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Ethnomathematical Exploration of Belitung's Typical Tambourine Musical Instrument

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ABSTRACT

Exploring ethnomathematics is not only about understanding mathematical concepts in various cultures but also about appreciating the cultural heritage and local wisdom embodied in the understanding of mathematics of each culture. Ethnomathematical exploration can be used as a means of preserving a culture that is carried out through learning at school. One of these ways is to apply ethnomathematical concepts to learning. The relationship between mathematics education and ethnomathematics stems from recognizing that mathematics is not culturally neutral. The field of ethnomathematical studies aims to discover mathematical ideas inherent in different cultural groups. This study seeks to explain ethnomathematical concepts contained in typical Belitung tambourine musical instruments and how they are used to teach mathematics. In this study, researchers used qualitative methods and an ethnographic approach. Researchers collected data through interviews, observations, and documentation in this study. Where the results of this study state that there is a mathematical concept in the typical Belitung tambourine musical instrument. To introduce and understand mathematical concepts through local culture, they can be submitted through mathematical concepts in the standard Belitung tambourine musical instrument.

Introduction

Education is essential for human survival and significantly impacts culture and nation because education without culture will not be able to build the character and identity of Indonesian people. Vice versa, if there is no education, the culture will gradually become extinct due to the absence of human thought to preserve it. Learning in schools is a way to preserve culture. Indonesia has many school subjects, including mathematics, which is essential to learn daily. Ethnomathematics arises when this activity is combined with mathematics and education, where. Ethnomathematics means mathematics learning related to cultural learning, whereas ethnomathematics can provide a new atmosphere in mathematics learning related to cultural contexts (Anisa, Siregar, & Hafiz, 2023).

The relationship between mathematics education and ethnomathematics stems from recognizing that mathematics is not culturally neutral. Ethnomathematics, as a field of study, seeks to uncover mathematical concepts embedded in various cultural groups. He recognized that society's cultural context and norms influenced mathematical ideas and practices. This understanding is fundamental in mathematics education, as it allows the incorporation of culturally relevant examples and applications into mathematics teaching and learning (Puspasari et al., 2022).

Ethnomathematics in mathematics education can be viewed as an approach to motivating students to learn mathematics. According to (Wahyuni and Pertiwi, 2017), one approach to learning mathematics called "ethnomathematics" utilizes local cultural wisdom to teach mathematics. Ethnomathematics looks at mathematics in many cultural practices and helps develop mathematical concepts in various cultural contexts. According to Huda (2018), ethnomathematics covers many things, not just ethno (ethnicity) or tribe, because it is now a discipline in great demand by many people. By exploring mathematical concepts in different cultural practices, ethnomathematics provides a way to bridge the gap between mathematics outside the classroom and formal mathematics taught in schools. This approach can help students understand how mathematics relates to everyday life and appreciate its cultural diversity. In addition, integrating ethnomathematics into mathematics education can contribute to developing students' critical thinking skills, as it encourages them to analyze and understand mathematical concepts in diverse cultural contexts. It also promotes a more inclusive and culturally responsive approach to mathematics teaching, which caters to diverse student backgrounds and experiences.

Ethnomathematical exploration is an integral part of mathematics education because people have unconsciously used basic concepts and principles of mathematics in everyday life. According to (Rahmawati Z & Muchlian, 2019) ethnomathematical exploration is an integral part of mathematics education because people have unconsciously used basic concepts and principles of mathematics in everyday life. In addition, according to (Pratiwi & Pujiastuti, 2020), the concept of mathematics exists in local culture is called ethnomathematical exploration. Therefore, ethnomathematical exploration provides basic information about the evolution of ethnomathematics to mathematics learning, especially geometry. So, in this study, ethnomathematics is the result of people's artwork, such as tambourine musical instruments, which combine mathematical concepts with artworks from their own culture (Putri, 2023).

Ethnomathematics can be applied in people's lives, one of which is the Belitung Typical Musical Instrument called the Tambourine musical instrument. Tambourine is one of the traditional musical instruments that is widely used in various regions in Indonesia. These musical instruments are generally made of wood and animal skins and have various variants used in different regions. Belitung tambourine is one tambourine type typical for the Belitung region (Aliantari & Sumardi, 2024). The reason for choosing a typical Belitung tambourine musical instrument as a research material is because of the uniqueness and diversity of its use in local culture. Tambourine, also known as "company" in the local community, is a table musical instrument often used in cultural festivals, religious events, weddings, and other celebrations. This musical instrument is unique in its round shape with various sizes, producing different sounds when played. In addition, the tambourine is also the result of the acculturation of Malay and Arabic culture that entered Bangka Belitung, so it has interesting historical and cultural values to be studied (Kurniawan, Suherman, Komarudin, Zarpellon, & Khalil, 2023).

