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Exploring Mathematical Concepts in Rebana Art: An Ethnomathematical Approach for Junior High School Learning

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ABSTRACT

Purpose of the study: This study aims to identify ethnomathematical concepts in rebana art related to one-dimensional, two-dimensional, and three-dimensional geometry, arithmetic sequences, and integer operations. Furthermore, this study also seeks to test the potential of rebana art as a source of mathematics learning for junior high school students.

Methodology: The data obtained were qualitative, while the sources were obtained from observations, interviews, and documentation related to the Rebana Art. The instrument in this study was the researcher herself. The tools used were interview guidelines, observations, and documentation. Data validity techniques were carried out through triangulation through checking method triangulation, source triangulation, and time triangulation, with the data analyzed descriptively qualitatively.

Main Findings: The findings show that rebana art contains ethnomathematic concepts related to one-dimensional, two-dimensional, and three-dimensional geometry through measurement activities, including angles, circles, rectangles, cylinders, and cones. The concept of arithmetic sequences is identified in Qasidah rebana, while integer operations appear in Hadrah rebana performances. Furthermore, rebana art can be aligned with the curriculum as a source of mathematics learning for Grades VII, VIII, and IX.

Novelty/Originality of this study: This study offers a new contribution by systematically mapping specific mathematical topics across different types of tambourine arts and explicitly aligning them with lower secondary school curriculum levels. This study advances ethnomathematics research by showing how local musical traditions can be transformed into structured mathematical learning resources grounded in formal curriculum standards.

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1. INTRODUCTION

Mathematics is a subject that plays a crucial role in developing students' logical, systematic, and critical thinking skills [1], [2]. However, in school learning practices, mathematics is often perceived as abstract and disconnected from students' daily lives. This condition leads to low student interest and understanding of mathematical concepts [3], [4]. Therefore, a learning approach is needed that connects mathematics to real-life and cultural contexts that are close to students' lives [5], [6]. One relevant approach to address this need is ethnomathematics.

Ethnomathematics is the study of connecting mathematical concepts with local culture that develops in a community [7], [8]. This approach positions cultural activities as a source of meaningful and contextual mathematics learning. Through ethnomathematics, students can understand that mathematics is not only sourced from textbooks but also exists in everyday cultural practices [9], [10]. This aligns with learning that emphasizes meaningfulness and connection to students' real-life experiences. Thus, ethnomathematics has the potential to enhance students' conceptual understanding and appreciation of mathematics [11], [12].

Indonesia, as a country rich in culture, has great potential for study from an ethnomathematics perspective [13], [14]. Various forms of traditional art contain mathematical patterns, structures, and activities that can be used as learning resources [15], [16]. One traditional art form that continues to thrive in society is the rebana (tambourine). This art form serves not only as a means of entertainment and religious practice, but also possesses educational value [17], [18]. Therefore, rebana is an interesting study in the context of culture-based mathematics learning.

Rebana art consists of various instruments and playing patterns that indirectly involve mathematical concepts. The rebana's shape, size, arrangement, and beat patterns demonstrate geometric and number concepts. The activities of measuring, counting, and arranging patterns in rebana playing reflect authentic mathematical activity [19], [20]. These concepts have the potential to be linked to mathematics material in junior high schools. However, the mathematical potential of rebana art has rarely been systematically studied in a formal learning context [21], [22].

Mathematics learning in junior high schools covers a variety of basic topics, such as geometry, arithmetic sequences, and integer operations. Students often find these topics difficult because they are presented abstractly [23], [24]. By utilizing rebana art as a learning resource, these mathematical concepts can be presented in a more concrete and contextual way. This approach is expected to help students understand mathematical concepts through cultural experiences close to their lives. Furthermore, culture-based learning can also foster a love for local culture.

Several previous studies have shown that the application of ethnomathematics can improve students' conceptual understanding and learning motivation [7], [25], [26]. However, studies specifically examining rebana art as a mathematics learning resource are still limited. Furthermore, there are few studies that clearly link ethnomathematics findings to the structure of the school curriculum. However, alignment with the curriculum is crucial for implementing research findings in learning. Therefore, research is needed that examines rebana art in depth and integrates it with the curriculum.

