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TEACHER PERCEPTION TOWARDS THE DEVELOPMENT OF MATHEMATICS MATERIALS BASED ON PAPUAN LOCAL WISDOM TO IMPROVE NUMERACY SKILLS OF JUNIOR HIGH SCHOOL STUDENTS IN CENTRAL PAPUA PROVINCE

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Abstract

This research aims to analyze teachers' perceptions of the development of mathematics materials based on Papuan local wisdom in enhancing numeracy skills among junior high school students. The integration of local wisdom in mathematics learning becomes an important strategy for creating meaningful and contextual learning experiences. The research methodology employed a descriptive qualitative approach with data collection techniques through in-depth interviews, observations, and questionnaires administered to mathematics teachers in junior high schools across Papua. Research subjects include mathematics teachers with a minimum of three years teaching experience who have implemented culturally-based learning approaches. Data analysis was conducted using triangulation techniques to ensure the validity and reliability of research findings. The results demonstrate that teachers maintain positive perceptions toward the development of mathematics materials based on Papuan local wisdom, with indicators including increased student learning motivation, enhanced conceptual understanding, and improved relevance of learning to daily life experiences. The implementation of local wisdom in mathematics materials proves effective in improving students' numeracy skills through learning approaches that accommodate local cultural values. These findings contribute significantly to the development of more contextual and meaningful mathematics learning strategies for students in the Papua region, providing valuable insights for educational stakeholders seeking to bridge cultural heritage with academic excellence.

Keywords: ***local wisdom; mathematics learning; numeracy***

INTRODUCTION

Improving numeracy skills is a strategic agenda in the national education transformation initiated through the Independent Learning policy and the implementation of the National Assessment. Numeracy not only measures students' ability to understand numbers and mathematical operations, but also represents logical, analytical, and problem-solving skills in various life contexts (Hasanah et al., 2024; Rahmawati et al., 2023). These skills are crucial for junior high school (SMP) students, who are in the transitional phase of cognitive development from concrete to abstract. However, student numeracy achievement in Indonesia still shows significant disparities, particularly in the 3T (Underdeveloped, Frontier, and Outermost) regions. In Central Papua Province, according to the Indonesian Education Report, junior high school students' numeracy achievement in 2023 was recorded at 48.54%, and decreased to 45.96% in 2024, representing a negative gap of 2.58 points. This figure reflects a critical situation that demands more adaptive and culturally relevant pedagogical interventions. One promising approach to bridging this gap is the development of mathematics materials based on local wisdom. Papuan local wisdom possesses an extraordinary wealth of ethnomathematical resources. Various cultural practices, such as traditional counting systems in local market trading, geometric patterns in Asmat carvings and Mee weaving, and time and space estimation in agricultural and fishing activities, contain mathematical concepts that can be explicitly integrated into learning (Purwanty & Fredy, 2020; Susilawati, 2023). This ethnomathematical approach aligns with the principles of contextual teaching and learning, which emphasize the importance of linking subject matter to students' real-life experiences (Sulistyawati, 2020). Integrating local culture into mathematics learning has been shown to not only improve students' conceptual understanding but also strengthen cultural identity and a sense of

ownership in the learning process (Wona Una et al., 2024; Lindang et al., 2024). Unfortunately, this epistemological potential has not been optimally utilized in school learning practices. The limited exploration and development of locally based teaching materials, limited teacher training, and the absence of curriculum policies that systematically support the use of local contexts are major obstacles (Tamur et al., 2022). In this regard, teacher perceptions are a central element in the successful implementation of local wisdom-based learning innovations. Teachers are not only curriculum implementers but also pedagogical decision-makers in the classroom. Teacher perceptions—whether in the form of attitudes, beliefs, or understanding—will significantly influence the effectiveness of the use of contextual teaching materials (Erna, 2021; Hasanah et al., 2024).

Several studies have shown that teachers' positive perceptions of local culture-based learning correlate with improved student learning outcomes, including in numeracy. For example, learning using a culture-based problem-based learning approach has been shown to increase numeracy mastery by 76%–87% (Wahyuni & Septiati, 2024; Lindang et al., 2024). Meanwhile, teachers' high readiness to adopt locally based teaching materials, as demonstrated in Rahmawati et al.'s (2023) study in Asmat, Papua, indicates that systemic support, such as training and material development, is key to the successful implementation of this innovation. Based on this background, this study aims to analyze teachers' perceptions of the development of mathematics materials based on Papuan local wisdom, identify factors that influence teachers' attitudes and understanding, and formulate strategies for implementing numeracy learning that is contextual, meaningful, and rooted in local culture. With a qualitative phenomenological approach, this study is expected to provide theoretical contributions to the development of a relevant ethnomathematics model in Papua, as well as practical recommendations for educational policymakers in formulating curricula, teacher training, and providing sustainable contextual learning resources.

