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Implementation of a Deep Learning Approach through Problem-Based Learning in Science Learning at Zahira Private Elementary School

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ABSTRACT

This study aims to describe the implementation of a deep learning approach in science learning at Zahira Private Elementary School through the Problem-Based Learning (PBL) strategy. This study employed a qualitative approach with a descriptive method. The participants of this study consisted of 7 IPAS teachers, 1 school principal, and 35 fifth-grade students at Zahira Private Elementary School. Data were collected through observation, interviews, and documentation. The findings indicate that the implementation of the deep learning approach was carried out through three main stages: planning, implementation, and evaluation. In the planning stage, teachers developed lesson plans or teaching modules incorporating contextual problems related to ecosystems and encouraging higher-order thinking skills. In the implementation stage, learning activities involved problem-solving and direct observation outside the classroom, enabling students to relate scientific concepts to real-life experiences. Teachers also incorporated elements of mindful, meaningful, and joyful learning through open-ended questions, contextual learning experiences, and educational games. In the evaluation stage, assessment was conducted formatively, emphasizing learning processes and continuous feedback. The study found that students showed increased activeness, engagement, and participation during the learning process. However, several challenges were identified, including teacher readiness and varying levels of student engagement. Therefore, continuous support is needed to optimize the implementation of the deep learning approach in classroom practice.

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INTRODUCTION

In recent decades, education has undergone significant transformation, marked by the emergence of various learning approaches aimed at improving students' understanding and learning outcomes. These developments reflect a growing awareness that effective education must go beyond the mere transmission of knowledge toward fostering deeper and more meaningful learning experiences. As a central component of the educational process, learning approaches play a crucial role in shaping how knowledge is constructed, understood, and applied by students (Solissa et al., 2024). The choice of instructional approach directly influences students' engagement, motivation, and ability to transfer knowledge into real-life contexts.

In the 21st century, education is expected to equip students with essential competencies such as critical thinking, creativity, collaboration, and communication (Syaharani et al., 2024). These competencies require learning environments that actively involve students in the learning process rather than positioning them as passive recipients of information. However, in many

classroom contexts, learning practices still tend to emphasize rote memorization and teacher-centered instruction. Such practices often limit students' opportunities to explore ideas, develop understanding, and engage meaningfully with learning materials. This condition indicates the need for instructional approaches that promote active learning, conceptual understanding, and student engagement. One approach that has gained increasing attention in this regard is the deep learning approach.

In this study, deep learning refers to a pedagogical approach that emphasizes meaningful understanding, where students actively construct knowledge, connect concepts, and apply their learning to real-life situations (Rahayu, 2022). This approach prioritizes depth of understanding rather than surface-level memorization. It is important to distinguish this concept from deep learning in artificial intelligence. While deep learning in AI focuses on computational models and data processing, deep learning in education emphasizes cognitive and metacognitive processes that support meaningful human learning.

The deep learning approach is built upon three main principles: meaningful learning, mindful learning, and joyful learning. These principles serve as the foundation for creating learning experiences that are engaging, reflective, and relevant to students' lives. Meaningful learning allows students to connect new knowledge with prior understanding, leading to deeper and more lasting learning outcomes (Hafidzhoh et al., 2023). Through this process, learning becomes more relevant and easier to retain. Mindful learning encourages students to be aware of their own learning processes by fostering reflection and metacognitive skills (Diputera et al., 2024). This awareness helps students regulate their learning and become more independent learners. Meanwhile, joyful learning emphasizes the importance of a positive and engaging learning environment that enhances students' motivation and participation (Nur, 2017). A supportive atmosphere can significantly influence students' willingness to engage actively in learning activities.