Despite the growing body of ethnomathematics research in mathematics education, studies that systematically explore local musical arts and explicitly align their mathematical content with formal junior high school curricula remain limited. Most previous studies focus on identifying mathematical elements in cultural artifacts without clearly mapping them to specific grade levels and learning topics. Therefore, this study offers novelty by comprehensively identifying mathematical concepts embedded in various types of rebana art and explicitly aligning them with geometry, arithmetic sequences, and integer operations taught at Grades VII, VIII, and IX. The urgency of this research lies in the need for contextual and culturally responsive learning resources that can reduce students' perceptions of mathematics as abstract while simultaneously supporting the preservation of local cultural heritage. By integrating rebana art into curriculum-relevant mathematics learning, this study responds to contemporary educational demands for meaningful, culturally grounded, and student-centered instruction.

Based on this description, this study focuses on analyzing the concept of ethnomathematics in rebana art and its potential as a mathematics learning resource for junior high school students. This study examines the concepts of one-dimensional, two-dimensional, and three-dimensional geometry, arithmetic sequences, and integer operations within the rebana art form. Furthermore, the findings are adapted to mathematics materials taught in grades VII, VIII, and IX. It is hoped that the results of this study will provide theoretical and practical contributions to the development of culture-based mathematics learning. Thus, the rebana art form will not only be preserved but also utilized educationally in the world of education.

2. RESEARCH METHOD

2.1. Type of Research

This research uses a qualitative approach because it aims to understand and uncover the meaning behind cultural phenomena related to mathematical concepts. Qualitative research focuses on exploring the reasons and meaning of a phenomenon, rather than on numerical measurements or quantitative relationships [27], [28]. The data analyzed are unstructured, such as interview results, observation notes, and documentation, allowing the researcher to gain a deep understanding of the object of study.

Qualitative approaches often utilize themes, concepts, and patterns as tools for conceptual generalization [29], [30]. In this research, the researcher acts as the primary instrument, directly involved in the data collection process. The researcher observes, interacts with, and asks questions of the research subjects to uncover cultural

meanings that have not been formally documented. This type of research was chosen because the problems studied are complex, contextual, and dynamic, requiring a deep understanding of the social situation.

The primary focus of qualitative research is understanding social realities that are not always explicitly visible [31], [32]. This research seeks to interpret cultural phenomena as sources of mathematical meaning through an ethnomathematics perspective. Thus, the research aims not only to describe phenomena but also to explore the meanings behind these cultural activities.

This research falls into the category of qualitative descriptive research. Researchers directly visited the research location to observe rebana art in its natural context. The research process involved observing, recording, analyzing, interpreting, and reporting findings related to the research focus. This approach enabled researchers to present a detailed, in-depth, and nuanced picture of the phenomenon under study.

Through qualitative descriptive research, the information obtained was presented in the form of meaningful narrative descriptions [33], [34]. This approach was deemed more appropriate than simply presenting data in numerical form, as it captured the complexity and uniqueness of cultural phenomena. Therefore, this study generated descriptive data in the form of words, writings, and observed behaviors of the research subjects, which were then analyzed to uncover the concept of ethnomathematics in rebana art.

2.2. Research Subjects

The research subjects are individuals who can provide information regarding the problem being studied. The subjects in this study were a mathematics teacher and a rebana arts coach at Darul Falah Junior High School, Bandar Lampung.

2.3. Sampling Techniques

The sampling technique used in this study was adapted to a qualitative approach. In qualitative research, sample selection does not focus on quantity or statistical representation, but rather on the depth and completeness of information obtained from the research subjects [35], [36]. Therefore, the selection of informants is a crucial part of the research strategy to ensure the quality of the resulting data.

This study employed purposive sampling, a technique for selecting samples based on specific considerations relevant to the research objectives. This technique was chosen because it enabled the researcher to identify informants deemed to have the best understanding of the research object. With purposive sampling, informants were deliberately selected based on their knowledge, experience, and involvement in the rebana art form.