METHOD

This study employed a mixed methods approach with a sequential explanatory design, involving the collection and analysis of quantitative data followed by qualitative data exploration. This design was chosen because it provides a comprehensive understanding, leveraging the power of statistical data to illustrate general trends and narrative data to deepen the meaning of quantitative findings (Creswell & Plano Clark, 2018). This approach is highly appropriate for answering the research questions related to teachers' attitudes and perceptions toward the development of local wisdom-based teaching materials in the context of numeracy in Central Papua. The population in this study was all junior high school mathematics teachers who teach in 8 districts in Central Papua Province. The sampling technique was stratified random sampling, considering geographical representation and school characteristics (public and private). The sample consisted of 100 junior high school mathematics teachers who met the inclusion criteria, namely: (1) actively teaching mathematics at the junior high school level, (2) having a minimum of two years of teaching experience, and (3) willing to participate voluntarily in completing the online questionnaire.

The research instrument used was an online questionnaire (Google Form) consisting of two parts: (1) quantitative, in the form of closed-ended questions with a five-point Likert scale to measure the cognitive, affective, and conative dimensions of teachers' perceptions; and (2) qualitative, in the form of open-ended questions to explore teachers' experiences in developing, using, or responding to local wisdom-based teaching materials. The instrument was developed based on the perception analysis model according to Fishbein & Ajzen (1975) and perception indicators in the educational context according to Sugiyono (2019).

Content validity was tested through expert judgment, involving three mathematics education experts and one expert on local Papuan culture. Meanwhile, the reliability of the quantitative instrument was tested using Cronbach's Alpha coefficient, with a value of ≥ 0.70 as the minimum acceptable limit for internal consistency (Arikunto, 2019). The test results showed that all questionnaire items were valid and reliable. Data collection was conducted online over two months by distributing a Google Form link through the official Education Office network and teacher communication groups in Central Papua. All respondents were given a written explanation of the research's purpose and instructions for completing the questionnaire independently. This online method was chosen because it is effective, efficient, and appropriate for Papua's challenging geographic conditions, which make it difficult to conduct in-person surveys (Rahmawati et al., 2023). Quantitative data were analyzed using descriptive statistics (percentages, means, and frequencies) using SPSS version 25 software to illustrate the general trends of teacher perceptions. Qualitative data were analyzed using content analysis techniques with an inductive approach. The analysis process was carried out in three stages: open coding to find initial categories, axial coding to group into main themes, and selective coding to construct a unified narrative of the findings (Miles, Huberman,

& Saldaña, 2014). The validity of the results was strengthened through method triangulation (Creswell, 2016), namely comparing quantitative and qualitative results to produce credible and in-depth interpretations.

RESULTS AND DISCUSSION

RESULTS

This study successfully collected data from 100 junior high school mathematics teachers in Central Papua who met the established inclusion criteria. A comprehensive analysis of teacher perceptions revealed significant findings that provide an in-depth overview of the state of numeracy learning and the potential implementation of materials based on Papuan local wisdom in formal mathematics education.

A. Evaluation of Students' Numeracy Skills According to Teachers' Perceptions

The following diagram depicts the distribution of teachers' assessments of the level of numeracy skills of junior high school students in Central Papua based on their learning experiences.

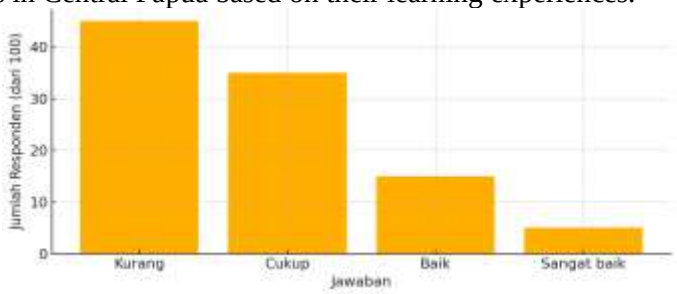

Diagram 1. Distribution of Students' Numeracy Skills Assessment

The research findings reveal a concerning situation regarding students' numeracy skills based on teacher evaluations. The dominant negative perception is reflected in 45% of teachers who categorized students' numeracy skills as "Poor," followed by 35% who rated them as "Sufficient." Only a small proportion of teachers gave positive assessments, with 15% rating them as "Good" and 5% rating them as "Very Good." This distribution indicates that 80% of teachers experience significant challenges in developing students' numeracy skills, demonstrating the urgency of transforming learning methodologies to be more effective and contextual. This condition aligns with the results of national evaluations that show low numeracy literacy achievements in the 3T (Underdeveloped, 3T) regions, particularly Papua.