Ethnomathematical research on Belitung's typical tambourine musical instrument can be done by exploring the shape and components of flat and built space contained in this musical instrument. Tambourines have round shapes of various sizes that produce different sounds when played. In ethnomathematical research, the shape and size of tambourines can be associated with geometric concepts, such as circles, spheres, and cones. In addition, using hands as a bat tool in tambourines can also be associated with geometric concepts, such as angle and distance. Thus, ethnomathematical research on tambourine musical instruments typical of Belitung can contribute to developing more contextual and relevant mathematics learning to local culture (Fitriyah & Fitriani, 2021).

Many ethnomathematical studies have been researched, including, according to (Putri, 2017), (Andriono, 2021), (Mu'asaroh & Noor 2021), and (Richardo, 2016). From several previous studies, it was concluded that researchers only focused on Ethnomathematical Exploration and did not focus on where the musical instrument came from besides previous studies only focused on its application to learning in schools. Therefore, I am interested in expanding this research where I, as a researcher, explore a traditional musical instrument typical of Belitung culture. By focusing on these different musical instruments, this study seeks to uncover and document the mathematical concepts inherent in the tambourine's form, structure, and technique. This research contributes to a broader understanding of ethnomathematics by highlighting the mathematical principles embodied in tambourines, thus enriching knowledge of the mathematical aspects of traditional musical instruments. It can be concluded, based on this background, that researchers want to conduct research entitled "Ethnomathematical Exploration of Belitung Tambourine Musical Instruments".

Research Methods

In this study, researchers used qualitative methods and an ethnographic approach. In this ethnographic approach, the role of ethnographers is to participate in research as observers, both overtly and secretly, to observe events that occur in people's daily lives (Achmad & Ida, 2018). In research that uses this ethnographic approach, there are several steps needed to conduct research, including the following: Determine the mathematical concepts contained in the Belitung Tambourine Musical Instrument, Identify and determine the location to be studied on the Belitung Tambourine Musical Instrument, Determine the resource person, namely the Belitung Tambourine Musical Instrument guard officer, Choose a theme, issues, or theories and why choose the Belitung Tambourine Musical Instrument, determine the type of ethnography to be used. In this study, using realist ethnography, collect data from cultural groups directly: observation, interviews, take notes, documentation, recording activities, interviews, measuring, evaluate data to explain cultural themes originating from cultural groups and interpreting the data from the results of the analysis and make conclusions from observations, interviews, and research documentation.

The data collection process will be carried out for approximately one month, from the end of December 2023 to the beginning of January 2024. The location of the first research conducted by this research was on Jl. Gajah Mada, Lesung Batang, Kec. Tj. Pandan, Belitung Regency, Bangka Belitung Islands 33411 precisely the location of this research is located in the Belitung Traditional House, which can be found in the Bangka Belitung area (right next to the Belitung Regent Office). The second location for this research is the community's house, which is precisely located on Jl. Kesehatan Membalong, Membalong District, Belitung Regency, Bangka Belitung Islands Province.

According to (Wijaya, 2015)**,** data analysis techniques in this study exist in three forms of analysis using an ethnographic approach, which is carried out with the following steps: The first is a domain analysis where researchers obtain a comprehensive and comprehensive picture of the typical tambourine musical instrument of Belitung along with the situation in the surrounding environment. The results are in the form of a general description of the typical Belitung tambourine musical instrument; the second is taxonomic analysis, where researchers make observations focused on the typical tambourine musical instrument of Belitung, which then the data that has been collected in the overall analysis, the third is componential analysis where the researcher conducts a more specific analysis where the data is obtained through observation, interviews and documentation of the typical Belitung tambourine musical instrument, and the fourth is cultural theme analysis where researchers look for relationships between the history and description of the tambourine musical instrument typical of Belitung as a whole which is then stated in the theme or title of the study.

