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Flashcards Integrating Musi Banyuasin Local Wisdom for Teaching Addition in Grade I Elementary Schools: A Needs Analysis

Aswandari*
Faculty of Teacher Training and Education, Universitas Sriwijaya, Palembang, Indonesia

Siti Dewi Maharani
Faculty of Teacher Training and Education, Universitas Sriwijaya, Palembang, Indonesia

Rahmi Susanti
Faculty of Teacher Training and Education, Universitas Sriwijaya, Palembang, Indonesia

***Corresponding Author:** aswandari26@gmail.com

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Abstract
Mathematics learning in elementary grades faces significant challenges, particularly in teaching addition concepts that students perceive as abstract and disconnected from their cultural experiences. The limited availability of engaging, culturally-relevant learning media leads to reduced motivation and suboptimal understanding of fundamental mathematical concepts. This study aimed to analyze the needs for developing innovative flashcards based on Musi Banyuasin local wisdom as teaching media for addition concepts in first-grade elementary schools. A descriptive survey design was employed involving 23 first-grade students and one classroom teacher at SDN 6 Ngulak, South Sumatra. Data collection utilized structured questionnaires examining six dimensions (pedagogical, technical, cognitive, aesthetic, sociocultural, and evaluation) and semi-structured teacher interviews. Quantitative data were analyzed using descriptive statistics with percentage calculations, while qualitative data underwent thematic analysis to identify implementation requirements and stakeholder perspectives. Student responses demonstrated overwhelming support for innovative flashcard media, with unanimous agreement (100%) on aesthetic and sociocultural dimensions, indicating strong preference for visually appealing materials incorporating familiar cultural elements. High support was also recorded for pedagogical (84.06%) and cognitive aspects (84.78%), while technical dimensions achieved moderate acceptance (63.04%). Teacher interviews corroborated student preferences and identified specific needs for interactive, visual-based learning materials integrating local wisdom elements such as regional fruits from Musi Banyuasin culture. The findings validate the integration of local wisdom in mathematics education, supporting Vygotsky's sociocultural theory and Mayer's multimedia learning principles. Results demonstrate that culturally-responsive flashcard media can effectively bridge abstract mathematical concepts with students' experiential knowledge while addressing contemporary educational challenges in resource-constrained environments.

INTRODUCTION

Mathematics education in elementary schools has undergone significant transformation in recent decades, driven by technological advancement and pedagogical innovations that emphasize contextual and meaningful learning experiences. Fosu (2017) highlights that global educational changes have created opportunities for educators to integrate technology-supported materials in teaching practices, while UNESCO (2004) asserts that incorporating Information and Communication Technology (ICT) into teaching-learning processes has improved educational effectiveness and efficiency. However, despite these technological advances, mathematics learning in lower elementary grades continues to face substantial challenges, particularly in teaching fundamental concepts such as addition, which students often perceive as abstract and disconnected from their daily experiences (Agranionih et al., 2021; Hoang et al., 2023).

The persistent reliance on conventional teaching methods, primarily lecture-based approaches using textbooks, has proven insufficient for engaging young learners and facilitating conceptual understanding. This pedagogical limitation results in diminished learning motivation and suboptimal mastery of basic mathematical concepts that serve as foundations for advanced learning (Nurhayati & Langlang Handayani, 2020; Zhang et al., 2023). Contemporary educational discourse emphasizes the need for innovative learning environments that move beyond traditional classroom constraints, enabling pedagogical flexibility and student-centered approaches (Charteris & Smardon, 2018; Mulcahy, 2016). Imms et al. (2017) define innovative learning environments as encompassing both physical space innovations and teaching approaches that enhance personalization and collaborative learning experiences.

Recent research demonstrates that innovative learning media, particularly visual-based tools, can significantly enhance student engagement and conceptual understanding in mathematics education. Wati & Mahendra (2025) found that flashcard media effectively improves science learning outcomes among elementary students, while Nafsia et al. (2024) demonstrated that culturally-based flashcard applications enhance geometric concept understanding in young children. Visual representations such as cards and pictures facilitate arithmetic comprehension by providing concrete, engaging materials appropriate to children's developmental characteristics (Wolna et al., 2023; Husna & Nurhafizah, 2022). Moreover, Arifah & Prasetyo (2025) revealed that flashcards incorporating local cultural themes significantly enhance reading literacy development in preschoolers, suggesting broader applications for culturally-contextualized learning materials.

