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# Ethnomathematics: Exploration of Star Anise Spice in Mathematics Learning

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**Abstract:** This research examines the application of ethnomathematics by utilizing star anise spice in geometry learning for junior high school (SMP) students. Mata lawang, which is one of the native spices from Indonesia, offers a shape and structure that is rich in geometric aspects so that it can be used as an interesting and relevant learning tool. The method used in this study is a qualitative approach, collecting data through observation, interviews, and document analysis. Participants in this study consisted of grade VIII junior high school students and mathematics teachers. The findings of this study show that the integration of star anise, in geometry learning, can improve students' understanding of geometric concepts such as symmetry, pattern, and volume. In addition, students show a higher level of enthusiasm and participate more actively in learning when material is taught by relating to the local culture. This study concludes that the application of ethnomathematics in teaching geometry enriches students' learning experience, strengthens cultural identity, and enhances their enthusiasm for learning. It is hoped that the results of this research can contribute to developing more innovative and contextual mathematics education methods in schools.

**Keywords:** Ethnomathematics, Flower Bells, Geometry Learning, Junior High School Students, Local Culture.

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## A. INTRODUCTION

The Sultanate of Banten left behind various historical relics that reflect its glory as an Islamic maritime kingdom in the archipelago. Among these important relics are the Surosowan Palace and the Kaibon Palace, once the sultans' center of government and residence. The Great Mosque of Banten with its iconic tower, the Pacinan Tinggi Mosque, and the Kasunyatan Mosque reflect the acculturation of Islamic and Chinese cultures. Other relics include the Timila Building, the tombs of the sultan, and the Ki Amuk cannon now preserved in the Old Banten Museum. These relics are not only silent witnesses of the course of history, but are also very valuable cultural heritage to preserve.

The Sultanate of Banten is one of the largest Islamic kingdoms in the archipelago, established in the 16th century. Founded by Sultan Maulana Hasanuddin, the son of Sunan Gunung Jati, Banten has grown rapidly into an international trade center thanks to its strategic location on the west coast of Java Island. At the peak of its glory, the port of Banten was crowded with traders from various parts of the world, including Arabs, Persians, Indians, China, and European countries such as the Netherlands and England. This sultanate also played an important role in Islam's spread in the western archipelago. In addition to having a

formidable military force, the Sultanate of Banten was known for its tolerant attitude and wise diplomatic policies, making it one of the most influential political, economic, and cultural power centers of its time. Ethnomathematics is an approach that links mathematical concepts to cultural contexts, and is increasingly recognized as an important tool in education. Etymologically, the term ethnomathematics comes from the word "Ethno" which refers to the socio-cultural context, including aspects such as people's culture, codes of conduct, myths, symbols, etc. Meanwhile, "Mathema" means explaining, understanding, and performing various activities such as coding, measuring, and concluding. Lastly, the suffix "Tics" comes from the word "techne," which means Engineering (Pratiwi & Pujiastuti, 2020).

In globalization and rapid technological developments, mathematics education challenges, especially geometry, are becoming increasingly complex. Many students at the junior high school level face difficulties in understanding geometric concepts, which are often considered abstract and irrelevant to their daily lives. This situation can lead to low confidence and low interest in math lessons. Ethnomathematics helps students to see the relevance of mathematics in everyday life. Integrating local and national cultural elements into the learning curriculum significantly strengthens and increases the sense of nationalism among students. Local and national cultures reflect a nation's history, values, and identity. Thus, a curriculum that includes these cultural elements aims to transfer knowledge and foster and enrich a sense of love for the homeland. By incorporating cultural elements in the curriculum, education can be an effective means of forming and strengthening students' emotional bonds with their country (Atmaja & Tanjungpura, 2023).

The star flower motif is not only known in the culinary context of the Sultanate of Banten, but also an important part of the artistic ornament in Banten batik. This motif has repeating and symmetrical patterns that can be analyzed mathematically through arithmetic concepts, such as pattern repetition, rotational symmetry, and summation of shape units. For example, in a batik sheet with a star star motif, the number of petals that form the main pattern is usually a multiple of four or eight, which reflects an even number-based calculation system. This shows how Banten's ethnic traditions intuitively integrate mathematics into their cultural practices. This approach is known as ethnomathematics, which is the study of the use of mathematical concepts by certain ethnic groups in their daily lives, including in art, architecture, and textiles (Safira et al., 2021).

By studying star anise, students can explore some mathematical ideas such as patterns, symmetry, and geometry that exist in the shape and structure of the spice. This plant has towering trees with an average height of 8 to 15 meters. The stem is erect and green, while the skin is white to light gray. The leaves are single, speckled, with a pointed tip, measuring between 6 and 12 cm. The tree produces small flowers that range in diameter from 1 to 1.5 cm, with colors that vary from pinkish-white to red or greenish-yellow. The fruit of the star flower has a star-like shape, consisting of 5 to 10 petals, with an average of 8 petals. This fruit is usually harvested before ripe and dried. (Lestari et al. , n. d. (Journal et al., 2022).

