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MODIFICATION OF ELEMENTARY SCHOOL MATHEMATICS QUESTIONS INTO CONTEXTUAL QUESTIONS BASED ON BENGKULU CULTURE

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ABSTRACT
This research aims to develop a prototype of contextual elementary school mathematics problems based on Bengkulu culture by modifying seven conventional problems into authentic narratives that integrate local elements such as the renovation of the Jamik Mosque (mixed arithmetic), the average number of visitors to Soekarno's House (descriptive statistics), the area of the Anggut Atas rembulan batik cloth (area measurement), the volume of the Seluma durian lempuk packaging (cube volume), the circumference of the Rafflesia Kepahiang fence (circumference of a circle), the symmetry of the Besurek batik nail niche motif (transformation geometry), and the remaining spices (fractions). The Define-Develop phase focused on reconstructing the Merdeka curriculum document without field testing, resulting in an instrument that maintains conceptual rigor while enhancing affective relevance in line with Realistic Mathematics Education. The prototype is ready for dissemination as an inclusive teaching material, with implications for teacher training and digital media for elementary school mathematics learning in Bengkulu.
Keywords: ethnomathematics; contextual problems; Bengkulu culture

ABSTRAK
Penelitian ini bertujuan mengembangkan prototipe soal matematika kontekstual sekolah dasar berbasis budaya Bengkulu melalui modifikasi tujuh soal konvensional menjadi narasi autentik yang mengintegrasikan elemen lokal seperti renovasi Masjid Jamik (aritmetika campuran), rata-rata pengunjung Rumah Soekarno (statistik deskriptif), luas kain batik besurek rembulan Anggut Atas (pengukuran luas), volume kemasan lempuk durian Seluma (volume balok), keliling pagar Rafflesia Kepahiang (keliling lingkaran), simetri motif relung paku batik besurek (geometri transformasi), dan sisa bumbu pendap (pecahan). Tahap Define-Develop difokuskan pada rekonstruksi dokumen kurikulum Merdeka tanpa uji lapangan, menghasilkan instrumen yang mempertahankan rigor konseptual sambil meningkatkan relevansi afektif selaras dengan Realistic Mathematics Education. Prototipe siap diseminasi sebagai bahan ajar inklusif, dengan implikasi pelatihan guru dan media digital untuk pembelajaran matematika SD di Bengkulu.
Kata kunci*: budaya Bengkulu; etnomatematika; soal kontekstual*

Introduction

Mathematics is a core subject in education that develops logical reasoning and problem-solving skills; however, many studies report that mathematics learning in schools is often presented abstractly and disconnected from students' sociocultural contexts, resulting in low engagement and conceptual understanding (Andyra et al., 2025; Jeheman et al., 2019;). Recent research on ethnomathematics indicates that

integrating local culture into mathematics learning can enhance relevance, motivation, and comprehension (Mei et al., 2021). yet most instructional materials and assessment problems used in classrooms remain generic and culturally neutral. This gap shows that although the importance of culture based learning is widely acknowledged, practical examples of contextual mathematics problems grounded in specific local cultures particularly Bengkulu culture are still limited. In Indonesia, a culturally diverse country, incorporating local cultural elements into mathematics learning is important not only to facilitate understanding but also to support cultural preservation amid globalization. Therefore, this study proposes reconstructing conventional elementary mathematics problems into contextual problems based on Bengkulu culture as a practical solution to make learning more meaningful. The objective of this research is to develop a prototype of culturally contextualized mathematics problems for elementary school students that maintain mathematical rigor while reflecting local cultural contexts (Widyasari et al., 2021).

Although mathematics is introduced from early childhood and widely applied in daily life, many students still struggle to understand mathematical concepts when learning materials are presented abstractly (Milla Husna & Noriza Munahefi, 2024). Therefore, the use of interactive teaching materials such as e-modules is essential to improve conceptual understanding, engagement, and the overall quality of mathematics learning (Andyra et al., 2025).

Observations indicate that mathematics learning is still dominated by theoretical explanations and formula-based problem solving, with limited use of contextual teaching materials and varied instructional methods (Mukhlisin & Lestari, 2023). These conditions contribute to low student engagement and motivation, which ultimately hinder the development of conceptual understanding the primary goal of mathematics education (Sularni & Asmara, 2025).

Despite its importance, many students still experience difficulties in mathematical literacy and higher-order thinking, particularly when understanding abstract concepts presented without meaningful context (Sofiyah et al., 2025). These difficulties indicate that mathematics learning has not fully supported conceptual understanding and problem-solving skills, which are essential competencies in modern education (Rahayu, 2021).

Mathematics learning can be made more meaningful by linking concepts to students' real-life contexts, including their sociocultural environment and digital experiences (Keminanda et al., 2025). Given students' high engagement with digital games, this tendency can be utilized as a gamification-based learning strategy to increase motivation and participation. Integrating local cultural contexts through ethnomathematics further supports realistic mathematics learning by connecting abstract concepts with familiar experiences (Layliyyah et al., 2022). The contextual learning model (contextual teaching and learning) is a learning process where learning can be linked to everyday life so that learning becomes more meaningful (Winarto et al., 2023).