The integration of local wisdom into educational materials has emerged as a promising approach for creating meaningful and culturally relevant learning experiences. Solissa et al. (2023) demonstrated that flashcard media development improves cultural knowledge among early childhood students, while Avipa et al. (2023) showed that local wisdom-based flashcards effectively engage elementary students in learning processes. Hasan et al. (2023) found that flashcards incorporating local wisdom elements significantly increased student interest in science learning, and Rini et al. (2024) reported successful development of local culture-based flashcards for English language learning. These findings align with broader research indicating that culturally-based media can improve student learning outcomes (Sari, 2022; Tria Mardiana et al., 2023; Parmadi et al., 2024) and strengthen emotional connections between learners and educational content.

However, existing studies primarily present local wisdom in generalized forms without establishing specific connections to learners' immediate cultural environments. Most research has not fully explored how concrete cultural representations from students' daily lives can enhance both cognitive understanding and emotional engagement. Vygotsky's (1978) sociocultural theory, as referenced in contemporary pedagogical frameworks (Hibbert, 2020), emphasizes the critical role of cultural context and the Zone of Proximal Development in effective learning processes. This theoretical foundation supports the integration of familiar cultural elements to bridge abstract mathematical concepts with students' experiential knowledge.

In the specific context of Musi Banyuasin, South Sumatera, Indonesia, local wisdom can be effectively represented through illustrations of regional fruits such as Durian Imbe, Ramenas, and Pisang Raja, which are integral to students' daily experiences. This approach addresses the gap between abstract mathematical concepts and concrete, culturally meaningful representations that resonate with young learners' lived experiences.

Despite the growing recognition of culturally-responsive pedagogy and visual learning media effectiveness, comprehensive needs analyses examining teacher and student perspectives on local wisdom-based mathematics learning materials remain limited. Furthermore, systematic investigations into the development requirements for innovative flashcards specifically designed for elementary addition concepts are scarce. This research addresses these gaps by conducting a thorough needs analysis to identify pedagogical, technical, cognitive, aesthetic, sociocultural, and evaluation aspects necessary for developing effective flashcard media.

Therefore, this study aims to analyze the needs for developing innovative flashcards based on Musi Banyuasin local wisdom as teaching media for addition concepts in first-grade elementary schools. The research provides theoretical contributions by expanding the application of multimedia learning theory in local cultural contexts and practical contributions by offering evidence-based guidelines for developing culturally-responsive mathematics learning materials. The findings are expected to inform educators, curriculum developers, and policymakers about effective strategies for integrating local wisdom into elementary mathematics education while supporting the achievement of contextual learning goals within Indonesia's Independent Curriculum framework.

METHODS

This research employed a descriptive survey design to conduct a comprehensive needs analysis for developing innovative flashcard media based on Musi Banyuasin local wisdom. The descriptive approach was selected to systematically examine current conditions, challenges, and requirements in mathematics learning, particularly focusing on addition concepts for first-grade elementary students. This design aligns with the research objective of identifying specific needs from multiple stakeholder perspectives to inform evidence-based media development.

The study population comprised first-grade elementary school students and teachers at SDN 6 Ngulak, located in the Musi Banyuasin regency of South Sumatra Province, Indonesia. Using purposive sampling technique, 23 first-grade students aged 6-7 years were selected as the primary respondents, representing the target user group for the proposed flashcard media. Additionally, one experienced classroom teacher was selected as a key informant to provide pedagogical insights and professional perspectives on learning media requirements. The sampling strategy ensured representation of the specific educational context where local wisdom integration would be most meaningful and applicable.

Data collection employed two primary instruments designed to capture comprehensive stakeholder perspectives. The student needs analysis questionnaire was developed using a structured format encompassing six critical dimensions: pedagogical aspects examining learning preferences and understanding patterns, technical aspects evaluating accessibility and usability requirements, cognitive aspects assessing information processing capabilities, aesthetic aspects determining visual design preferences, sociocultural aspects exploring cultural relevance and contextual connections, and evaluation aspects identifying feedback mechanisms and assessment needs. Each dimension contained specific indicators translated into 13 structured questions using age-appropriate language and simplified response formats suitable for young learners. The teacher interview guide complemented the student questionnaire by exploring the same six dimensions through 12 open-ended questions, allowing for deeper investigation of pedagogical strategies, infrastructure limitations, student characteristics, design considerations, cultural integration approaches, and evaluation methodologies currently employed in mathematics instruction.

