



Ethnomathematics Exploration on Purun Crafts of Pulau Geronggang for Middle School Mathematics Learning

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ABSTRACT

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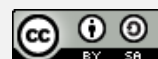
Mathematical concepts sometimes arise naturally through the culture of a particular community. Mathematics with cultural nuances (ethnomathematics) will contribute greatly to learning mathematics. Ethnomathematics can be used to make it easier for students to learn through a cultural approach. This research aims to: 1) Find out what mathematical concepts are found in the Purun craft of Geronggang Island. 2) Find out what philosophical values are present in the Purun craft of Geronggang Island. 3) Find out how junior high school mathematics learning can be implemented within the context of ethnomathematics in the Purun craft of Geronggang Island. In research data collection, researchers are directly involved in the data collection process through interviews, observation, and documentation. Data was analyzed by carrying out data reduction, data presentation, and data exploration. Variants of shapes and types of Geronggang Island purun crafts contain several aspects of mathematics on geometric material.

Keywords: *Eksplorasi, Ethnomathematics, Purun craft of Pulau Geronggang*

Konsep matematika kadang muncul secara alamiah melalui budaya masyarakat tertentu. Matematika yang bernuansa budaya (etnomatematika) akan memberikan kontribusi yang sangat besar terhadap pembelajaran matematika. Etnomatematika dapat digunakan untuk mempermudah siswa dalam belajar melalui pendekatan budaya. Penelitian ini bertujuan untuk: 1) mengetahui apa saja konsep matematika yang terdapat pada kerajinan Purun Pulau Geronggang, 2) mengetahui apa saja nilai filosofis yang ada pada Kerajinan Purun Pulau Geronggang, 3) mengetahui bagaimana implementasi pembelajaran matematika SMP dengan konteks etnomatematika pada kerajinan Purun Pulau Geronggang. Pengambilan data penelitian menggunakan human instrument, peneliti berhubungan langsung dengan proses pengambilan data dan berperan sebagai pengumpul data melalui pengumpulan data pustaka, wawancara, observasi dan dokumentasi. Teknik analisis data dilakukan dengan reduksi data, penyajian data dan analisis data serta pemaparan data. Varian bentuk dan jenis kerajinan purun Pulau Geronggang memuat beberapa aspek matematika pada materi geometri, khususnya pada bangun datar dan bangun ruang, yaitu: belah ketupat, oval, dan balok.

Kata Kunci: *eksplorasi, etnomatematika, kerajinan purun Pulau Geronggang.*

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INTRODUCTION

Education is important for individuals as it helps them acquire knowledge, skills, values, and attitudes essential for personal development and social integration. It also plays a vital role in shaping perspectives and preparing for future careers and roles in society (Groves et al., 2023). Education fosters critical thinking, creativity, and problem-solving abilities, which are crucial for navigating the complexities of the modern world (Franco et al., 2018). Furthermore, education promotes social mobility, economic growth, and reduces poverty. It also helps in building a more informed, responsible, and engaged citizenry, which is essential for a well-functioning democracy.

Education is a way of enabling the human being to develop his or her potential through the process of learning (Fitri, 2021). Education is a three-dimensional process that includes the individual, the community or national community of the individual, and the entire content of reality, both material and spiritual, all of which play a role in determining the nature, fate, human form, and society (Nurkholis, 2013). Education is a process that is planned and organized in a systematic manner in relation to the learning process (Waroka et al., 2020).

Mathematics is a fundamental discipline that plays a critical role in our daily lives. It serves as the basis for various fields, such as science, engineering, technology, and economics. Mathematics is an essential tool for comprehending the world and addressing the challenges we encounter in our personal and professional lives. Mathematics, as one of the subjects taught in formal educational institutions, is an important component of efforts to improve educational quality (Novitasari, 2016). Mathematics is a universal science that teaches humans how to progress through precise and accurate calculations (Yuniar et al., 2021).

