approaches have been adopted by educators, they fall short in terms of real assessment and reflection. Inadequate facilities, time management skills, and administrative difficulties can all contribute to this underutilised implementation. These results highlight the need for additional tactics to improve deep learning practices, especially through institutional support from education offices and schools.

The findings demonstrated that teachers had comparatively sufficient access to facilities and good support from the principal. The effectiveness of creative learning is significantly impacted by school leadership [17]. Creating a thoughtful and meaningful

learning environment is fuelled by the strong support of school principals. However, time limits for learning and a lack of technological resources continue to be prevalent challenges. A designed support ecosystem is necessary for educational innovation, not only teacher preparedness [18], [19]. These challenges demonstrate that deep learning adoption necessitates systemic strengthening rather than merely raising teachers' individual capacities.

The success of deep learning-based learning is largely dependent on teachers' ability to comprehend topics and use deep learning techniques. Meaningful learning that incorporates critical thinking exercises requires teachers to be pedagogically competent. [20]. By designing activities that incorporate analysis, investigation, cooperation, and reflection, teachers in this study demonstrate high preparedness. Nonetheless, ongoing training is still necessary to improve teacher preparedness, particularly with regard to the use of learning technology and accurate assessments. This is crucial because deep learning necessitates a balanced integration of learning environments, processes, and content. The study's findings so support the idea that the key to a deep learning transformation's success is teacher preparedness.

The school environment has proven to play a significant role in supporting the implementation of deep learning. Teachers who received support from facilities, learning media, and collaboration spaces showed more positive assessments of implementation. Structural support such as IHT training by school supervisors is a major driving factor in improving teacher understanding. Professional collaboration to create effective pedagogic change [21]. With the support of the principal and supervisor, teachers can develop more creative and innovative learning practices. However, the school's low partnership with universities and industry shows the need to expand learning networks. A collaborative and open school environment is key in strengthening the implementation of deep learning.

The results of the study show that teachers understand the relationship between deep learning and the Independent Curriculum consistently. Teachers realize that this new curriculum emphasizes flexibility, meaningfulness, and competency development of Pancasila student profiles. Learning in the Independent Curriculum must prioritize relevant and contextual learning experiences [22]. In the interview, the teacher said that problem-based and project-based learning really helps students think critically and creatively. This suitability shows that the implementation of deep learning is an integral part of the success of the Merdeka Curriculum. Thus, teachers' positive perception of this alignment strengthens the belief that deep learning can be the main motor of national learning transformation.

The integration of quantitative and qualitative findings shows consistency between teachers' perceptions and classroom learning practices. Quantitative data show the category is very positive across almost all dimensions of perception. Meanwhile, interviews show that teachers are actually implementing exploratory, collaborative, and reflective learning practices in the classroom. This shows that the positive perception of teachers is not just an attitude, but is reflected in real actions. Consistency between perception and practice shows cognitive compatibility and pedagogic action [23]. As a result, this study offers factual proof that educators comprehend and implement the idea of deep learning in accordance with curriculum requirements.

The study's conclusions have theoretical and practical ramifications for raising the standard of instruction in classrooms. From an academic perspective, this study uses a

thorough mixed methods approach to enhance the literature on deep learning in the Indonesian setting. From a practical standpoint, the study's findings indicate that in order to support the application of deep learning, it is necessary to enhance teacher preparation, upgrade facilities, and create genuine assessments. As learning organisations, schools must keep enhancing teachers' abilities through professional learning communities [24]. These results support the necessity of enhancing school regulations and ongoing mentorship in order to maximise the application of deep learning. Thus, this research contributes to understanding the factors that affect the successful implementation of deep learning in the Independent Curriculum.

The role of teacher professional development programs, school leadership support, and the implementation of the national policy of the Independent Curriculum were analyzed as the main supporting factors that influenced the success of the implementation of deep learning in educational units. Professional development programs are seen as contributing to building teachers' pedagogical competence and conceptual understanding, while school leadership provides direction, resources, and a collaborative culture that allows learning innovations to be implemented consistently. On the other hand, the Independent Curriculum policy provides a regulatory framework, curriculum flexibility, and student-centered learning orientation that encourages the implementation of high-level strategies such as project-based learning and authentic assessment. These three factors are mapped analytically to show how the interaction between them shapes the level of readiness and quality of deep learning implementation, thereby providing a more comprehensive insight into the dynamics of the Indonesian education system in the context of curriculum reform.

The novelty of this research lies in the simultaneous integration between the dimensions of teacher perception which includes cognitive, affective, implementive, and contextual aspects with a mixed method approach that allows for strong triangulation between quantitative and qualitative data. This approach not only confirms the results of previous research showing the importance of conceptual readiness and institutional support in deep learning, but advances the literature by offering a more comprehensive analytical framework to understand the dynamics of the implementation of the Independent Curriculum at various levels of education. By showing how teachers' perceptions are directly connected to classroom practice and are influenced by the structural context of the school, this study makes a new theoretical contribution that has not been clearly mapped in the Indonesian literature, while providing a stronger empirical basis for designing more relevant teacher training interventions and supporting policies.

Comparisons between elementary and junior high school teachers were carried out by separating data based on education level, then testing the differences in perception, readiness, and implementation practice scores using comparative statistical tests such as independent samples t-test or one-way ANOVA according to the characteristics of the data. This analysis aims to identify whether the two groups of teachers show different patterns of perception or readiness systematically in implementing the Independent Curriculum. The test results are then used to determine statistical significance, for example through p-values, to see if the differences that arise are really meaningful or just coincidental. If significant differences are found, this indicates a variation in structural and pedagogical readiness between levels, while if it is not significant, the study can conclude that the implementation of the Independent Curriculum is relatively consistent

at both levels of education, although it is still necessary to consider other contextual factors.

Infrastructure limitations, teacher administrative workload, and student learning culture were systematically analyzed through a research framework that linked contextual factors with quantitative and qualitative findings regarding the implementation of deep learning. The analysis was carried out by mapping each obstacle into structural, pedagogical, and cultural categories, then linking it with perception data and interviews to see how these obstacles affect the quality of learning and the implementation of the Independent Curriculum. Through this approach, the study not only recorded constraints as descriptive findings, but placed them as explanatory variables that showed why teachers' perceptions and certain classroom practices did not reach optimal levels. Thus, contextual factors are discussed as an integral part of the interpretation of results, rather than stand-alone additions, thus providing a stronger understanding of the dynamics of deep learning implementation in primary and junior high schools.

4 Conclusion

This study concludes that teachers' perceptions of the deep learning approach are in the very positive category in all dimensions measured. Teachers demonstrate a strong understanding of the principles of deep learning as a process that emphasizes meaningful experiences, reflection, and critical thinking. The attitude of teachers is also very supportive because they believe that deep learning is able to improve the quality of the learning process and student learning motivation. The implementation has gone quite well, although there are still obstacles such as time constraints, authentic assessments, and the use of learning technology. The factors of support from school principals, adequate learning facilities, and continuous teacher training have proven to be very influential in strengthening the implementation of this approach. The consistency between quantitative and qualitative results shows that teachers' understanding is in harmony with the learning practices they apply in the classroom. Overall, this study confirms that teachers have high readiness to implement deep learning and support learning transformation in line with the Independent Curriculum.

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