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Implementation of deep learning-based instruction integrating pertuturen sulang silima local wisdom to enhance elementary students' social attitudes and mathematical creativity

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ABSTRACT

This study aims to systematically analyze the implementation of the deep learning approach in elementary mathematics education, particularly its integration with local wisdom and its impact on students' mathematical creative thinking skills and social attitudes. The study employed a Systematic Literature Review (SLR) method to analyze 15 scientific articles published between 2017 and 2025 that were relevant to the research topic. The article selection process followed the PRISMA framework, which consists of the identification, screening, eligibility, and inclusion stages. The findings indicate that integrating deep learning with ethnomathematics and local wisdom significantly enhances students' conceptual understanding, mathematical creativity, and social character development. Furthermore, the incorporation of local cultural contexts, such as traditional games and community traditions, has been shown to increase students' engagement in learning activities. This study recommends the development of contextual and transformative deep learning-based instructional models that integrate local wisdom into elementary school curricula to support meaningful and sustainable mathematics learning.

Keyword: deep learning; local wisdom; ethnomathematics; mathematical creativity; social attitudes

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1. INTRODUCTION

Mathematics learning in elementary schools continues to face several challenges, particularly related to students' low conceptual understanding, limited mathematical creative thinking skills, and the lack of meaningful connections between mathematical concepts and students' real-life experiences. Learning practices that remain heavily oriented toward procedural knowledge and memorization often prevent students from developing higher-order thinking skills (HOTS). This condition is consistent with the findings of Utami and Wutsqa (2017) and Ida et al. (2021), who reported that students' mathematical creative thinking skills remain at a low to moderate level.

As an alternative, the deep learning approach has increasingly been adopted in mathematics education because it promotes meaningful and in-depth conceptual understanding. Studies conducted by Barokah and Mahmudah (2025) and Maharani et al. (2025) demonstrate that deep learning improves the quality of mathematics instruction through conceptual exploration, reflection, and knowledge integration. Similarly, Mutmainnah et al. (2025) and Wibowo et al. (2025) emphasize that this approach effectively enhances elementary school students' conceptual understanding.

In addition, integrating local wisdom into mathematics learning has become an important strategy for creating contextual and meaningful learning experiences. The ethnomathematics perspective proposed by Ramadhani (2023) and Prahmana and D'Ambrosio (2020) highlights that mathematics is inherently embedded in culture; therefore, mathematics instruction should be connected to local cultural practices. Putra & Indriani (2017) further demonstrate that incorporating local cultural elements into mathematics education enhances students' contextual understanding.

Recent studies have increasingly integrated deep learning with local wisdom in mathematics instruction. Wulandari et al. (2025) found that incorporating local traditions, such as *Grebeg Syawal*, significantly increased students' engagement in learning activities. Likewise, Dalia et al. (2025) reported that traditional games, such as *congklak*, effectively improved students' understanding of mathematical concepts. Ramona and Warsani (2024) also emphasized that local wisdom-based learning contributes to students' character development.

Regarding mathematical creativity, Nadhiroh et al. (2023) demonstrated that students' mathematical creative thinking skills can be improved through innovative and contextual learning approaches. This finding is further supported by Setiawan (2022), who developed a local wisdom-based realistic mathematics learning model that successfully enhanced students' creativity and conceptual understanding.

Furthermore, literature reviews conducted by Nurjannah and Ramlah (2025) and Kholid et al. (2025) suggest that deep learning has considerable potential to improve the quality of mathematics education. However, its effectiveness can be further optimized when integrated with local cultural contexts and ethnomathematical approaches.

Based on the foregoing discussion, a strong relationship exists among deep learning, local wisdom, and mathematical creativity in elementary mathematics education. Nevertheless, studies that systematically integrate these three dimensions remain limited. Therefore, this study aims to:

1. Identify research trends related to deep learning in elementary mathematics education.
2. Analyze the role of local wisdom in supporting mathematics learning.
3. Examine its influence on students' mathematical creativity and social attitudes.

This study is expected to provide both conceptual and practical contributions to the development of contextual, innovative, and transformative mathematics learning models in elementary mathematics education.

2. RESEARCH METHOD

This study employed a Systematic Literature Review (SLR) approach based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The SLR approach was selected to provide a comprehensive, objective, and systematic synthesis of relevant studies.