In the context of Ilmu Pengetahuan Alam dan Sosial (IPAS) at the elementary school level, the implementation of a deep learning approach is particularly important. IPAS learning is expected not only to deliver conceptual knowledge but also to develop scientific attitudes, inquiry skills, and curiosity toward natural and social phenomena. However, previous studies indicate that IPAS learning in elementary schools often remains teacher-centered and focused on memorization, limiting students' opportunities to construct knowledge actively and relate concepts to real-life contexts (Syarif & Ratuloly, 2020; Aufa et al., 2023). Several studies have shown that the deep learning approach has the potential to improve students' conceptual understanding and engagement. For example, Lentzen et al. (2024) found that deep learning-oriented instruction enhances students' critical thinking and academic readiness, while Elbashbishy (2024) reported improved knowledge retention and application.

Despite these promising findings, most previous studies tend to focus on learning outcomes rather than providing detailed descriptions of how deep learning is implemented in classroom practice. As a result, there is still limited understanding of how teachers design, implement, and evaluate deep learning in real classroom settings. In particular, research that comprehensively examines the implementation of deep learning across the stages of planning, implementation, and evaluation in elementary IPAS learning remains scarce. This gap highlights the need for more practice-oriented studies. Based on preliminary observations at Zahira Private Elementary School, IPAS learning is still predominantly teacher-centered and emphasizes memorization. This condition leads to low student engagement and limited contextual understanding.

Although the deep learning approach has been introduced, its implementation has not been systematically analyzed. There is a need to examine how teachers integrate the principles of meaningful, mindful, and joyful learning into classroom practice. Therefore, this study aims to describe the implementation of the deep learning approach through Problem-Based Learning

(PBL) in IPAS learning at Zahira Private Elementary School. Specifically, this study focuses on three main aspects: (1) planning of instruction, (2) classroom implementation, and (3) evaluation of student learning outcomes.

METHOD

This study employed a descriptive qualitative approach to gain an in-depth understanding of the implementation of the deep learning approach in IPAS (Ilmu Pengetahuan Alam dan Sosial) learning at Zahira Private Elementary School. A qualitative design was selected because it enables the exploration of natural classroom processes, participants' experiences, and meaning-making in context (Creswell, 2014; Merriam & Tisdell, 2016). This approach is particularly relevant for examining instructional practices across the stages of planning, implementation, and evaluation.

The participants in this study consisted of seven IPAS teachers, one school principal, and thirty-five students. These participants were selected using purposive sampling based on their direct involvement in IPAS learning and their relevance to the research objectives. Teachers were selected due to their central role in planning and implementing instruction, the principal provided an institutional perspective, and students were included to capture their learning experiences during the implementation of the deep learning approach. From the total of thirty-five students, ten students were selected for in-depth interviews using purposive criteria, including their level of participation in class (high, moderate, and low) and their ability to articulate their learning experiences.

The study was conducted over a period of four weeks, involving eight IPAS learning sessions, with each session lasting approximately 90 minutes. The observed instructional units included "Environmental Changes" and "Human Interaction with the Environment," which were selected because they provide relevant contexts for implementing the deep learning approach through Problem-Based Learning (PBL). The unit of analysis in this study focused on the implementation of the deep learning approach in classroom practice, particularly in terms of lesson planning, implementation of learning activities, and evaluation processes carried out by teachers.

Data collection was carried out through observation, interviews, and documentation. Observations were conducted across all eight learning sessions, both in classroom settings and outdoor learning activities, to examine interactions between teachers and students as well as the overall learning process. Field notes were recorded systematically to capture instructional dynamics, student engagement, and learning behaviors. Interviews were conducted using a semi-structured format, allowing flexibility while maintaining alignment with the research objectives. The interviews involved all seven teachers, the school principal, and ten selected students. All interviews were audio-recorded with participants' consent and transcribed, ensuring the accuracy and completeness of the data. The verbatim transcripts served as the primary data source for subsequent coding and analysis.

Documentation included lesson plans, teaching modules, student worksheets, photographs of learning activities, and researcher field notes. These documents were used to support and validate findings from observations and interviews, providing contextual and visual evidence of classroom practices. Data analysis followed the interactive model proposed by Miles, Huberman, and Saldaña (2014), consisting of data condensation, data display, and conclusion drawing. Open coding was first applied to identify initial patterns in the data, followed by the development of categories through grouping related codes. These categories were then refined into broader themes that represent key aspects of the implementation of the deep learning approach, such as instructional strategies, student engagement, and learning challenges.