Anise, which is often used in traditional cuisine, has a unique and attractive shape. Through the exploration of the shapes and patterns of star anise, students can learn about geometry and symmetry in a fun and contextual way, applying ethnomathematical methods

in the learning process can increase students' interest in the field of mathematics. Students can be involved in direct observation of star anise, drawing, and analyzing shapes, and also making calculations related to existing proportions and symmetry. Geometry material is an important aspect of mathematics education that must be studied. One of the main reasons to study geometry is to hone students' abilities in mathematics. Schwartz's opinion (Paradesa) affirms that "Geometry is a concept that connects different fields in mathematics." Students can bridge the relationship between abstract and concrete mathematical concepts by studying geometry. This makes it easier for them to relate the two types of concepts and a stimulus for more profound understanding (Luvy Sylviana Zanthy, Fitri Indah Maulani, 2020).

Individuals with high mathematical creativity can spontaneously relate concepts that others have not identified. In mathematics learning, especially in row and series materials, students with good creativity are not limited to application examples presented by educators. However, they can explore and find the relationship between these concepts and other contexts that other students do not yet recognize. One concrete example is the ability to relate the concept of rows and sequences with ethnomathematical elements found in natural patterns, such as the symmetrical shape of lawing flowers (Hardiyanti et al., 2022).

Therefore, a more in-depth study of geometry is considered very important. One of the traditional spices that implements the concept of geometry in its shape is star anise. Thus, the author chose "Ethnomathematics: Exploration of star anise spice in mathematics learning" in this study. This research will link mathematics learning with the traditional spice of star anise. The goal is to understand the relationship between the traditional spice of star anise and mathematics, the use of traditional spice of star anise in mathematics teaching, and to remind the public about the existence of this traditional spice of star anise.

## B. METHOD

This research uses a qualitative approach with ethnographic methods. The qualitative approach is descriptive and analytical, emphasising understanding a phenomenon's process and underlying meaning. Relevant theories are used as a conceptual foothold to ensure that the research focus remains aligned with the empirical conditions in the field. The ethnographic method, as a form of qualitative approach, involves the direct involvement of researchers in the context of natural culture through participatory observation techniques and in-depth interviews (Mardhotillah & Yazidah, 2023). Thus, observation, interviews, and documentation carry out data collection techniques.

The subject of this study is the star anise, which is in the Banten Museum. Observation, documentation, and interviews carry out the data collection technique. The analysis of the observations and interview results was used to learn more about using ethnomathematical concepts in star anise spices through arithmetic lines. Meanwhile, the documentation itself is used to support the data that has been obtained, both observation and interview data. The main instrument in this study is the researcher himself (human instrument), where the researcher is directly involved in the research process and plays the role of data collector through literature studies. The data analysis is done through data reduction, data presentation, and conclusion or verification (Safitri et al., 2022).

## C. RESULTS AND DISCUSSION

The term "mathematics" comes from the Latin mathematika, which was initially adopted from the Greek mathematike, which means "thing to be learned". The word has its roots in mathema, which refers to "knowledge" or "science", and is closely related to the word mathein or mathenein, which means "to learn" or "to think". Therefore, mathematics can be interpreted as a science obtained through thinking or reasoning. Mathematics focuses on rational reasoning activities, not on the results of experiments or empirical observations. Thus, mathematics is formed from human thought related to ideas, processes, and logical reasoning (Andriono, 2021).

Ethnomathematics is a discipline that began to be recognized after some scientists introduced the term as part of the realm of mathematical studies. Since the widespread spread of this concept, ethnomathematics has continued to evolve through relevant cross- disciplinary studies. Therefore, today ethnomathematics has been widely developed in Indonesia, especially in its application to the learning process in the school environment (Andriono, 2021). Ethnomathematics is a branch of science that examines the relationship between mathematical concepts and local cultural elements in an area, where mathematical elements can be found explicitly or implicitly in daily life practices. In general, ethnomathematics can be understood as a mathematical learning approach rooted in a cultural context. The term "ethnomathematics" comes from a combination of ethno, which refers to ethnicity or culture, and mathematics, a science that studies various mathematical concepts and principles (Achilla, 2024).

The Sultanate of Banten, which peaked in the 17th century, played a central role in the maritime trade network in the archipelago. Its strategic location at the western tip of Java makes it an important hub for exchanging commodities from various parts of the world, including Europe, Asia, and the Middle East. In addition to its reputation as a major exporter of pepper, historical evidence and merchants' records indicate the trade of other commodities, including spices such as star anise (Illicium verum), through the port of Banten. Lawanthem, with its distinctive aroma, is thought to have originated from other producing regions in the archipelago or even imported from China, which at that time was the main production center of this spice.

Banten's role in the star anise's trade tends to be a transit point, where these spices arrive by sea and are further distributed to various regions in the archipelago and international markets, facilitated by a diverse community of traders. In Banten's trade records, the existence

of star anise provides an interesting perspective on the diversification of trade commodities in the sultanate. Although pepper dominates and is the primary source of prosperity in Banten, other spices such as star anise hint at Banten's participation on the broader spice trade network. Banten's strategic position as a transit port holds the key in the star star flower trade, allowing for efficient exchange of commodities between regions.