Mathematics is often seen as an abstract and difficult subject to learn. Consequently, many students become disinterested and struggle with math. Difficulties in mathematics learning can be caused by a variety of factors, such as intellectual functioning, motivation, memory, lack of metacognitive strategies, and poor match between individual learning characteristics and instruction (Li & Ma, 2010). An ethnomathematical approach is one way to overcome this problem.

Cultural values must be embedded in each individual from an early age so that each individual can better understand, interpret, appreciate, and realize the importance of cultural values in all aspects of life (Fajriyah, 2018). Ethnomathematics is one that can bridge the gap between culture and education (Agustin et al., 2019). Ethnomathematics is an excellent method of educating students about character-based national culture (Supriadi et al., 2016).

Ethnomathematics is a method of teaching mathematics that incorporates concepts and practices from local cultures. It can be a helpful approach for students who struggle with traditional math instruction. Ethnomathematics uses culturally relevant examples to facilitate mathematical understanding and develop critical and creative thinking skills (Fouze & Amit, 2017). Students will learn how to compare, distinguish, and clarify mathematical concepts using simple examples. Critical thinking skills for understanding mathematics are also developed in Ethnomathematics (Richardo et al., 2019).

Ethnomathematics connects mathematics to students' daily lives and culture, making math learning more relevant and interesting for students, thus increasing their motivation to learn. Ethnomathematics helps students understand mathematical concepts in a more concrete and applicable way by showing them how these concepts are used in their culture. Ethnomathematics helps students understand mathematical concepts in a more concrete and applicable way by showing them how these concepts are used in their culture. This enables them to more easily understand and apply these concepts in different situations.

Ethnomathematics is a teaching approach that promotes critical and creative thinking in mathematics problem-solving. It involves analyzing patterns, identifying relationships, and developing innovative solutions based on cultural knowledge. This approach helps students gain a deeper understanding and appreciation of their own culture and other cultures. Additionally, it

explores how mathematics is embedded in various cultures and how those cultures have influenced the development of mathematics throughout history.

The island of Geronggang in South Sumatra is famous for its Purun handicrafts. Purun is a kind of grass that grows in the swamps of the island. Purun handicrafts are made by weaving it into various products such as mats, hats, bags, and others. With the basic ingredients of purun plants, there is a community of craftsmen. The village of Geronggang Island, East Pedamaran Timur Sub-district, Ogan Komering Ilir District, is home to the "*Paoh Sejahtera*" community. Purun Craft of Geronggang Island is the name of the craft.

Based on the scientific explanation above, the researcher is interested in conducting a study titled "Ethnomathematical Exploration on Purun Crafts of Geronggang Island for Middle School Mathematics Learning". The purpose of this study is to raise the ethnomathematics elements of purun craft of Pulau Geronggang with the reason of wanting to know the philosophical value and mathematical aspects.

METHOD

This research is a descriptive study with an ethnographic approach, which is an empirical and theoretical approach aimed at obtaining a description and analysis of the cultural elements of a community or ethnic group. This approach focused on determining how teachers or prospective mathematics teachers, children, or members of the community can organize the culture around them in their minds and apply it to the mathematics learning process.

As a model, it is certain that ethnography has its own set of characteristics and steps (Spradley, 1979). The steps are: 1) determining informants, 2) conducting informant interviews, 3) taking ethnographic notes, 4) asking descriptive questions, 5) analyzing descriptive interviews, 6) doing domain analysis, 7) asking structural questions, 8) conducting taxonomic analysis, 9) asking contrasting questions, 10) conducting component analysis, 11) finding cultural themes, and 12) writing ethnography.

In connection with the implementation of this research, the researcher gathered information through observations, interviews, and documentation with sources as craftsman of purun Pulau Geronggang and two figures from Pulau Geronggang traditional institutions. The resource person in this study was a craftsman from Pulau Geronggang village with initial name BSJ. Besides having produced many purun handicraft products, he also participated in various craft exhibitions at the district, provincial and national levels. Purun craftspeople and two figures from traditional institutions were chosen as communicative subjects in the subject selection. The three subjects acted as resources to assess the reliability of the relevant data.