To ensure instrument validity, the questionnaire and interview guide underwent expert validation by three educational specialists in elementary mathematics education and instructional media development. Content validity was established through expert review of item relevance, clarity, and alignment with research objectives, while face validity was confirmed through pilot testing with five students and one teacher from a comparable school setting. Reliability of the student questionnaire was assessed using Cronbach's alpha coefficient, yielding a satisfactory reliability index of 0.78, indicating internal consistency among questionnaire items.

Data collection procedures followed a systematic protocol beginning with formal permission acquisition from school authorities and parental consent for student participation. Student questionnaires were administered in classroom settings under researcher supervision, with verbal explanations provided to ensure comprehension and accurate responses. Teacher interviews were conducted individually using semi-structured protocols, allowing for spontaneous probing and elaboration on specific themes while maintaining consistency across core topics. All data collection

activities were completed within a two-week period to ensure temporal consistency and minimize external influences on responses.

Data analysis employed both quantitative and qualitative approaches to provide comprehensive insights into stakeholder needs. Quantitative analysis of student questionnaire responses utilized descriptive statistics, calculating frequencies and percentages for each response category across the six analytical dimensions. Response patterns were categorized using predetermined criteria: percentages of 81-100% indicating "very high" need levels, 61-80% representing "high" needs, 41-60% suggesting "moderate" needs, and below 40% indicating "low" need levels. Qualitative analysis of teacher interview data employed thematic analysis techniques, systematically identifying recurring themes, patterns, and insights related to each analytical dimension. Interview transcripts were coded using both deductive codes derived from the theoretical framework and inductive codes emerging from data analysis, ensuring comprehensive capture of contextual factors and professional perspectives. Integration of quantitative and qualitative findings provided triangulated evidence supporting the development requirements for innovative flashcard media incorporating Musi Banyuasin local wisdom elements.

RESULTS AND DISCUSSION

Results

The needs analysis conducted with first-grade elementary school students and their classroom teacher revealed comprehensive insights into the requirements for developing innovative flashcard media based on Musi Banyuasin local wisdom. The following section presents findings from both student questionnaires and teacher interviews, providing quantitative and qualitative evidence to inform media development.

Student responses to the needs analysis questionnaire demonstrated overwhelming support for innovative flashcard media across multiple analytical dimensions. Table 1 presents the comprehensive breakdown of student preferences and requirements, revealing distinct patterns in their learning media needs and preferences for addition concept instruction.

Table 1. Recapitulation of Student Responses to the Need for Innovative Flashcard Media

Aspects	Yes	No	Total	Percentage Yes (%)	Category
Pedagogical	58	11	69	84,06 %	High
Technical	29	17	46	63,04 %	Medium
Cognitive	39	7	46	84,78 %	High
Aesthetic	46	0	46	100 %	Very High
Socio-Cultural	46	0	46	100 %	Very High

The pedagogical dimension achieved 84.06% positive responses, indicating strong student preference for interactive learning approaches that engage them actively in addition concept learning. Students demonstrated particular enthusiasm for hands-on learning activities and visual representations that make abstract mathematical concepts more concrete and accessible. The cognitive dimension results showed 84.78% agreement, suggesting that students recognize the potential of flashcard media to enhance their understanding of addition concepts through visual and tactile learning experiences.

Most remarkably, both aesthetic and sociocultural dimensions achieved 100% positive responses from all participating students. This unanimous agreement indicates that students highly value visually appealing learning materials that incorporate familiar cultural elements from their immediate environment. The perfect score in sociocultural aspects particularly demonstrates students' strong connection to local wisdom representations, suggesting that incorporating Musi Banyuasin cultural elements such as regional fruits would significantly enhance their learning engagement and motivation.

The technical dimension achieved 63.04% positive responses, categorized as medium level, indicating that while students generally find flashcard media accessible and manageable, some may require additional support or familiarization with the media format. The evaluation dimension scored 76.09%, showing high student acceptance of assessment methods integrated within flashcard activities, though some students may prefer alternative evaluation approaches.