The primary consideration in selecting informants was their ability to provide in-depth, accurate, and contextual information related to the rebana art form. The selected informants were those directly involved in the practice of the art form, thus able to explain the activities, cultural meanings, and processes related to the research focus. With this technique, the researcher was able to obtain rich and relevant data to uncover the concept of ethnomathematics in the rebana art form.

2.4. Data Collection Techniques

The data collection techniques in this study adopted a qualitative approach, emphasizing the exploration of meaning and a deep understanding of cultural phenomena [37], [38]. Data were obtained through observation, interviews, and documentation, which complemented each other to produce valid and comprehensive data. Observation was used to obtain data directly from sources such as events, activities, places, and objects related to the rebana art form. This technique allowed researchers to observe phenomena in their natural state without manipulating existing conditions. Observation is one of the main techniques in qualitative research because it allows for direct capture of verbal and nonverbal data.

In this study, the researcher employed passive participant observation. The researcher was present at the research location as an observer without directly participating in the rebana art activities. Through this observation, the researcher recorded activities, instrument shapes, playing patterns, and interactions as they occurred. Observations were conducted openly and unstructured, allowing the researcher to freely observe and record anything deemed relevant to the research focus [39], [40].

Interviews were used to obtain in-depth information that could not be obtained through observation alone. The interview technique involved direct, verbal question-and-answer sessions between the researcher and the informant. Interviews allowed researchers to explore informants' perspectives, experiences, and understanding of rebana art and its relationship to mathematical concepts. The type of interview used in this study was unstructured. Researchers did not use a standard interview guide, but instead simply prepared a general outline of the issues to be addressed. This approach allowed informants the freedom to convey information freely and in-depth. Informants were selected based on criteria such as active involvement in rebana art, sufficient experience, and willingness to provide information. Informants in this study included mathematics teachers and students at Darul Falah Junior High School, Bandar Lampung.

The documentation method was used to supplement the data from observations and interviews. Documentation consisted of written notes, photographs, archives, and other documents related to rebana art and the mathematics learning process. This technique involved reviewing relevant documents, noting important information, and understanding their meaning. The documentation method was used to strengthen the research findings related to the concept of ethnomathematics in rebana art. The selection of documentation sources was selective and relevant to the research focus. By combining observation, interviews, and documentation, this research is expected to produce accurate, in-depth, and accountable data.

2.5. Research Design

A research design is a systematic plan designed to guide the data collection, analysis, and interpretation process in accordance with the research objectives [41], [42]. This design aims to ensure that each stage of the research can be implemented in a structured manner, resulting in relevant and accountable findings. In this study, the research design is adapted to a qualitative descriptive approach.

The first stage is the preliminary stage. During this stage, the researcher determines the research location and selects informants relevant to the research focus. The informants are selected purposively, considering their involvement in and knowledge of rebana art. The second stage is the development of the research instrument. During this stage, the researcher develops observation and interview guidelines. The observation guidelines outline aspects to be observed during rebana art activities, while the interview guidelines outline questions aimed at eliciting information about the concept of ethnomathematics within the art form.

The third stage is the implementation of the research. During this stage, the researcher collects data through observations of the research subjects and interviews with mathematics teachers, hadrah instructors, and students. Data collection is conducted directly in the field to obtain natural and contextual data. The fourth stage is data verification. Verification was conducted to ensure the validity and consistency of data obtained from observations and interviews. At this stage, researchers reviewed the information provided by the informants and compared it with the results of observations and documentation.

The fifth stage was data analysis. The data obtained were analyzed descriptively and qualitatively to identify and categorize the ethnomathematics concepts contained in the rebana art form. Analysis was conducted continuously during and after the data collection process. The final stage was drawing conclusions. Conclusions were drawn based on the results of the data analysis to address the research objectives. This stage resulted in a comprehensive overview of the ethnomathematics concept in the rebana art form and its potential as a mathematics learning resource for junior high school students.