Data were gathered through observations, interviews, and documentation. Observations on the culture of the Pulau Geronggang village community related to purun craft. An interview is conducted with people who were familiar with the subject of the research. The information was then examined by creating a transcript of the interview results. The obtained transcripts were then reduced. The researcher reduced the data by categorizing all of the data according to the needs of the researcher, then removing the data that were not in accordance to the needs of the researcher. In addition, the data were presented, examined, and concluded. The responses to the study questions of the research led to this conclusion.

The place for conducting the research was in Pulau Geronggang Village, Pedamaran Timur District, Ogan Komering Ilir Regency, South Sumatra Province. The subjects in this study were the purun crafts of Pulau Geronggang and related sources. While the object of research reviewed in this study is a study of philosophical values and mathematical aspects. In this study the instruments used were: researchers as the main instrument, observation guidelines, documentation guidelines, and interview guidelines. For this study, the researcher selected qualitative research, which requires in-depth, clear, and specific data. The data collection techniques used in this study included observation, interviews, literature review, and documentation.

This research using ethnographic approach. Several people were selected as resource persons to answer existing problems in accordance with the research objectives, including purun handicraft craftsmen, and two members of traditional institutions. To achieve this goal, the steps used with the ethnographic approach are as follows:

Conduct Preliminary Activities

This stage is carried out by understanding in depth about the culture of the Pulau Geronggang village community related to purun crafts, followed by determining the research subject. Then make initial observations by observing the mathematical aspects of the Geronggang Island purun craft.

Making Instruments

The preparatory stages carried out were making observation guidelines, documentation and interviews. The research instrument was made based on the researcher's initial observations regarding the culture of the Pulau Geronggang village community related to purun craft and the mathematical aspects of the purun craft of Pulau Geronggang. Observation guidelines are used as guidelines for researchers when research activities take place, documentation guidelines are used as physical evidence during research, and interview guidelines are used as a tool that is used as a source of data obtained from informants to answer various questions that will be asked by researchers.

Implementation

In ethnography, data collection is carried out using multiple procedures, and the intensity of these procedures varies according to the type of ethnography being performed. In case study research, researchers can collect data through interviews, observations, documents, and audio-visual recordings. Data collection was carried out by direct observation of the purun craftsmen of Pulau Geronggang as well as observing and participating in the activities there and conducting in-depth interviews with several people such as the purun craftsmen of Pulau Geronggang and two members of the Pulau Geronggang traditional institution. This stage is carried out until the researcher obtains data/information according to a predetermined schedule and can be used as a data source to answer the existing problem formulation and achieve the expected research objectives.

Data verification

At this stage, namely verifying the results of data collection that had been obtained during the research on purun Pulau Geronggang according to the type and shape so that it could be easily understood when analyzing the data, both verification of observational data, documentation and interviews with two members of the Pulau Geronggang traditional institution. If the data verification is valid, it can proceed to the next stage, but if it is not valid, it will be revised by collecting data again.

Data analysis

The data analysis stage was carried out by grouping research data during observations and interviews and organizing data sources according to the focus of the study of the problem and research objectives, namely identifying philosophical values and mathematical aspects in the purun craft of Pulau Geronggang. This analysis aims to describe the ethnomathematics in the purun craft of Pulau Geronggang.

Making Conclusions At this stage the researcher packages the information/data after being analyzed to find out the philosophical values and mathematical aspects that exist in the purun craft of Pulau Geronggang to draw conclusions according to the existing problem formulation.

RESULTS AND DISCUSSION

Purun craft on Geronggang Island is the result of the development of purun crafts in Pedamaran Sub-district, Ogan Komering Ilir District. The development of the purun craft is in the form of increasingly diversified types and patterns that adapt to the changing times (present). The Purun crafts of Geronggang Island features a variety of ethnomathematical studies from various existing patterns. This can be seen from several geometric shapes that exist in the purun craft patterns such as rectangles, rhombuses, circles, and blocks.