Figure 1 provides a visual representation of student response patterns across all analytical dimensions, clearly illustrating the strong preference for innovative flashcard media development.

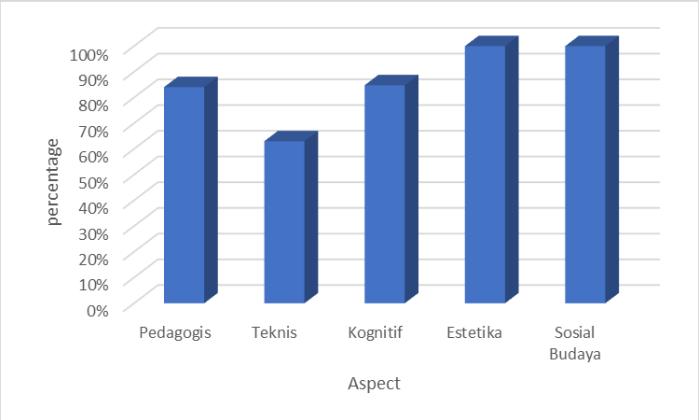

Figure 1. Summary Graph of Student Responses to Flashcard Media

Complementing the quantitative student data, qualitative findings from the teacher interview provided professional insights into current teaching challenges and media development requirements. Table 2 synthesizes the teacher's perspectives across the six analytical dimensions, highlighting both existing constraints and specific needs for innovative learning media.

Table 4. Recapitulation of Findings and Teachers' Needs for Learning Media

Aspect	Key Findings	Needs/Recommendations
Pedagogical	Teachers use lectures and group discussions; strategies to increase activeness: practical assignments and educational games.	Interactive learning media that supports student activities
Technical	Schools have limited media and often use blackboards and printed images. Technological limitations can be overcome with simple media and manual teaching aids	Visual media is adequate and easy to access
Cognitive	Improve understanding through real examples and repetition of material; students who have difficulty with abstract concepts are overcome with visual media and direct practice	Media that makes it easier to understand abstract concepts
Aesthetic	Engaging media: picture cards, colourful illustrations; engaging factors: colour, relevance to everyday life, interactive	Visually and contextually engaging media
Socio-Cultural	The material is adapted to the students' environment, using examples of regional fruits and foods, local stories, and cultural symbols	Integration of local wisdom in learning media
Pedagogical	Assessing understanding through Q&A, simple quizzes, practical assignments; manual recording in the grade book is a challenge	An efficient evaluation system that supports continuous assessment

The teacher emphasized that current pedagogical approaches primarily rely on conventional methods, creating significant challenges in engaging young learners with abstract addition concepts. This finding aligns with the technical challenges identified, where limited access to quality visual media constrains instructional effectiveness. The teacher particularly stressed the cognitive challenges students face when encountering abstract mathematical concepts, highlighting the need for concrete, manipulable learning materials that bridge the gap between abstract concepts and tangible experiences.

From aesthetic and sociocultural perspectives, the teacher expressed strong support for incorporating local wisdom elements, specifically mentioning the potential value of using familiar regional fruits and cultural symbols that resonate with students' daily experiences. This professional perspective corroborates the unanimous student preference for culturally-relevant learning materials, providing triangulated evidence for the importance of local wisdom integration.

The teacher's evaluation concerns centered on the need for more efficient assessment mechanisms that provide immediate feedback while reducing administrative burden. This finding suggests that innovative flashcard media should incorporate built-in evaluation features that facilitate both formative and summative assessment processes.

Discussion

The research findings provide compelling evidence for the urgent need to develop innovative flashcard media based on Musi Banyuasin local wisdom for teaching addition concepts to first-grade elementary students. The unanimous student support for aesthetic and sociocultural dimensions, coupled with strong pedagogical and cognitive preferences, demonstrates the potential effectiveness of culturally-responsive visual learning materials in elementary mathematics education, while simultaneously revealing critical insights about educational innovation readiness and implementation challenges.