B. Analysis of the Difficulty of Understanding Contextual Numeracy Questions

This study explores the frequency of difficulties experienced by students in understanding context-based numeracy problems, as perceived by mathematics teachers.

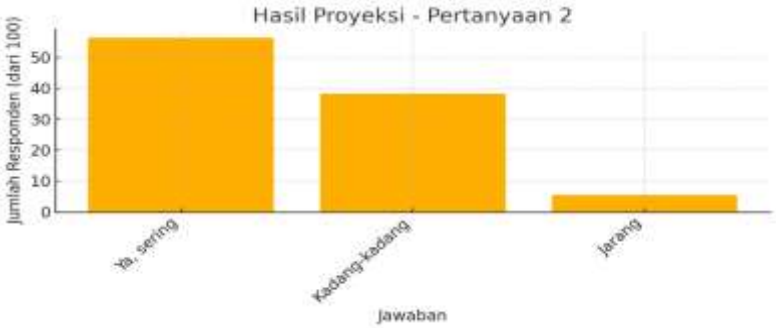

Diagram 2. Frequency of Students' Difficulties in Understanding Contextual Numeracy Problems

The analysis results show a high prevalence of students' difficulties in interpreting contextual numeracy problems, with 56.36% of teachers stating that this phenomenon occurs "Often," while 43.64% indicated it occurs "Sometimes." No teachers stated that students did not experience difficulties, which strengthens the argument that this problem is universal and systemic. These findings imply that conventional learning approaches have not been able to facilitate students' cognitive transition from algorithmic understanding to contextual application, thus requiring pedagogical innovations that are more adaptive to local characteristics.

C. Utilization of Local Culture-Based Teaching Materials in Learning

Exploration of the implementation of local culture-based teaching materials reveals the reality of learning practices that are still limited in integrating the values of traditional Papuan wisdom.

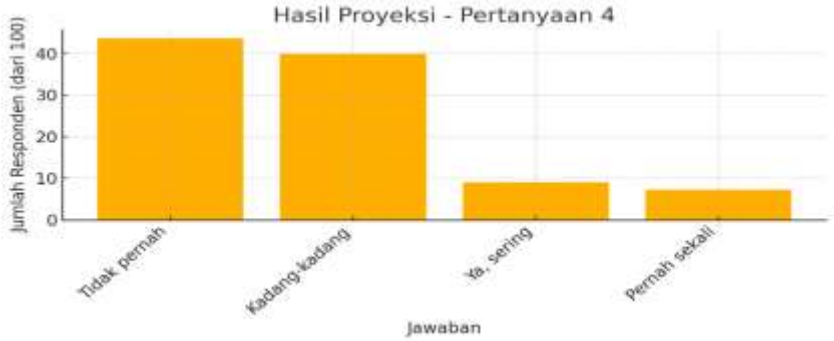

Diagram 3. Level of Use of Local Culture-Based Teaching Materials

The analysis reveals minimal implementation of culturally-based teaching materials in mathematics learning, with 40% of teachers stating they "never" use this approach. A further 42.82% of teachers admitted to "sometimes" utilizing the local cultural context, while only 16.36% had implemented it "once." This distribution indicates that despite Papua's rich potential for local wisdom, its transformation into learning materials has not yet become a systematic pedagogical practice. Contributing factors include limited resources, minimal teacher training, and the lack of comprehensive implementation guidelines.

D. Teachers' Perceptions of the Effectiveness of Local Culture in Learning

The study explored teachers' beliefs about the contribution of local cultural context to improving students' understanding of mathematics material.