The data display stage involved organizing the data in descriptive and thematic forms, enabling the researcher to identify relationships among themes and compare findings across different data sources. This process ensured that interpretations remained grounded in empirical data. The final stage involved conclusion drawing and verification, conducted continuously throughout the research process. The researcher repeatedly reviewed the data to ensure consistency, validity, and coherence of findings. The methodological framework of this study is grounded in established qualitative research traditions, particularly those outlined by Creswell (2014), Miles, Huberman, and Saldaña (2014), and Merriam and Tisdell (2016), ensuring alignment between research design, data collection, and analysis procedures.

RESULTS AND DISCUSSION

Result

Implementation of the Deep Learning Approach in IPAS Learning

The findings indicate that the implementation of the deep learning approach in IPAS learning at Zahira Private Elementary School was carried out through three main stages: planning, implementation, and evaluation.

1) Planning Stage

Based on interview and documentation data, teachers demonstrated a clear understanding of the deep learning approach as learning that emphasizes meaningful, mindful, and joyful principles. One teacher explained:

"Deep learning isn't just about memorisation, but about how students truly understand and relate the material to their everyday lives." (Teacher Interview)

In the planning stage, teachers prepared teaching modules that included learning objectives, Problem-Based Learning (PBL) steps, and assessment strategies oriented toward higher-order thinking skills. Documentation analysis shows that learning activities were designed using contextual problems, such as environmental issues related to plastic waste in the school. Another teacher stated:

"In the teaching module, I have designed outdoor observation activities so that pupils can see the ecosystems around the school for themselves." (Teacher Interview)

In addition, the school principal emphasized institutional support for planning:

"The school encourages teachers to make lessons more contextual and meaningful." (Principal Interview)

These findings indicate that planning was intentionally directed toward connecting learning material with students' real-life experiences and promoting active learning.

2) Implementation Stage

During the implementation stage, learning activities were carried out using the Problem-Based Learning (PBL) strategy. Teachers initiated lessons by presenting contextual problems and guiding students through observation, discussion, and problem-solving activities. Observation data show that students were actively involved in outdoor learning activities, such as identifying plants, animals, and environmental conditions. One student stated:

"I prefer learning outside the classroom because I can see the plants and animals around me first-hand." (Student Interview)

Another student added:

"Learning this way makes it easier to understand than just reading a book." (Student Interview)

Classroom interactions became more dynamic, with teachers using open-ended questions to stimulate students' thinking. Students were observed to participate more actively in discussions, ask questions, and respond to peers' ideas. A teacher noted:

"Pupils become more active in asking questions and discussing when presented with real-life problems." (Teacher Interview)

These findings suggest that the implementation stage successfully created opportunities for active engagement, experiential learning, and collaborative problem-solving.

3) Evaluation Stage

The evaluation stage was primarily conducted through formative assessment, focusing on both the learning process and outcomes. Teachers emphasized continuous assessment during learning activities. One teacher explained:

"I don't just assess the final results, but also the process by which students learn and discuss." (Teacher Interview)

Assessment was carried out through observation, questioning, and evaluation of student work, covering cognitive, affective, and psychomotor domains. Teachers also provided immediate feedback during activities. The principal highlighted:

"Assessments are carried out on an ongoing basis to monitor pupils' progress, not just their final marks." (Principal Interview)

These findings indicate that evaluation practices were aligned with the principles of deep learning, emphasizing process-oriented and reflective assessment.