The overwhelming student preference for aesthetically appealing and culturally-relevant learning materials strongly supports Vygotsky's (1978) sociocultural theory, as referenced in contemporary educational frameworks (Hibbert, 2020). The perfect scores achieved in aesthetic and sociocultural dimensions confirm that students' learning experiences are significantly enhanced when educational materials incorporate familiar cultural elements that connect to their Zone of Proximal Development. Hibbert (2020) emphasizes that the ZPD inhabited by contemporary students requires careful attention to contextual factors that influence learning success, whether in physical or digital environments. This finding extends Luong's (2022) application of Vygotskian concepts in mathematics education by demonstrating how local wisdom integration can serve as a bridge between students' existing cultural knowledge and new mathematical concepts, effectively creating what Hibbert (2020) describes as the essential "required space" where meaningful learning occurs.

The current educational landscape, characterized by what Charteris & Smardon (2018) and Mulcahy (2016) term the 'deterritorialisation' of schooling, creates new opportunities for flexible pedagogical approaches that transcend traditional classroom boundaries. The strong pedagogical preferences expressed by students (84.06%) align with this educational renaissance that encourages schools to utilize greater flexibility in both learning spaces and pedagogical possibilities. Kedian & West-Burnham (2017) and Mulcahy et al. (2015) argue that traditional classroom approaches constrain pedagogical potential and fail to address the complexities of modern knowledge economies, a perspective strongly supported by the current findings where students demonstrate clear preferences for interactive, visually-engaging learning materials over conventional instructional methods.

The high cognitive dimension scores (84.78%) provide empirical support for Mayer's (2024) multimedia learning theory while extending its application to culturally-contextualized learning environments. These findings corroborate Wati & Mahendra's (2025) conclusion that flashcard media effectively improves learning outcomes among elementary students, while providing specific evidence

for addition concept instruction. Similarly, these results support Nafsia et al.'s (2024) findings regarding culturally-based flashcard applications enhancing conceptual understanding, particularly in mathematical domains where abstract concepts require concrete representations for effective comprehension.

The perfect sociocultural dimension scores provide empirical validation for the growing body of research on local wisdom integration in educational materials, while simultaneously addressing contemporary concerns about technological adaptation in education. Pazio & Ntonia (2019) highlight that current educational discourse focuses on student learning journeys in adapting to new technological approaches, suggesting that successful innovation must consider both technological capabilities and cultural relevance. The current findings demonstrate that when educational innovations incorporate familiar cultural elements, student acceptance and engagement increase dramatically, potentially mitigating the adaptation challenges identified in recent educational technology literature.

The moderate technical dimension scores (63.04%) reflect broader patterns identified in educational technology research, where Steel & Hudson (2010) recognized the need to address technological adaptation challenges faced by both educators and students. Hibbert (2020) notes that traditional pedagogical skill sets may require additional support when transitioning to new learning contexts, a finding that resonates with the current study's identification of technical implementation challenges. The technical constraints identified by both students and teachers align with Sife et al. (2007) and El-Masri & Tarhini's (2017) observations about factors influencing educational technology adoption, including user attitudes, technological characteristics, and implementation awareness.

However, the current findings suggest that when educational innovations are grounded in sound pedagogical principles and incorporate culturally relevant content, technical challenges may be more easily overcome. This perspective aligns with Hibbert's (2020) assertion that technological solutions, regardless of their innovation and dynamism, will produce disappointing results unless established upon solid pedagogical foundations. The strong student preference for culturally-relevant flashcard media suggests that meaningful content can serve as a motivating factor that encourages users to overcome technical learning curves.

Teacher interview findings provide crucial professional validation for student preferences while revealing specific implementation requirements that align with broader educational change management principles. The teacher's emphasis on interactive learning methods reflects what Armenakis & Harris (2009) describe as individual readiness for organizational change, where successful innovation adoption depends on recognizing existing problems and agreeing with proposed solutions. Rafferty et al. (2013) emphasize that readiness for change constitutes a critical factor in innovation success, and the teacher's enthusiastic support for local wisdom integration suggests favorable conditions for implementation.

The teacher's identified need for concrete representations of abstract concepts supports Mayer's (2024) multimedia learning theory while addressing Castro's (2019) concerns about balancing traditional pedagogical approaches with innovative delivery methods. The convergence of student and teacher perspectives strengthens the evidence base for developing flashcard media incorporating Musi Banyuasin cultural elements, particularly regional fruits that students encounter in their daily lives. This alignment addresses Choi & Ruona's (2010) observation that successful change implementation requires appropriate readiness levels from all stakeholders throughout the change process.