Building upon the rich tradition of Purun crafts in Pedamaran Sub-district, Geronggang Island stands as a testament to the dynamism of this art form. Here, artisans have not only preserved this age-old craft but have also extended its legacy by incorporating an ever-wider range of designs and patterns that resonate with contemporary tastes. This evolution transcends mere aesthetics; it embodies a deep understanding of mathematical principles. The patterns on these purun crafts, including rectangles, rhombuses, circles, and blocks, are intricate expressions of ethnomathematics. They represent a fascinating interplay of cultural heritage and mathematical concepts, where tradition seamlessly merges with innovation. This infusion of mathematical knowledge not only enhances the aesthetics of the craft but also ensures its continued relevance in a world constantly seeking novelty. Geronggang Island embodies the essence of education: the ability to develop and express one's potential through a lifelong process of learning and adaptation.

Ethnomathematics in the Purun craft of Geronggang Island

Judging from its history, the purun craft Pulau Geronggang is a development of the purun craft Pedamaran. The types of purun craft Pulau Geronggang are more varied than those of purun craft Pedamaran.

After conducting an in-depth exploration of the mathematical elements and underlying philosophies of Purun Craft, the ethnomathematical study serves as a gateway to a deeper understanding. This investigation delves into the various components of the craft, meticulously uncovering the mathematical principles that bring these creations to life. The analysis not only sheds light on the technical aspects but also reveals the philosophical ideals intricately woven into Purun Craft. The section below presents the researcher's main findings, establishing links between the mathematical innovation and the philosophical principles embodied in this exceptional cultural practice.

The ethnomathematical study of the Purun Craft of Geronggang Island is an activity that seeks more precise information, explanations, or knowledge about the mathematical principles found in the craft and the philosophical ideals it embodies. As a result, the ethnomathematics of Purun Craft of Geronggang Island was examined on the numerous components that existed in this study. The following are the conclusions of the researcher in relation to the mathematical study of the Purun Crafts of Geronggang Island and the philosophical values included in it. One of the purun crafts can be seen in Figure 1.