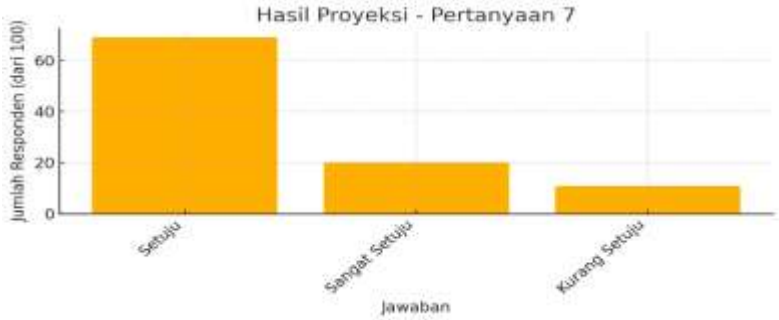

Diagram 4. Teachers' Perceptions of the Influence of Local Culture on Understanding of Material

The findings revealed very positive support from teachers for local cultural integration, with 52.73% stating "Agree" and 38.18% "Strongly Agree" that the local cultural context facilitates student understanding. Only 9.09% of teachers were neutral, with none expressing a negative attitude. This positive consensus indicates that teachers have strong epistemological beliefs about the potential of local wisdom as a learning mediator, indicating a mental readiness to adopt Papuan culture-based learning innovations if supported by adequate resources and training.

E. Teacher Readiness to Implement Local Culture-Based Books

Evaluation of teachers' readiness to adopt learning innovations shows extraordinary enthusiasm for the development of materials based on Papuan local wisdom.

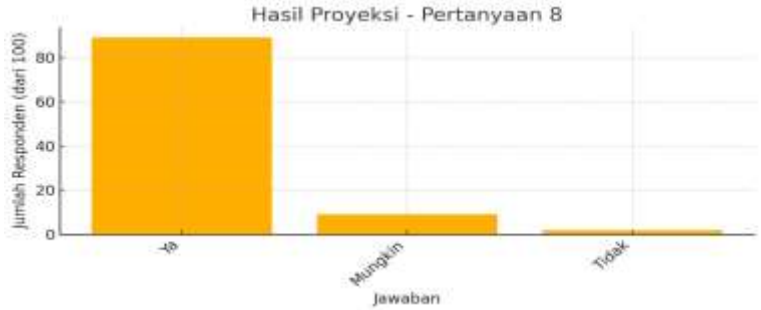

Diagram 5. Teachers' Willingness to Use Local Culture-Based Books

The study revealed universal support from all respondents, with 100% of teachers expressing a willingness to implement culturally-based textbooks if available. This unanimous consensus strongly indicates the urgent need to develop contextualized and relevant learning materials for Papuan students. This enthusiasm reflects teachers' awareness of the importance of meaningful learning and adapting it to students' socio-cultural characteristics, which can be a catalyst for increasing engagement and academic achievement.

F. Evaluation of the Effectiveness of Contextual Teaching Materials on Improving Numeracy

The study analyzed teachers' perceptions of the contribution of contextual teaching materials in optimizing junior high school students' numeracy skills.

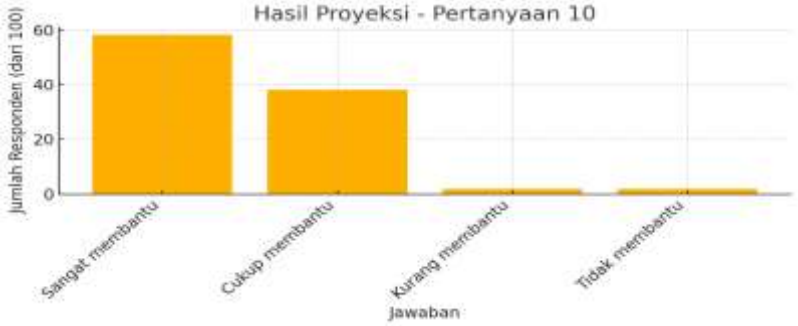

Diagram 6. Assessment of the Effectiveness of Contextual Teaching Materials on Numeracy

The analysis revealed high teacher optimism regarding the potential of contextual learning materials, with 67.27% rating them as "Very helpful" and 32.73% rating them as "Quite helpful" in improving numeracy skills. No teachers gave negative ratings, confirming the collective belief in the effectiveness of context-based learning approaches. These findings strengthen the theoretical argument that mathematics learning relevant to students' life experiences can enhance intrinsic motivation, conceptual understanding, and application skills, ultimately contributing to comprehensive improvements in numeracy literacy.