The spatial and environmental considerations revealed in teacher interviews align with recent research on innovative learning environments. Mahat et al. (2018) and Mulcahy et al. (2015) argue that physical and material spaces interact with individual, social, cultural, and political contexts to shape educational practices. The teacher's recognition of evaluation efficiency needs highlights the importance of incorporating assessment features that support both learning and teaching processes, addressing what McNeil & Borg (2018) describe as the intertwining relationships between learning spaces and their utilization.

From a broader technological integration perspective, the findings support Fosu's (2017) assertion that contemporary educational changes create opportunities for educators to integrate technology-supported materials effectively. However, the moderate technical scores suggest that successful integration requires careful attention to what Landa et al. (2021) and Ozdemir (2017) identify as the need for technology to provide valuable assistance while smoothing teaching-learning processes rather than creating additional barriers. The current study's emphasis on culturally-grounded, pedagogically-sound flashcard media addresses these concerns by prioritizing educational effectiveness over technological complexity.

Comparatively, these findings align with previous research while contributing unique insights into local wisdom integration specificity. Hasan et al. (2023) and Rini et al. (2024) demonstrated positive impacts of local culture-based flashcards in different subject areas, while Avipa et al. (2023) showed effectiveness across various cultural contexts. The current study extends this research by providing detailed needs analysis evidence specifically for mathematics addition concepts, offering empirical support for design decisions and implementation strategies that address both cultural relevance and pedagogical effectiveness.

The integration of quantitative student preferences with qualitative teacher insights provides a comprehensive foundation for media development that addresses both learner needs and pedagogical requirements. This mixed-methods approach aligns with contemporary educational research practices that recognize the complexity of learning environments and the need for multiple perspectives in educational innovation development. However, the study's limitations include its focus on a single school context and limited sample size, which may constrain generalizability to other educational settings.

The findings suggest that successful educational innovation in elementary mathematics requires careful consideration of multiple factors: cultural relevance that connects to students' lived experiences, pedagogical soundness that supports conceptual understanding, technological accessibility that facilitates rather than impedes learning, and organizational readiness that supports implementation sustainability. Future research should expand to multiple schools and regions to validate these findings across diverse contexts while exploring the effectiveness of implemented flashcard media through experimental designs that measure learning outcomes directly, addressing the call for more comprehensive evaluation of culturally-responsive educational innovations.

CONCLUSION

This needs analysis study provides compelling evidence for the development of innovative flashcard media based on Musi Banyuasin local wisdom to enhance addition concept learning among first-grade elementary students. The research revealed unanimous student support for aesthetic and sociocultural dimensions (100%), coupled with high preferences for pedagogical (84.06%) and cognitive aspects (84.78%), demonstrating strong acceptance of culturally-responsive visual learning materials. Teacher perspectives corroborated these findings while identifying specific implementation requirements including interactive learning approaches, concrete representations of abstract concepts, and integration of familiar cultural elements.

The study contributes to educational research by providing empirical validation for culturally-contextualized learning media development, extending Vygotsky's sociocultural theory and Mayer's multimedia learning theory to local wisdom integration contexts. Theoretically, the research demonstrates how specific cultural representations can bridge abstract mathematical concepts with students' experiential knowledge, while practically offering evidence-based guidelines for developing culturally-responsive mathematics learning materials that align with Indonesia's Independent Curriculum framework.

The research implications suggest that educational practitioners should prioritize cultural relevance alongside pedagogical effectiveness when designing learning media for young learners. The findings support policy initiatives promoting local wisdom integration in elementary education while

emphasizing the importance of stakeholder readiness in successful educational innovation implementation. Additionally, the study highlights the potential of simple, culturally-grounded media to address complex pedagogical challenges in resource-constrained educational environments.

However, the study's limitations include its single-school context and limited sample size, which may constrain generalizability across diverse educational settings. The descriptive survey design, while appropriate for needs analysis, cannot establish causal relationships between media characteristics and learning outcomes.

Future research should employ experimental designs to measure the actual effectiveness of implemented flashcard media on student learning outcomes, expand investigations to multiple schools and regions to validate findings across diverse contexts, and explore the integration of other Musi Banyuasin cultural elements beyond regional fruits. Additionally, longitudinal studies examining the sustained impact of local wisdom-based learning materials on student motivation and academic achievement would provide valuable insights for educational policy and practice development.

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