Results and Discussion

History of Belitung Tambourine

I, if observed from its origin, Belitung tambourinein, is one of the tambourines adopted from Kalimantan tambourine. Especially in Belitung, tambourine musical instruments are considered Malay art musical instruments, or Belitung people usually call it hadrah. This typical Belitung tambourine is divided into 2: tambourine drum three and tambourine drum 4. Tambourine drum three is usually called hadrah malay, and tambourine drum four is called Ketintul. This retinol is a typical Belitung tambourine musical instrument. Especially in Belitung, the tambourine drum 4 has enough steps to be found in the Belitung area, but only in some areas that still use this drum tambourine four musical instruments. These musical instruments are usually widely used for traditional Malay wedding thanksgiving events in Belitung. Mr. Shofwan, a traditional supervisor at the Belitung traditional house, said that the tambourine is one type of percussion instrument that is best played by playing there are two, namely hitting and drumming. If it is hit, it requires other tools, such as wood, to hit, and in the beat, it does not use the help of other tools to hit but directly uses the hands. Beat musical instruments are usually called percussion instruments because of the way they are played with punch (Widhyatama, 2012). Percussion instruments also have two notations, namely dang and dung. The difference between the typical tambourine of Belitung and other regions is that the typical tambourine of Belitung does not use sheet music, whereas the score is a collection of musical notation symbols.

Tambourine Musical Instruments

Belitung tambourine is a traditional musical instrument from Belitung Island, an island in Indonesia located east of Sumatra. This musical instrument has its characteristics and is often used in various customary, religious, and artistic events in the Belitung area and several other regions in Indonesia. Tambourine musical instrument typical of Belitung or usually Belitung people call it as hadrah Belitung or retinue. Belitung people generally use 4 drums in 1 Belitung hadrah marade or retinue. His habit is to carry 4 drums, alternate, and shout at each other when playing it.

According to Mr. Shofwan, a traditional supervisor at the Belitung traditional house, it is said that the Belitung tambourine, commonly called Belitung hadrah or kitul, consists of several components of drum types, namely soprano, alto, tenor, and bass. Belitung's typical tambourine musical instrument has a circle shape that varies in diameter

according to its size. If the Belitung tambourine is hit, which is usually called the Belitung community, namely the Belitung hadrah or kitul, it is far different from tambourines in other areas because when hit, the sound produced is surprising or the Belitung people usually call it "Gertak or Ngejut."

Overall, the Belitung tambourine is not only a traditional musical instrument but also an essential part of the cultural and religious life of the Belitung people. With its unique design, sound, and cultural function, the Belitung tambourine continues to symbolize the diversity and richness of Indonesian culture.

Ethnomathematical Exploration

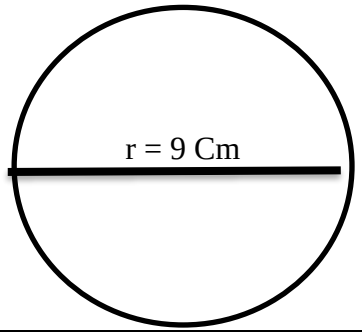
The exploration of ethnomathematics is an attempt to understand the relationship between mathematics and culture, especially in the context of using mathematics in culture and everyday life. The Belitung tambourine musical instrument is one exciting example of ethnomathematics that can be explored. Belitung tambourine is a traditional musical instrument from Belitung, Indonesia. This musical instrument is made of wood and leather stretched on top. Usually, Belitung tambourines are played in groups as musical accompaniment in various customary, religious, and cultural events.

In ethnomathematical exploration, exploration itself has the meaning of exploring. Belitung people usually mention the word explore in the Belitung language, namely "Ngitau," commonly known as circling. Moreover, Ethno itself means a region's ethnicity or culture. So, exploring ethnomathematics here means exploring areas with cultures related to mathematics, where regional cultural arts are explored by acting and thinking quickly. Ethno and mathematics have a relationship, and we can learn mathematics through the culture of a region, one of which is the traditional musical instrument, namely the typical Belitung tambourine. In other languages, ethnomathematics also means exploring the region's culture in a place with mathematical elements. In this study, researchers found several mathematical concepts from the results of ethnomathematical exploration in Belitung or kitul's typical tambourine musical instrument, including the following.

Table 1
Ethnomathematical Exploration of Tambourine Musical Instruments

Photo and Ethnomathematical Exploration	Concept Geometry	Rumus
Foto  Diameter 57 Cm	Circle	**Area of a circle** (πr^2) Information : $\pi = 3{,}14$ r = Jari-jari **Circumference of the Circle** $2\ x\ \pi\ x\ r$ Information :

Eksplorasi Etnomatematika :



$\pi = 3{,}14$
r = Jari-jari

Foto :

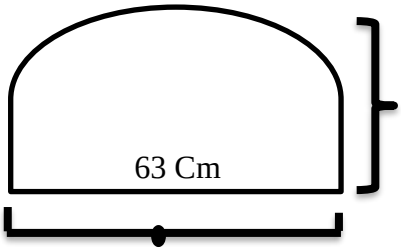
Diameter
63 Cm

Semicircle

The area of the semicircle
$(CapP.r^2)$

Information :
$\pi = 3{,}14$
r = Jari-jari

Eksplorasi Etnomatematika :