A. Data Collection Procedure

1) Literature Identification

Relevant articles were retrieved from nationally indexed journals (SINTA) and international journals identified through DOI databases. The keywords used in the literature search included:

a) "deep learning in elementary mathematics education"
b) "ethnomathematics"
c) "mathematical creativity"
d) "local wisdom in learning"

B. Inclusion and Exclusion Criteria

1) Inclusion Criteria
   a) Articles published between 2017 and 2025.
   b) Studies focusing on elementary mathematics education.
   c) Research addressing deep learning, ethnomathematics, or mathematical creativity.
   d) Empirical research articles or review studies.
2) Exclusion Criteria
   a) Studies unrelated to elementary mathematics education.
   b) Articles without DOI information or accessible full-text versions.
   c) Duplicate publications.

C. Data Analysis

The collected data were analyzed using qualitative thematic analysis through the following stages:

1) Data Extraction
   Identifying the objectives, research methods, findings, and key conclusions of each selected study.
2) Thematic Coding
   Classifying the studies into three major themes:
   a) Deep learning in mathematics education.
   b) Local wisdom and ethnomathematics.
   c) Mathematical creativity.
3) Data Synthesis
   Integrating the findings across the selected studies to identify patterns, similarities, and differences.

4) Critical Interpretation
Examining the theoretical and practical implications of the findings for elementary mathematics education.

3. RESULTS AND DISCUSSION

A. Mapping the Characteristics of Previous Studies

Based on the review of 15 selected articles, the findings indicate that most studies were published between 2020 and 2025, with a notable concentration in 2025. This trend suggests that research on deep learning in elementary mathematics education is a relatively recent and rapidly expanding field of study.

Methodologically, the reviewed studies consisted of:

- Experimental and quasi-experimental studies (Barokah & Mahmudah, 2025; Maharani et al., 2025; Wibowo et al., 2025).
- Developmental studies (Mutmainnah et al., 2025; Wulandari et al., 2025).
- Qualitative studies (Dalia et al., 2025; Ramona & Warsani, 2024).
- Systematic Literature Reviews (Nurjannah & Ramlah, 2025; Kholid et al., 2025; Prahmana & D'Ambrosio, 2020).

Based on their primary focus, the studies were categorized into three major themes:

1. Deep learning in mathematics education.
2. The integration of local wisdom and ethnomathematics.
3. Mathematical creative thinking skills.

These themes demonstrate a complementary relationship in fostering meaningful and transformative mathematics learning experiences.

B. The Effectiveness of Deep Learning in Elementary Mathematics Education

The review findings indicate that the deep learning approach significantly improves the quality of mathematics instruction in elementary schools. Barokah and Mahmudah (2025) found that students who participated in deep learning-based instruction demonstrated greater conceptual understanding than those who experienced conventional teaching approaches.

Similarly, Maharani et al. (2025) reported that deep learning enables students to:

- Actively construct knowledge.
- Connect new concepts with their prior knowledge.
- Reflect on their own learning processes.

Furthermore, Mutmainnah et al. (2025) emphasized that the implementation of deep learning in mathematics education focuses not only on learning outcomes but also on students' thinking processes. This characteristic is consistent with the fundamental principles of deep learning, which encourage exploration, analysis, and conceptual synthesis.

Wibowo et al. (2025) further demonstrated that deep learning effectively enhances students' understanding of abstract mathematical concepts, particularly topics requiring symbolic and visual representations. Students became more capable of explaining the reasoning behind their answers rather than merely following procedural steps.

C. The Role of Local Wisdom in Mathematics Learning

The integration of local wisdom emerged as one of the most significant findings of this review. The ethnomathematics perspective proposed by Ramadhani (2023) and Prahmana and D'Ambrosio (2020) emphasizes that mathematics is a cultural product; therefore, learning becomes more meaningful when it is connected to students' cultural experiences.

Putra & Indriani (2017) reported that incorporating local culture into mathematics instruction can:

- Improve students' contextual understanding.
- Facilitate the abstraction of mathematical concepts.
- Foster students' appreciation of and respect for local cultural values.