Ethnomathematics integrates cultural contexts into mathematics learning to make abstract concepts more meaningful and easier to understand (Mahyudi & Yanti, 2019; Siregar et al., 2020). However, many students still experience low conceptual understanding and limited classroom interaction, causing mathematics to be perceived as difficult and irrelevant (Jeheman et al., 2019; Agustina et al., 2022). To address these problems, cooperative learning models such as Student

Teams Achievement Division (STAD) can be implemented, as they promote collaboration, peer discussion, and active participation, which are essential for constructing conceptual understanding. Integrating ethnomathematics-based content into STAD-supported e-modules is therefore expected to enhance learning motivation, interaction, and comprehension by combining meaningful contexts with cooperative learning strategies (Nopianti et al., 2025). Previous studies report that students' low conceptual understanding and limited participation are often associated with teacher-centered instruction that relies heavily on direct explanation n without supportive interactive media(Nurkhomisa et al., 2025; Riyadi & Supriatna, 2025). However, these studies tend to focus on identifying learning difficulties without offering integrative solutions, such as combining appropriate learning models with engaging digital or visual media. This limitation indicates a gap in the development of instructional approaches that simultaneously address conceptual understanding, student interaction, and learning motivation

Based on the problems identified during the field study, this research addresses the need for innovative learning materials that can improve students' conceptual understanding and engagement in mathematics. Previous studies have examined e-modules, cooperative learning models such as Student Teams Achievement Division (STAD), and educational games separately; however, few studies have integrated these components into a single learning product. In particular, no prior research has developed a mathematics e-module on sequences and series that combines the STAD model with gamification elements to simultaneously promote collaboration, motivation, and conceptual understanding. Therefore, this study proposes the development of a STAD-based e-module supported by educational games as an integrated instructional solution. The objective of this research is to develop and analyze a contextual mathematics e-module that facilitates cooperative learning, interactive engagement, and meaningful understanding of mathematical concepts. (Sari, 2021).

Research Methods

This study used a qualitative descriptive approach with elements of product development to construct a prototype of contextual mathematics problems based on Bengkulu culture. The qualitative approach was chosen because the study focused on analyzing documents and reconstructing problems rather than measuring learning outcomes in classrooms. The development component was limited to producing a validated prototype without field trials (Wulandari et al., 2024).

Data were collected from secondary sources, including (1) Merdeka Curriculum documents for elementary mathematics, (2) elementary mathematics textbooks and teaching modules commonly used in schools, and (3) scholarly articles and ethnographic publications on Bengkulu culture, such as traditional architecture, textiles, ceremonies, and local culinary practices. These documents were selected based on their relevance to elementary mathematics topics and the authenticity of the cultural information. Field observation was not conducted because reliable cultural data were already available in published academic sources, making document analysis sufficient for developing theoretically grounded contextual problems.

The research procedure was carried out sequentially through four stages: (1) identifying conventional mathematics problems from textbooks, (2) selecting relevant cultural contexts from Bengkulu that match the mathematical concepts, (3) integrating

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these contexts into problem narratives while maintaining mathematical accuracy, and (4) revising the problems based on expert feedback. This integration process follows the principle of horizontal mathematization in Realistic Mathematics Education, which refers to transforming real-life situations into mathematical representations to support meaningful learning.

Data were analyzed using qualitative content analysis. The analysis steps included organizing the collected documents, reducing irrelevant information, categorizing mathematical concepts and cultural elements, synthesizing contextual problem narratives, and drawing conclusions regarding their suitability.

Validation was conducted through virtual expert review involving two experts: one specialist in mathematics education and one in local culture. Experts were selected based on academic qualifications, research experience, and familiarity with ethnomathematics. The validation process used an assessment sheet and online consultation to evaluate content accuracy, language clarity, contextual relevance, and cultural appropriateness. Revisions were made according to the experts' recommendations.

To ensure data credibility, source triangulation was applied by comparing information from curriculum documents, textbooks, and cultural literature. Method triangulation was also used by combining document analysis with expert validation. These triangulation strategies strengthened the reliability of the reconstructed problems despite the absence of field observation. The result of this process is a theoretically valid prototype of contextual mathematics problems aligned with the Merdeka Curriculum and Bengkulu cultural contexts.

Results and Discussion

Results

The development process produced a prototype instrument consisting of seven contextual mathematics problems for elementary school students. Conventional textbook problems were reconstructed into problems that incorporate elements of Bengkulu culture while maintaining mathematical accuracy. The reconstruction was based on document analysis and expert validation shows in Table 1.