2.6. Research Instruments

The human instrument is the research instrument, where the researcher's role as an instrument cannot be replaced by another person. The researcher collects data and deepens it through the researcher's own observations, hearing, perception, and appreciation of the art of rebana. The data collection instruments consist of primary and secondary instruments. The primary instruments are interview guides and observation guides, while the secondary instruments are observation sheets and documentation sheets [43], [44]. The following is a comparison of data collection methods and instruments:

Table 1. Research Instruments

No	Methods	Instruments
1	Interviews	Interview Guidelines
2	Observation	Observation Sheet
3	Documentation	Documentation Sheet

2.7. Data Analysis

Data analysis is a systematic process of examining and interpreting collected data to discover its meaning and patterns. In qualitative research, data analysis is conducted by examining the data from various perspectives to uncover new facts relevant to the research focus [45], [46]. Data are analyzed in depth to gain a comprehensive understanding of the phenomena being studied.

Data analysis in this study was conducted on data obtained from interviews, observations, and documentation. The analysis process was continuous and interactive, meaning that data collection and analysis occurred simultaneously. Analysis was conducted not only after all data had been collected, but also throughout the data collection process. This approach allows researchers to flexibly adjust the research focus until data saturation is reached.

This study uses an interactive data analysis model based on the Spradley model. This model was chosen because it is appropriate for studying cultural phenomena and uncovering the meanings embedded in social practices. The stages of data analysis in this study include domain analysis, taxonomic analysis, componential analysis, and cultural theme analysis.

The first stage is domain analysis. This analysis aims to obtain a general and comprehensive overview of the research object. In this stage, researchers identified cultural symbols and activities related to rebana art through descriptive observation. Next, they compiled a list of domains based on object similarities and selected the primary domain relevant to the research focus, namely rebana art.

The second stage was taxonomic analysis. This analysis was conducted by examining the previously defined domains in greater detail. At this stage, researchers conducted focused observations and in-depth interviews with informants, particularly mathematics teachers at Darul Falah Junior High School in Bandar Lampung. The taxonomic analysis aimed to deepen understanding of the structure and variation of data related to the concept of ethnomathematics in rebana art.

The third stage is componential analysis. This analysis aims to identify the differences and specific characteristics of each component within the rebana art form. Researchers conducted selective observations and asked follow-up questions regarding the shape, size, patterns, and activities of rebana playing. Through this analysis, researchers gained a more detailed and in-depth understanding of the characteristics of rebana art as they relate to mathematical concepts.

The fourth stage is cultural theme analysis. In this stage, researchers examined the relationships between previously analyzed concepts and domains to form a holistic understanding. The results of the analysis were reconstructed in the form of descriptions, narratives, and arguments linking rebana art to mathematics learning. This stage requires the researcher's thoroughness and sensitivity in drawing general conclusions that align with the research objectives.

Data analysis in this study was conducted in two main stages: analysis during the fieldwork and analysis after data collection. Fieldwork analysis was conducted concurrently with the data collection process through note-taking, initial coding, and analytical memos. Initial data, particularly interviews with key informants, were coded based on common themes and emerging issues.

Post-data collection analysis was conducted by developing categories and a more structured coding system. The coded data is then compared with previous data to identify patterns and consistency in findings. This process helps researchers draw valid and scientifically sound conclusions.

3. RESULTS AND DISCUSSION

This research was conducted using a purposive sampling technique, where the research subjects must meet the criteria for the problem being discussed. The author selected two different subjects from which the author could obtain accurate information, as evidenced by the availability of historical archives and directly observable physical remains, thus obtaining accurate information. The results of the research subject data are as follows:

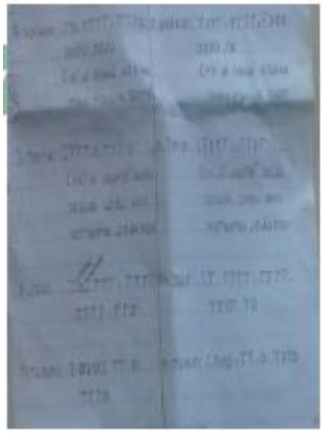
Table 2. Conclusion of the Results of the Interview Analysis of Subject I and Subject II