DISCUSSION

The results of this study reveal several important aspects related to teachers' perceptions of the development of mathematics materials based on Papuan local wisdom in the context of numeracy learning in junior high schools. In general, the majority of teachers assessed students' numeracy skills as still low, with 45% of teachers rating them as "Poor" and 35% as "Sufficient." This aligns with the National Education Report Card data, which shows a decline in numeracy achievement in Central Papua from 48.54% (2023) to 45.96% (2024). This condition indicates that conventional learning approaches are not fully effective in meeting students' learning needs, particularly in developing contextual numeracy skills. Furthermore, the data shows that 56.36% of teachers stated that students often experience difficulty understanding contextual numeracy problems, and 43.64% stated that this occurs "sometimes." Students' unfamiliarity with real-life situations is a key factor, reinforcing the findings of Qomaria & Tsulutsya (2020) that students often fail to grasp the essence of the problem because the numeracy problems are not closely related to their life experiences. This means that numeracy learning in Central Papua has not yet adopted an approach that emphasizes the relevance of local context and culture.

The minimal use of locally based teaching materials by teachers (40% stated "never" and 42.82% "sometimes") indicates that the potential of Papuan local wisdom has not been systematically incorporated into mathematics learning. This corroborates the findings of a study by Tamur et al. (2022), which showed that teachers in the 3T (United Territories) lack the skills or resources to integrate ethnomathematics into their learning. Yet, various local cultural practices, such as geometric patterns in carving, estimation in agriculture, and the traditional Papuan barter system, possess significant mathematical value (Purwanty & Fredy, 2020; Susilawati, 2023). Although the implementation of local teaching materials is still limited, teachers' responses to the effectiveness of culture-based approaches have been very positive. A total of 90.91% of teachers "agreed" or "strongly agreed" that using local cultural contexts can improve students' understanding of mathematics. This finding aligns with a study by Lindang et al. (2024) which showed that local culture-based learning media significantly improved numeracy skills. This reflects teachers' epistemological awareness that learning materials that are close to students' lives will facilitate the process of knowledge construction.

Meanwhile, 100% of teachers stated their readiness to use local wisdom-based books if available, reflecting their mental readiness and attitudinal support for learning innovation. This phenomenon reinforces the findings of Rahmawati et al. (2023) and Wona Una et al. (2024), who emphasized the importance of strengthening systemic support, such as training and providing adaptive teaching materials, to optimally utilize this potential. In terms of effectiveness, 67.27% of teachers rated the contextual teaching materials as "very helpful" and 32.73% as "quite helpful" in improving students' numeracy. No negative responses emerged. This confirms the suitability of the ethnomathematics approach to the learning characteristics of Papuan students, who tend to think contextually and visually. These findings corroborate the research findings of Wahyuni & Septiati (2024) that the locally based Problem-Based Learning model can significantly improve students' numeracy literacy.

Based on teacher needs, the top priorities identified were: (1) intensive training (87%), (2) provision of contextual teaching materials (76%), and (3) sample questions based on local culture (53%). This hierarchy of needs indicates that teachers require not only conceptual inspiration but also concrete support in the form of resources and professional capacity development (Annajmi et al., 2022). Without this support, positive teacher perceptions will not be enough to ensure sustainable pedagogical transformation. Overall, these findings confirm that integrating Papuan local wisdom into mathematics learning has transformative potential to improve students' numeracy while strengthening their cultural identity. However, realizing this potential requires systemic and sustainable policy support, including local curriculum development, needs-based training, and the development of contextual and applicable learning media.

CONCLUSION

Based on the data analysis and discussion, it can be concluded that junior high school mathematics teachers in Central Papua Province have a very positive perception of the development of locally-based materials. The majority of teachers believe that integrating local culture into mathematics learning has significant potential for improving students' numeracy skills. This is reflected in the high level of teacher agreement regarding the effectiveness of contextual approaches and their willingness to use culturally-based teaching materials when available.

This research also revealed a gap between Papua's rich local wisdom and the still-dominantly conventional learning practices. Most teachers have not actively implemented contextual teaching materials due to limited training, references, and appropriate learning media. These findings emphasize the need for systemic support from local governments, training institutions, and curriculum developers to foster a culturally relevant transformation of numeracy learning. Theoretically, this research adds to the literature on ethnomathematics and teacher perceptions in the context of education in the 3T (third-most remote) regions, particularly Central Papua. Practically, the results can inform policymaking in developing a locally based curriculum, developing contextual teaching materials, and developing teacher training programs focused on inclusive and contextual numeracy literacy. Thus, strengthening numeracy in Central Papua requires not only an adaptive pedagogical approach but also a multi-level commitment to making local wisdom an integral part of the education system. This step will not only improve students' academic competence but also strengthen cultural identity and the connection between schools and their local communities.

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