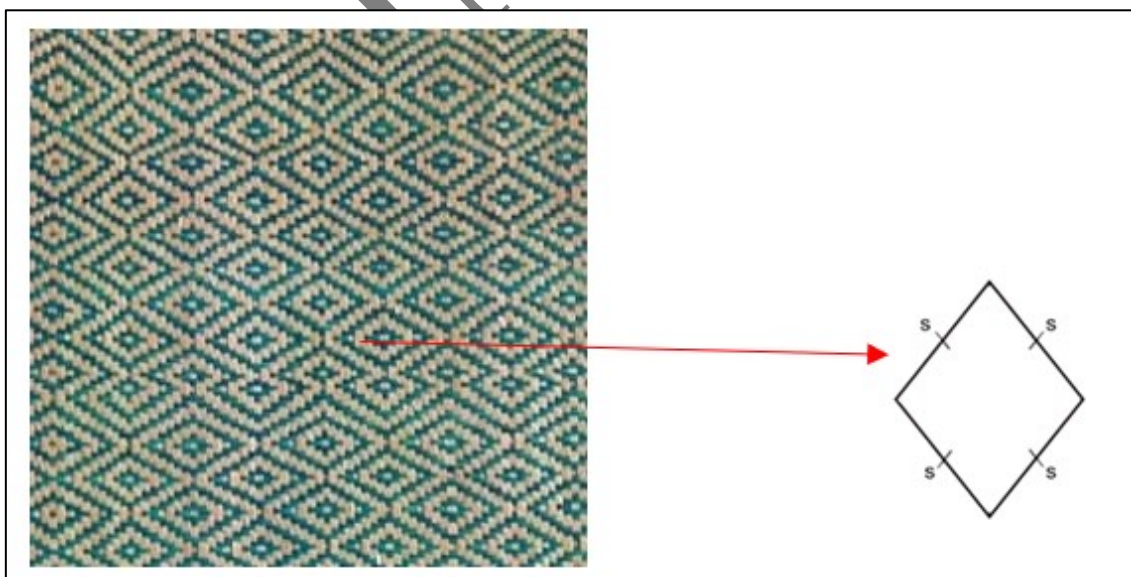


Figure 1. *Purun Mat*

Based on the findings of the exploration of the Purun Crafts of Geronggang Island with the craft products in the form of mats, it was discovered in figure 1 that there is a flat shape concept a

rhombus. The purun mat is the outcome of the culture of Geronggang Island, which has been passed down from generation to generation by the ancestors. The purun mat is a symbol of togetherness/family because it is used as a sitting mat when receiving guests or family members. A concept of flat oval shape in purun craft can be seen in Figure 2.

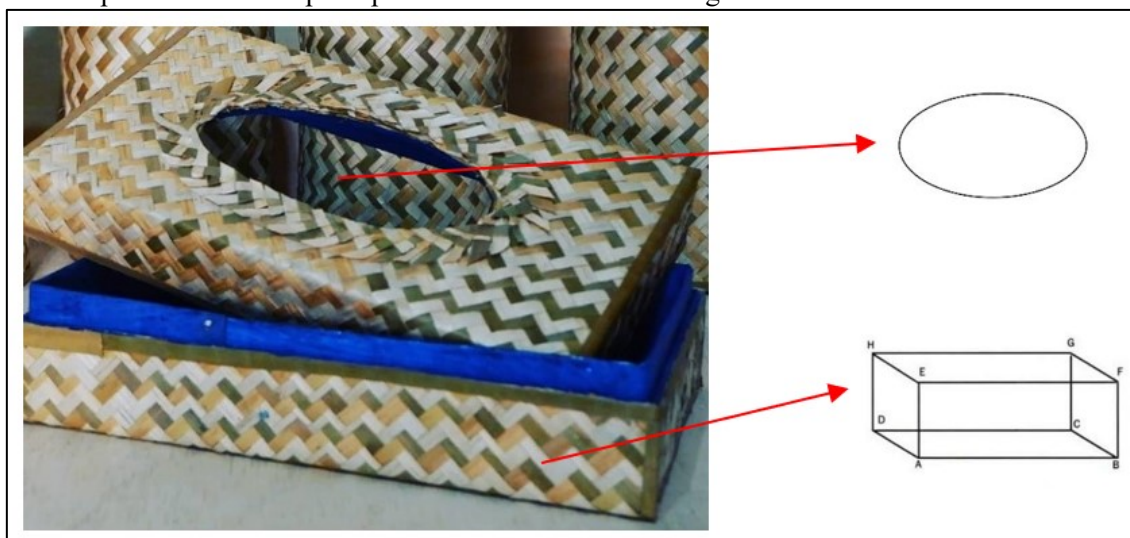


Figure 2. Tissue Box

Based on the findings of the Purun craft on Geronggang Island and its craft goods in the form of tissue boxes, it was discovered in figure 2 that there is a concept of flat oval shape and block solid figure. The purun woven pattern on the tissue box is a mullet/porcupine scale pattern that represents Geronggang Island's hard life in ancient times. As a result, people must battle and work hard to survive. Another type of craft, the knicks-knacks box, is shown in Figure 3.



Figure 3. Knick-knacks Box

Based on the findings of the exploration of Geronggang Island's purun craft with its craft products in the form of knick-knacks boxes, figure 3 depicts a concept of block solid figure. The white mat pattern (basic pattern) is a natural purun mat that has not been dyed. This mat is used not only as an usual sitting mat, but also when a new baby is born or when someone dies: "when he is born, he is greeted with a mat, when he dies, the mat is removed." This philosophical value of the white mat is purity/cleanliness.