Indicator	Subject I	Subject II	Conclusion
Geometric Study: a. One-dimensional geometry b. Two-dimensional geometry c. Three-dimensional geometry	I think it's clear that there are, these are Bass and Tumbuk (while pointing) are included in the geometric shapes, as far as I know, both are included in three-dimensional geometry. Then these are Hadrah and Tam, both of which are circles and included in two-dimensional geometry.	Judging by its circular shape, the hadrah tambourine has two-dimensional geometric elements. The rebana, keprak, and tumbuk are all geometric shapes, making them three-dimensional.	There are mathematical concepts that can be explored through the rebana. The rebana's shape incorporates mathematical concepts related to two- and three-dimensional geometry.
Measuring Activities	Tambourines come in various shapes and sizes. The perimeter of the tambourine is made of wood, typically between 25 and 30 cm in diameter. The center is made of dried goatskin. The Pondok Leadership usually provides the tambourine. Of course,	With a tambourine, we can directly calculate diameter, radius, area, circumference, and volume. This can be used as a reference in learning about geometric shapes, especially circles. It's generally presented in problems.	Tambourines come in various sizes. The perimeter of the tambourine is made of wood, typically between 25 and 30 cm in diameter. The center is made of dried goat skin.

	we can use it directly if we need to measure area, circumference, or other measurements.		
Counting Activities: a. Addition Concept b. Subtraction Concept c. Multiplication Concept	Although this hadrah game generally just flows along with the song, there are rules for the beats, such as the number of "tak" and "duk" strokes. Examples of these basic strokes are: Question stroke: DT.DDD.TDT (repeated) Answer stroke: DTT.DDDT.TD.TT (repeated)	The rebana beats are always repeated. I happen to be an alumnus of the female Hadrah Al Qorja group at this Islamic boarding school. In addition to the repetition of beats, there are also additions and subtractions. This is evident in the frequent use of "tak" and "duk" beats.	The repeated strokes in playing the tambourine incorporate mathematical activities, namely counting. This involves repetition, addition, and subtraction of strokes on the tambourine. The material covers addition, subtraction, and multiplication.

Table 3. Data Triangulation Using Triangulation Method

No	Indicator	Conclusion of Interview with Subject 1 and Subject 2	Conclusion of Observation Results for Subject 1 and Subject 2	Conclusion of Documentation Results for Subject 1 and Subject 2
1	Geometric Study: a. One-dimensional geometry b. Two-dimensional geometry c. Three-dimensional geometry	There are various types of rebana, including the hadrah, qasidah, bass, guling, and keprak. Their shapes reflect mathematical concepts of two- and three-dimensional geometry. The hadrah, tam, and qasidah rebana fall into two-dimensional geometry, while the bass, guling, and keprak rebana fall into three-dimensional geometry.	The results of the observations carried out showed the same information, namely that there were one, two, and three dimensional geometric studies of the tambourine shapes.	  The documentation results show the same information, as can be seen in the image above. The circular shapes of the hadrah, tam, and qasidah tambourines are considered two-dimensional geometric shapes. The tubular-shaped bass and tumpang tambourines, as well as the cone-shaped top of the tambourines, are considered three-dimensional geometric shapes.
2	Measuring Activities	Tambourines come in various sizes. The perimeter of the hadrah tambourine is made of wood, typically 25-30 cm in diameter. The center is made of dried goat skin.	Observation results revealed the same information. Researchers and informants directly measured the tambourines and found that the hadrah tambourines measured 30 cm in diameter and the tam tambourines	 D = 2r = 15 cm