In practical implementation, Wulandari et al. (2025) integrated the *Grebeg Syawal* tradition into mathematics learning activities. The results demonstrated increased student participation and more active classroom interaction. Likewise, Dalia et al. (2025) utilized the traditional game *congklak* as a learning medium, which effectively supported students' understanding of number concepts and arithmetic operations.

Ramona and Warsani (2024) further highlighted that local wisdom-based learning contributes not only to students' cognitive development but also to character development, including cooperation, responsibility, and mutual respect.

D. Enhancement of Students' Mathematical Creativity

Mathematical creative thinking is regarded as one of the essential competencies required for twenty-first-century learning. The findings indicate that integrating deep learning with local wisdom effectively enhances students' mathematical creativity.

Nadhiroh et al. (2023) found that students who participated in innovative learning environments demonstrated stronger abilities to:

- Generate multiple ideas (*fluency*).
- Apply diverse problem-solving strategies (*flexibility*).
- Produce original solutions (*originality*).

These findings are consistent with those reported by Utami and Wutsqa (2017) and Ida et al. (2021), who concluded that learning environments emphasizing exploration and open-ended problem-solving significantly improve students' mathematical creativity.

In addition, Setiawan (2022) demonstrated, through a local wisdom-based realistic mathematics education approach, that students more easily understood mathematical concepts and generated creative ideas when learning activities were connected to their everyday experiences.

E. Integrating Deep Learning and Local Wisdom: A Transformative Approach

The synthesis of the reviewed studies indicates that integrating deep learning with local wisdom creates a transformative approach to mathematics learning. Mathematics education becomes oriented not only toward content mastery but also toward meaning-making, value formation, and character development.

Literature reviews conducted by Nurjannah and Ramlah (2025) and Kholid et al. (2025) affirm that deep learning has substantial potential to improve the quality of mathematics education. However, its effectiveness can be further enhanced when integrated with local cultural contexts.

This integrated approach promotes learning that is:

- Holistic, by integrating cognitive, affective, and social dimensions.
- Contextual, by connecting learning to students' real-life experiences.
- Reflective, by encouraging students to understand and evaluate their own learning processes.

Consequently, the integration of deep learning and local wisdom can be regarded as a promising framework for developing meaningful, culturally responsive, and transformative mathematics education in elementary schools.

4. CONCLUSION

Based on the findings of the Systematic Literature Review involving 15 relevant studies, it can be concluded that elementary mathematics education has experienced significant progress through the implementation of deep learning approaches, particularly when integrated with local wisdom and ethnomathematics. Deep learning significantly improves the quality of mathematics instruction by enhancing students' conceptual understanding. Students become capable of understanding the underlying meaning of mathematical concepts rather than merely applying procedural solutions. This approach promotes reflective, exploratory, and constructive learning processes, resulting in more meaningful learning experiences.

Furthermore, the integration of local wisdom into mathematics education makes a substantial contribution to creating contextual and relevant learning environments. The incorporation of local cultural practices, traditional games, and community traditions facilitates students' understanding of abstract mathematical concepts while increasing their engagement and motivation in learning. In addition, this approach strengthens students' cultural identity and fosters greater appreciation of local values. The combination of deep learning and local wisdom also effectively enhances students' mathematical creative thinking skills by encouraging greater flexibility in problem-solving, the generation of multiple alternative solutions, and higher levels of originality. Consequently, mathematics learning emphasizes not only learning outcomes but also the development of higher-order thinking skills.

Moreover, integrating deep learning with local wisdom positively influences students' affective and social development. Values such as cooperation, responsibility, tolerance, and mutual respect naturally emerge through contextual and collaborative learning activities. These findings demonstrate that mathematics education can serve not only as a medium for cognitive development but also as an effective means of character development. Overall, the findings indicate that integrating deep learning, local wisdom, and ethnomathematics creates a holistic, contextual, and transformative approach to mathematics learning. This approach is well

aligned with the demands of twenty-first-century education and the objectives of Indonesia's *Merdeka Curriculum*, which emphasizes the balanced development of students' cognitive, affective, and social competencies. Therefore, educators and curriculum developers are encouraged to integrate local wisdom into deep learning-based mathematics instruction in order to create more meaningful, culturally responsive, and sustainable learning experiences in elementary schools.

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