Table 1. Comparison of Conventional and Contextualized Problems

No	Topic	Conventional Problem	Contextual Problem (Bengkulu Culture)
1	Mixed Arithmetic	Calculate 450 + 320 - 150	During the renovation of Jamik Mosque in Bengkulu, 450 wooden beams and 320 stones were used, but 150 materials were damaged. How many materials remain?
2	Mean (statistics)	Given data: 12, 18, 24, 16. Calculate the average	The number of visitors to Soekarno's House from Monday to Thursday was 12, 18, 24, and 16 people. What is the average number of visitors per day?
3	Area of rectangle	Find the area of a rectangle (150 cm × 100 cm).	A craftsman in Anggut Atas makes a Besurek batik cloth measuring 150 cm by 100 cm. What is the area of the cloth?
5	Circumference	A circle has a diameter of 100 cm. Find its circumference.	A circular fence is built to protect a Rafflesia flower with a diameter of 100 cm. How long is the fence needed?

6	Symmetry	Determine the number of lines of symmetry in a rhombus.	A rhombus-shaped Besurek batik motif is used in traditional cloth. How many lines of symmetry does the motif have?
7	Fractions	Mother has 2 kg of sugar. She used 1/2 kg and 1/4 kg. How much remains?	To prepare traditional pendap, a mother used 1/2 kg of sugar for cooking and 1/4 kg for drinks from a 2 kg supply. How much sugar remains?

Expert Validation Results

The prototype was evaluated by two experts (mathematics education and local culture). Validation covered four aspects: content accuracy, language clarity, contextual relevance, and cultural appropriateness.

a. Content validity: appropriate mathematical concepts and solutions
b. Language clarity: suitable for elementary students
c. Contextual relevance: real-life situations familiar to students
d. Cultural appropriateness: authentic representation of Bengkulu culture

Overall, experts agreed that the problems were feasible for use as contextual mathematics tasks, with minor revisions for wording and clarity.

Discussions

The reconstruction of mathematics problems into culturally contextualized forms reflects the principles of Realistic Mathematics Education (RME), particularly the concept of horizontal mathematization. Horizontal mathematization refers to the process of translating real-life situations into mathematical representations. In this study, cultural contexts such as Jamik Mosque renovation, Besurek batik production, and traditional culinary activities function as meaningful situations that allow students to interpret mathematical problems within familiar experiences.

For example, the arithmetic problem related to mosque renovation illustrates how numerical operations can be interpreted through real-world situations. Similarly, the statistics problem uses visitor data from a historical site, allowing students to interpret mathematical concepts through observable social phenomena. Measurement concepts such as area, volume, and circumference are contextualized through local crafts, food packaging, and environmental conservation. These contexts demonstrate how mathematics can be used to describe objects and activities found in everyday life.

From an ethnomathematics perspective, the integration of Bengkulu cultural elements reveals how mathematical ideas exist within cultural practices. Cultural artifacts such as Besurek batik patterns contain geometric structures that can be analyzed mathematically. By incorporating these elements into mathematics problems, students are encouraged to recognize that mathematical thinking is closely related to their cultural environment.

These findings are consistent with previous studies that emphasize the role of ethnomathematics in improving the relevance of mathematics learning. For instance, research by Wulandari et al. (2024) and Keminanda et al. (2025) demonstrates that local cultural contexts can support students' understanding of mathematical concepts by connecting abstract knowledge with familiar experiences. The present study extends these findings by reconstructing conventional problems into contextual problems specifically based on Bengkulu culture.

One strength of the reconstructed problems is their ability to maintain mathematical accuracy while incorporating cultural contexts that are meaningful for students. This balance is important because contextualization should not compromise conceptual rigor.

However, this study also has several limitations. First, the prototype was validated only through expert review and has not yet been tested in classroom settings. Therefore, empirical evidence regarding its effectiveness in improving student motivation or learning outcomes is not yet available. Second, the cultural contexts selected in this study represent specific aspects of Bengkulu culture. Students from different cultural backgrounds may require additional contextual adaptation to ensure relevance.

Despite these limitations, the study provides an important contribution to mathematics education by offering a model for reconstructing conventional mathematics problems into culturally contextualized problems. Such contextual problems can be used as alternative teaching materials or assessment items in elementary mathematics learning.

From a practical perspective, the results suggest that teachers can incorporate local cultural contexts when designing mathematics problems to make learning more meaningful. The prototype developed in this study may also serve as a reference for developing contextual question banks that reflect local cultural knowledge. Future research is recommended to conduct classroom trials to examine students' responses, learning engagement, and conceptual understanding when using these contextual problems.

Conclusion and Suggestion

This study developed a prototype of contextual elementary mathematics problems based on Bengkulu culture by reconstructing conventional questions into culturally meaningful narratives. The resulting problems maintain mathematical accuracy while incorporating authentic local contexts, making them suitable as alternative assessment materials aligned with the principles of Realistic Mathematics Education and the Merdeka Curriculum. The findings indicate that local cultural elements can be systematically integrated into mathematics tasks to support meaningful learning. However, the prototype has not been tested in classroom settings; therefore, further research is needed to examine its practicality, effectiveness, and student responses in real learning environments. Future studies may also explore adaptation to different cultural contexts and the development of similar contextual instruments for other mathematical topics

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