			measured 15 cm in diameter.	 D = 2r = 30cm The documentation obtained shows the same information. It can be seen that the hadrah rebana and the tam rebana, although similar in shape, have different sizes. The hadrah rebana has a diameter of 30 cm and the tam rebana has a diameter of 15 cm.
3	Counting Activities: a. Addition Concept b. Subtraction Concept c. Multiplication Concept	In rebana playing, there is a concept of dividing the beats between players. There are basic beats (question and answer), rising beats, pauses, getrak beats, and closing beats. The beats in rebana playing are always repeated until the vocalist's song ends. This beat concept incorporates mathematical activity, namely counting. In this case, it relates to the repetition, addition, and subtraction of the "duk" and "tak" beats in rebana playing.	Observation results revealed the same information. The author observed the rebana playing directly, where out of nine people in a hadrah group, five played the rebana. Two focused on the question and three on the answer. All five paid attention to the repetition, addition, and subtraction of "duk" and "tak" sounds with each beat, repeating this until the song ended.	 The documentation results show the same information, it can be seen that there are notes that serve as a reference for extracurricular hadrah students to learn how to play the tambourine properly and correctly, of course with basic hitting techniques that involve the concepts of repetition, addition and subtraction that are in accordance with mathematical concepts.
Valid data obtained from undergraduate and postgraduate students indicate a link between rebana art and mathematical concepts. Mathematical studies of rebana encompass one-dimensional, two-dimensional, and three-dimensional geometry, as well as arithmetic sequences. Furthermore, measuring activities were demonstrated through informants' explanations of the radius, diameter, and height of the rebana. Counting activities were also identified through informants' explanations of playing techniques and estimating the number of strokes in rebana playing.				
Based on the results of data analysis, S1 subjects and S2 subjects were able to describe measuring activities and counting activities contained in the art of rebana clearly and relevantly to mathematical concepts.				

Rebana art not only serves as a cultural and religious expression but also represents the mathematical practices that exist within society. The activity of playing rebana demonstrates that mathematical concepts develop naturally through habits, experiences, and traditions, without necessarily being recognized as formal mathematical activities. This reinforces the ethnomathematician view that mathematics is a social construct born from human cultural and everyday activities.

The findings of this study demonstrate that the geometric and number concepts in rebana art are contextual and applicable. Mathematical concepts do not emerge as abstract symbols, but rather as tools for understanding

shape, size, and playing patterns. Thus, mathematics becomes more meaningful because it is directly connected to students' real-world experiences. This is in line with the contextual learning approach, which emphasizes the connection between academic concepts and students' real-world experiences [47], [48].

From a pedagogical perspective, rebana art holds great potential as an alternative learning resource in junior high school mathematics. Integrating local cultural elements into learning can help students build conceptual understanding gradually and naturally [49], [50]. Learning that starts from a cultural context also has the potential to reduce the perception of mathematics as a difficult subject and disconnected from everyday life, thereby increasing student motivation and engagement in the learning process.

Furthermore, the use of rebana art in mathematics learning can support the strengthening of character education and the preservation of local culture. Students not only learn mathematical concepts but also learn to appreciate the cultural values in their environment [51], [52]. This approach aligns with the national education goals that emphasize a balance between mastery of knowledge, character development, and the preservation of national culture.

The results of this study also provide important implications for mathematics teachers in designing innovative and contextual learning. Teachers can develop ethnomathematics-based learning tools by utilizing rebana art as a medium or context for learning. This approach allows teachers to connect mathematics material with students' cultural experiences, making the learning process more interactive, meaningful, and relevant to their lives.

From a curriculum perspective, this study demonstrates that rebana art can be integrated with mathematics material at various grade levels in junior high schools. This confirms that the ethnomathematics approach does not conflict with the formal curriculum but can instead be a strategy for enriching and strengthening learning. This integration also opens up opportunities for the development of interdisciplinary learning that connects mathematics with art and culture.

Overall, this discussion confirms that ethnomathematics through rebana art is a relevant and potential approach to supporting mathematics learning that is contextual, meaningful, and rooted in local culture. This approach not only contributes to the understanding of mathematical concepts but also strengthens students' cultural identity and the role of education in preserving cultural heritage.

The findings of this study have significant implications for the development of culture-based mathematics learning at the junior high school level. The identification of geometric, arithmetic, and integer operations concepts in rebana art demonstrates that local cultural practices can serve as authentic and contextual sources for mathematics learning. By linking mathematical concepts to cultural activities relevant to students' lives, learning has the potential to become more meaningful, concrete, and understandable. This supports efforts to reduce students' perceptions of mathematics as an abstract subject detached from everyday reality.