The purun mat is the outcome of Geronggang Island's culture, which has been passed down from generation to generation by the ancestors. The purun mat is a symbol of

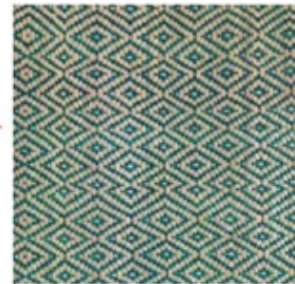
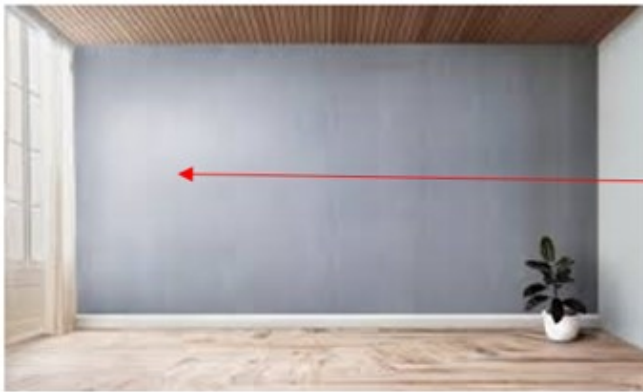
togetherness/family and is used as a sitting mat when hosting guests or family members. Purun crafts with a predominant red color are typically worn by adult females. The color red is used to represent the enthusiasm and spirit of the youth. Purun crafts with a predominant green color are commonly used by adolescent girls. The color green represents the age of adolescence (young). The golden color of purun crafts represents a married (adult) female. Married girls will use purun crafts with a combination of red and yellow.

Implementation of Middle School Mathematics Learning

In a geometry unit, students can explore the patterns and symmetries present in traditional Purun weaving designs. The teacher should introduce the cultural background of the craft and its significance to the Pulau Geronggang community. Then, students should analyze the geometric shapes, such as squares and triangles, within the patterns and explore concepts like rotational and reflectional symmetry. One way to connect abstract mathematical concepts to a tangible, culturally relevant context is by designing Purun-inspired patterns using transformations and measuring tools to ensure precision. This example of implementing ethnomathematics with Purun craft can be seen in Figure 4.

(a)

1. A living room on one side of the wall will be decorated with purun mat woven wallpaper. The wall to be decorated is 5×3 m, if the price of the purun mat is IDR 10.000,00/m² then determine the money needed to buy the purun mat!



(b)

2. The following tissue box is a purun craft from Pulau Geronggang. The basic material of the craft is a purun mat woven with a mullet/porcupine scale pattern. The tissue box has a size of 22 cm x 14 cm x 12 cm. Before selling the tissue box, it will first be coated with a plastic parcel so that it is neater and not dirty. Determine the minimum area of plastic used to line the tissue box!



(c)

3. The following picture is a purun Craft of Pulau Geronggang in the form of a box of knick-knacks. If the size of the box of knick-knacks is $25 \times 20 \times 15$ cm, determine the volume!



Figure 4. example of implementing ethnomathematics with Purun craft

According to the findings of the research, there are various mathematical concepts in the purun craft of Pulau Geronggang, including rhombuses, ovals, and blocks. The understanding of the mathematical concepts associated with purun crafts will increase enthusiasm, resulting in better understanding and more meaningful learning. Furthermore, it is critical to introduce cultural ideals in students at a young age so that they can comprehend the importance of culture in social life. In accordance to the statement of Fajriyah, cultural values should be implanted in each individual from an early age so that each individual can better understand, interpret, appreciate, and realize the importance of cultural values in carrying out every activity of life (Fajriyah, 2018).

The development of cultural understanding starts at a young age. Instilling cultural values in children fosters a deep-rooted appreciation that influences their actions and decisions throughout life. This early exposure teaches respect for traditions and diversity, allowing individuals to navigate different social environments with empathy and understanding. By learning the stories, customs, and beliefs associated with their own culture and those of others, children develop a broader worldview. The recognition that cultural values shape not only individual identity but also collective behaviors within a community enhances communication skills, builds stronger relationships, and encourages collaborative problem-solving in diverse contexts.