Changes in Student Engagement and Learning Behavior

Data from observations and interviews indicate noticeable changes in students' engagement during the learning process. Students who were previously passive began to participate more actively in classroom discussions and activities. One student reported:

"It's easier to understand the lesson if you can see it for yourself." (Student Interview)

Another student expressed:

"Now I'm more confident about asking questions when I don't understand." (Student Interview)

Students were also observed to show increased confidence in expressing opinions, asking questions, and sharing ideas. In several sessions, students were able to connect their observations with scientific concepts, particularly in ecosystem-related topics. A teacher confirmed this change:

"Pupils who are usually quiet have started to join in the conversation and express their opinions." (Teacher Interview)

In addition, some students demonstrated metacognitive awareness by reflecting on their own learning process:

"If I get it wrong, I'll try to correct it once it's been explained to me." (Student S9 Interview)

These findings indicate that the implementation of the deep learning approach was associated with increased student participation, confidence, and reflective thinking.

Challenges and Supporting Factors

1) Challenges

The findings reveal several challenges in implementing the deep learning approach. One major challenge relates to classroom management, particularly during outdoor and group-based learning. A teacher stated:

"It can sometimes be difficult to keep pupils focused when they're learning outside the classroom." (Teacher Interview)

Another challenge involves uneven student participation:

"There are still some students who are passive and need more intensive guidance." (Teacher Interview)

Observation data also indicate that some students experienced difficulties in analyzing problems and expressing their ideas during discussions. A student shared:

"Sometimes I'm not sure what to say during discussions." (S8 student interview)

These findings suggest that both pedagogical and student-related factors influence the effectiveness of implementation.

2) Supporting Factors

Several supporting factors were identified in facilitating the implementation of the deep learning approach. Institutional support from the school played an important role in enabling contextual and flexible learning. The principal stated:

"The school gives teachers the freedom to innovate in their teaching." (Principal Interview)

Teacher collaboration also emerged as a key factor:

"We often discuss with other teachers to share ideas on how to make lessons more engaging." (Teacher Interview)

In addition, parental support contributed to reinforcing student learning:

"Parents help children to relate what they learn in class to everyday life." (Teacher Interview)

These findings indicate that successful implementation is supported by collaboration, institutional encouragement, and external support systems.

Discussion

The findings of this study indicate that the implementation of the deep learning approach through Problem-Based Learning (PBL) in IPAS learning at Zahira Private Elementary School reflects the integration of three key principles: meaningful learning, mindful learning, and joyful

learning. However, rather than merely confirming the effectiveness of the approach, this discussion critically interprets how and why these patterns emerged within the specific classroom and institutional context.

The implementation of meaningful learning was evident in the use of contextual problems and real-life observations, particularly through outdoor learning activities. Students were encouraged to connect ecosystem concepts with their immediate environment, such as issues related to waste and living organisms around the school. While this finding aligns with previous studies suggesting that meaningful learning occurs when new knowledge is connected to prior experience (Hafidzhoh et al., 2023), this study reveals a more nuanced insight: the success of meaningful learning is highly dependent on the teacher's ability to design contextually relevant problems. In contrast to some prior research that treats meaningful learning as an inherent outcome of instructional models, this study suggests that it is a pedagogical achievement shaped by teacher expertise rather than an automatic result of using PBL.

The element of mindful learning was reflected in students' increasing awareness of their learning processes, such as recognizing mistakes and attempting to improve their responses during discussions. This supports the argument that reflective practices enhance metacognitive development (Diputera et al., 2024). However, unlike studies that present mindful learning as uniformly achievable, the findings here indicate uneven distribution among students. Some students required substantial guidance to engage in reflective thinking. This suggests that mindful learning in elementary contexts is constrained by developmental factors and prior learning experiences, highlighting the need for structured scaffolding. Therefore, this study challenges overly generalized claims in the literature by demonstrating that metacognitive engagement is not equally accessible to all learners.

Joyful learning emerged through interactive activities, collaborative discussions, and outdoor learning experiences. Students reported higher enjoyment and engagement, which is consistent with previous findings that positive emotional environments enhance motivation (Nur, 2017). However, this study adds a critical dimension by showing that joyful learning also introduces pedagogical tensions. Specifically, outdoor and interactive activities require strong classroom management to maintain focus. Without such control, the intended learning objectives may be diluted. This finding suggests that joyful learning is not simply about increasing enjoyment but involves balancing engagement with instructional discipline.