From a pedagogical perspective, the results of this study provide alternatives for mathematics teachers in designing contextualized and experiential learning. Rebana art can be used as an entry point to introduce mathematical concepts before students are directed to symbolic and formal representations. This approach aligns with the principles of constructivist learning, where conceptual understanding is built from real experiences to abstractions. Thus, the use of rebana art as a learning resource not only enriches learning variations but also supports the strengthening of students' conceptual understanding.

Furthermore, this research also impacts efforts to preserve local culture through education. The integration of rebana art into mathematics learning enables students to recognize, appreciate, and preserve their regional cultural heritage. Mathematics learning is not only oriented towards academic achievement but also contributes to the development of students' character and cultural identity. Thus, ethnomathematics serves as a bridge between academic and socio-cultural goals of education.

From a curriculum perspective, the results of this study indicate that rebana art-based ethnomathematics can align with the competencies and materials in the junior high school curriculum. Mapping mathematical concepts into grades VII, VIII, and IX demonstrates that a culture-based approach can be integrated without neglecting the demands of the formal curriculum. This opens up opportunities for the development of more systematic and structured ethnomathematics-based learning tools and materials.

Despite providing meaningful findings, this study has several limitations that warrant consideration. First, it used a qualitative approach with a limited number of subjects and focused on a single cultural context and research location. Therefore, the results cannot be broadly generalized to other cultural contexts or regions with different artistic characteristics and traditions. Second, this study was limited to the identification and mapping of mathematical concepts in rebana art, without conducting empirical testing of its direct application in classroom learning. The impact of using rebana art on improving student learning outcomes, motivation, or attitudes toward mathematics has not been measured quantitatively. This limits the ability to assess the practical effectiveness of this study's findings.

Third, the interpretation of the ethnomathematics concept in this study relies heavily on observations and interviews with informants, thus potentially exposing researcher subjectivity in the analysis process. Although data validity has been strengthened through triangulation, the involvement of more diverse perspectives, such as

students or cultural practitioners from different backgrounds, has the potential to enrich and strengthen the research findings. Considering these limitations, further research is recommended to develop rebana art-based learning designs and test them experimentally in the classroom. Further research can also expand the study to other cultural art forms in various regions to strengthen the contribution of ethnomathematics in mathematics learning that is contextual, inclusive, and rooted in local wisdom.

4. CONCLUSION

Based on the results of studies and observations of various types of tambourines, it can be concluded that tambourines contain various ethnomathematical concepts relevant to mathematics learning in junior high schools. Ethnomathematic concepts in one-dimensional, two-dimensional, and three-dimensional geometry emerge through measuring activities from a cultural perspective. One-dimensional geometry, in the form of angles, is found in the Hadrah tambourines, two-dimensional geometry in the form of circles and rectangles, while three-dimensional geometry, in the form of cylinders, is found in the Keprak tambourines and cones in the Tumbuk tambourines.

Furthermore, ethnomathematical concepts in arithmetic sequences are also identified as measuring activities found in the Qasidah tambourines. Meanwhile, the concept of integer operations in the Hadrah tambourines emerges through counting activities, which include addition, subtraction, and multiplication. These findings indicate that tambourines have the potential to be a contextual and meaningful source for learning mathematics. The mathematics learning resources based on rebana art in this study are adapted to the 2013 Curriculum, specifically for grade VII on integer operations, angles, and two-dimensional geometry; grade VIII on arithmetic sequences; and grade IX on three-dimensional geometry. Thus, rebana art can be used as an alternative learning resource that supports mathematics learning based on local culture. Future research is recommended to develop and implement ethnomathematics-based learning designs using rebana art in classroom settings to empirically examine their effects on students' mathematical understanding, learning motivation, and cultural awareness. In addition, further studies may explore other local musical or cultural traditions across different regions to expand the scope of ethnomathematics and strengthen its integration with mathematics curricula at various educational levels.

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