Several research results related to ethnomathematics have reported that the use of various real contexts can make learning more meaningful for students (Arisetyawan et al., 2014; Machaba & Dhlamini, 2021; Syahrin et al., 2016). Connecting mathematical concepts to tangible, familiar examples can help students grasp abstract ideas and see the relevance of mathematics to their own lives. For instance, studying geometric patterns in traditional crafts or architecture can allow students to appreciate the beauty and practicality of mathematics in a cultural context. Similarly, exploring concepts like measurement and proportion through indigenous cooking practices can ground learning in everyday activities. The field of ethnomathematics showcases the diverse range of applications of mathematics, which can help students develop a greater appreciation for its value and become more engaged in the subject.

One of the other advantages of using the context of the Geronggang Island purun craft in learning mathematics is that it makes mathematics more interesting for students because the context is close to students' daily lives. So it is hoped that a sense of pride and awareness will grow as well as awareness to protect and care for one of the cultural products of the community, namely the Purun Geronggang Island craft. This is in accordance with previous studies which have reported that ethnomathematics studies can be used to explore various potentials that can be used as a means of learning mathematics, so that students become more motivated in learning mathematics (Rosa & Orey, 2003; Ubayanti et al., 2016).

The context of the Geronggang Island purun craft as a means to train students' higher-order thinking skills. One of the characteristics of learning that trains students' higher-order thinking skills is using real contexts (Apino & Retnawati, 2017; Jailani et al., 2017). Thus it is hoped that through ethnometric studies related to the purun craft of Geronggang Island a learning design can be produced which is expected to facilitate students to develop high-level thinking skills. This design aims to move beyond rote learning and towards a model where students discover mathematical concepts within cultural artifacts. This promotes a deeper understanding and appreciation for both mathematics and the rich heritage of Geronggang Island.

The various patterns and colors that exist in the purun craft of Pulau Geronggang have their own philosophical meanings including: 1) The existence of the purun mat has the meaning of togetherness/family, 2) The white mat has the meaning of purity/cleanliness, 3) The songket pattern has a meaning originating from South Sumatra, 4) The mullet/porcupine scale pattern has the meaning of a hard life, 5) The red color has the meaning of cheerfulness and youthful spirit, 6) The green color means the age of adolescence (young), 6) The yellow color means a married girl (mature), 7) The round mat has the meaning of togetherness and love, 8) The combination prayer rug has the meaning of harmony and cooperation. These values are expected to be remembered and applied along with the existence of purun crafts in the life of the people of Pulau Geronggang Island Village.

CONCLUSION

Based on the results obtained, it can be concluded several things. First, the purun craft of Pulau Geronggang is the result of the development of the purun craft Pedamaran. Purun craft of Pulau Geronggang have more diverse types. Second, the variant forms and types of purun crafts from Pulau Geronggang contain several mathematical aspects of geometric material, especially on flat shapes and geometric shapes, namely: rhombuses, ovals, and blocks. Third, the color, type, and shape variants in the purun craft Pulau Geronggang have their own philosophical meaning. The philosophical values that exist in the Purun Craft of Geronggang Island include: togetherness/family, purity/cleanliness, originating from South Sumatra, hard life, cheerfulness and spirit of young blood, teenage age, married girls, togetherness and love, and harmony and cooperation. These values are expected to be remembered and applied along with the existence of purun crafts in the life of the people of Geronggang Island Village. Fourth, the things found in the purun craft Pulau Geronggang can be used as a source of learning mathematics at the junior high school level. Ethnomathematics is an approach that integrates mathematics with culture, offering an innovative solution to improve the effectiveness and quality of mathematics learning in junior high schools. This approach involves not only teaching math in a cultural context but also exploring the mathematical knowledge embedded in local culture.

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