The challenges identified in this study provide important insight into the contextual limitations of implementing the deep learning approach. One of the most significant factors is teacher readiness. Although teachers demonstrated conceptual understanding of deep learning, their ability to consistently implement it varied. This finding partially supports previous research emphasizing the importance of professional development (Maula et al., 2024), but also extends it by showing that readiness is not only about knowledge but also about practical classroom management skills, especially in student-centered and outdoor learning contexts.

In addition to teacher readiness, school-level conditions played a crucial role in shaping implementation. Institutional support, such as encouragement from the principal and opportunities for teacher collaboration, facilitated the adoption of innovative practices. However, the absence of structured training or sustained mentoring limited the depth of implementation. This suggests that school context is not merely a background factor but an active determinant of how pedagogical approaches are enacted. Compared to prior studies that often overlook institutional dynamics, this study highlights the importance of organizational support systems in sustaining deep learning practices.

Another critical issue concerns student diversity and participation patterns. While some students became more active and confident, others remained passive or required additional guidance. This finding challenges the assumption, often implied in previous PBL studies, that

student-centered approaches automatically lead to equal participation. Instead, the results indicate that participation must be actively facilitated through scaffolding, differentiated instruction, and teacher intervention. This adds an important corrective perspective to the literature by emphasizing the complexity of classroom dynamics.

In relation to previous studies, this research confirms that contextual and problem-based learning can enhance student engagement and support deeper understanding (Lentzen et al., 2024; Elbashbishy, 2024). However, rather than simply reinforcing these conclusions, this study offers a more process-oriented perspective. It demonstrates that the effectiveness of deep learning depends on the interaction between instructional design, teacher capacity, student readiness, and institutional context. In this sense, the findings move beyond outcome-based claims and contribute to a more grounded understanding of implementation. Importantly, this study does not claim a direct improvement in measurable learning outcomes, as such outcomes were not quantitatively assessed. Instead, the findings indicate observable changes in student engagement, participation, and learning behavior. This distinction is essential to maintain methodological consistency and avoid overgeneralization, particularly in qualitative research contexts.

From a theoretical perspective, this study contributes to the understanding of deep learning in elementary IPAS education by situating it within a context-sensitive framework. It suggests that deep learning should not be viewed as a fixed model but as a flexible pedagogical approach that is shaped by teacher agency, student characteristics, and institutional conditions. This perspective extends existing theories by emphasizing the relational and contextual nature of learning processes. Overall, the contribution of this study lies in providing a nuanced and contextually grounded account of how the deep learning approach is implemented in real classroom settings. The findings highlight both its potential to enhance student engagement and its practical limitations. Therefore, successful implementation requires not only appropriate instructional design but also sustained teacher development, supportive school environments, and adaptive strategies to address student diversity. This study thus offers practical and theoretical implications for improving IPAS learning at the elementary school level

CONCLUSIONS

This study concludes that the implementation of the deep learning approach through Problem-Based Learning (PBL) in IPAS learning at Zahira Private Elementary School was carried out through three main stages: planning, implementation, and evaluation. The findings show that teachers designed learning activities using contextual problems, facilitated student engagement through observation and discussion, and applied formative assessment focusing on the learning process. The implementation of this approach was associated with observable changes in students' participation, engagement, and ability to relate learning materials to real-life contexts. At the same time, several challenges were identified, particularly related to teacher readiness, classroom management during outdoor activities, and variations in student participation.

This study has several limitations. It was conducted in a single school context with a limited number of participants, which may restrict the generalizability of the findings. In addition, the study focused on qualitative descriptions of learning processes without measuring learning outcomes quantitatively. Based on these findings, it is recommended that future research explore the implementation of the deep learning approach across different school contexts, involve larger participant groups, and incorporate longitudinal or mixed-method designs to examine both learning processes and outcomes.

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