Semicircular circumferenceCap(
$\frac{1}{2}.Pi\pi.d)$

Information :
$\pi = 3{,}14$
d = Diameter

Foto :

Diameter
80 Cm

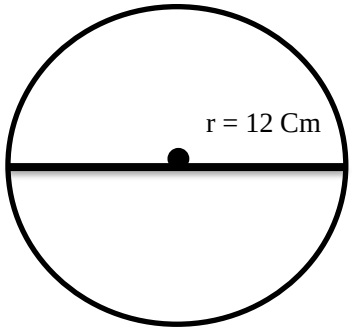
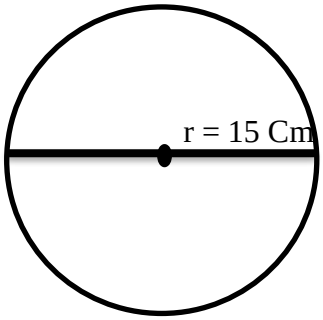
Circle

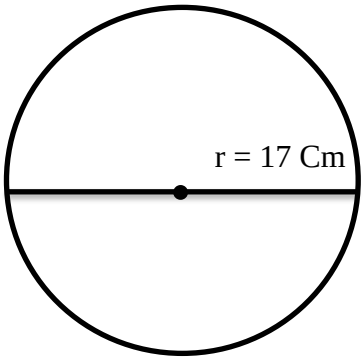
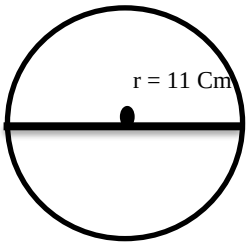
Area of a circle
(πr^2)

Information :
$\pi = 3{,}14$
r = Jari-jari

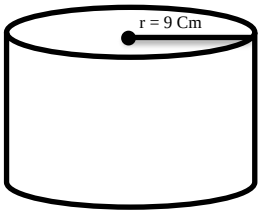
Circumference of the Circle
$2\ x\ \pi\ x\ r$

Information :

Eksplorasi Etnomatematika :  		$\pi = 3{,}14$ r = Jari-jari
Foto :  Eksplorasi Etnomatematika :  	Circle	**Area of a circle** (πr^2) Information : $\pi = 3{,}14$ r = Jari-jari **Circumference of the Circle** $2\ x\ \pi\ x\ r$ Information : $\pi = 3{,}14$ r = Jari-jari
Foto :  	Circle	**Area of a circle** (πr^2) Information : $\pi = 3{,}14$ r = Jari-jari

Eksplorasi Etnomatematika :  		**Circumference of the Circle** $2\ x\ \pi\ x\ r$ Information : $\pi = 3{,}14$ r = Jari-jari
Foto :  Eksplorasi Etnomatematika :  	Circle	**Area of a circle** (πr^2) Information : $\pi = 3{,}14$ r = Jari-jari **Circumference of the Circle** $2\ x\ \pi\ x\ r$ Information : $\pi = 3{,}14$ r = Jari-jari
Foto :  	Tube	**Tube Height** $\left[\begin{array}{c} t = Vtabung \\ \pi . r^2 \end{array}\right]$ **Tube Volume** $(\pi\ x\ r^2\ x\ t)$

Eksplorasi Etnomatematika :



The current research is similar to previous research regarding ethnomathematical approaches, research methods, and findings related to mathematics in traditional music. Previous research may have used a similar approach to explore the relationship between mathematics and traditional music, perhaps with a focus on different musical instruments or cultures. In addition, similarities can also be found in the theoretical framework used and findings related to mathematical patterns in tambourine music that may be similar to discoveries in previous studies.

Conclusion

Based on the analysis above, it can be concluded that: 1) The mathematical concepts contained in Belitung's typical tambourine musical instrument are circles, semicircles, and tubes. 2) The mathematical concept contained in Belitung's typical tambourine musical instrument can be used as a medium to introduce mathematics learning through local cultural concepts. The results of this study should encourage researchers to convey several suggestions, namely: 1) The ethnomathematical concept that exists in the typical tambourine musical instrument of Belitung can be used as teaching material in the process of learning mathematics in schools in order to introduce the culture and characteristics of Malay culture that exist in the typical tambourine musical instrument of Belitung so that students can know concepts that arise through their cultural traditions. 2) Researchers expect further research that examines the application of ethnomathematics-based learning processes in schools with students.

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