Anise that may have originated east of the archipelago or China can be distributed to the west or exported through Banten's established trade network. The diversity of traders in Banten has helped smooth the star anise's trade through their interactions and networks. Although the volume of star star oil trade in Banten may not be as large as pepper, its significance is still felt in the context of the sultanate's economy and trade network, demonstrating Banten's ability to leverage its position to trade various commodities according to the demand of regional and international markets. Also known by the name deaf, star anise, is a spice easily recognizable by its shape that resembles a star. The spice is the fruit of the Illicium verum tree, a perennial evergreen plant native to southern China and Vietnam. Its star shape comprises 6 to 8 petals, each hiding small shiny brown seeds.

After drying, the color changes to between reddish brown to

dark chocolate. Anise exudes a strong and sweet scent, similar to anise at first glance even though the two are not closely related. The taste is also unique, providing a warm, sweet sensation, with a soft spicy touch, thanks to its dominant anetol compounds. The uses of star anise, ranging from enriching the taste of cuisine to being used in traditional medicine practices. From this explanation, the researcher found that there is a mathematical concept on each star petal that can be used as one of the mathematics learning media in arithmetic row material, which is as follows:

Barisa arithmatics:

An arithmetic sequence is a sequence of numbers in which each tribe (starting from the second quarter) is derived from the previous tribe by adding or subtracting a fixed number. This fixed number is called difference (denoted by b).

Characteristics of Arithmetic Rows:

* The difference between two consecutive tribes is always fixed (constant).
* Consistent pattern of addition or subtraction.

In this explanation, we can use star anise, as a learning medium that can facilitate the process of understanding the material because we can visualize directly by looking at the picture of star anise, which is one of the spices that are exported through the trade network in Banten.

Arithmetic Formulas N-tribe (Un)

A = a + (n - 1)b Information:

* Un: Nth tribe
* a: First quarter
* n: Tribal number

*b: Beda barisan

In the formula of the arithmetic row, we can apply the star anset as Learning media are as follows:

For example:

*Number of star antagonists: levels or layers

So:

* Un : In the context of star anise, Un can be interpreted as the number of star annets at the n "level" or "layer" in a specific arrangement or pattern.
* a (First Tribe): This can be interpreted as the number of star annets in the first "level" or "layer" in the order.
* n (Syl number): This remains as a "level" or "layer" number in the array The Flower of Hope that we imagine.
* b (Row difference): This is the fixed number of star annets added (or subtracted) at each subsequent "level" or "layer".

To further apply, the researcher directly applies the relationship of star anise, in the following example problems:

A flower arrangement arranges a star anset in a circle. In the first circle, he placed 6 levels of star anise. In the second circle (outside the first circle), he added 4 more tiers of star annets than the first circle. In the third circle, he added 4 more levels of star anememones than the second circle, and so on. If the sum of the star flowers on each circle forms an arithmetic row, determine:

*Number of star annets in the 7th circle.

Answer:

From the problem, we know that the number of star annets in each circle forms an arithmetic row with:

* First quarter (a) = 6 (number of star star levels in the first circle)
* Difference (b) = 4 (addition of star star levels in each circle next).
* Number of star antagonists in the 7th circle:

We use the formula of the nth quarter of the arithmetic line:

Un = a + (n - 1)b for n = 7:

U7 = 6 + (7 - 1) . 4

U7 = 6 + 6 . 4
U7 = 6 + 24
U7 = 30

So, the number of star annets in the 7th circle is 30 pieces.

It can be concluded from the example of the arithmetic row problem above we can use star star which was initially only intended as a cooking spice, it turns out that we can use it as a learning medium to make it easier to understand math problems by directly visualizing the shape of star star in arithmetic row problems into daily life by using star star as a learning medium.

## D. CONCLUSIONS

In the 17th century, the Sultanate of Banten played a significant role in the maritime trade network. Banten is not only known as a pepper export center, but also serves as a transit port for various other commodities, including star anise. The trade record reflects Banten's contribution to a more diverse distribution of spices, taking advantage of its strategic geographical position and network of international traders. Interestingly, star anise, which we often encounter as a kitchen spice, also has the potential as a math learning tool, especially in arithmetic line material. With its unique shape and the number of petals that can be visualized in layered patterns, star anisebirds can be used to introduce mathematical concepts in a more contextual and fun way. This proves that a learning approach prioritizes culture and daily life can improve students' understanding of abstract concepts.

To improve the quality of learning, it is highly recommended that teachers apply a contextual approach by utilizing objects from daily life, such as star anise, as a medium in mathematics learning. This approach helps students understand abstract concepts such as arithmetic rows and makes learning more interesting and meaningful. In addition, it is important to integrate local content in teaching, for example by discussing the history of the spice trade in Banten. This can foster a sense of pride in the local culture and strengthen understanding between subjects. Teachers and researchers are encouraged to innovate creatively, adapting various commodities or other cultural elements as innovative learning media. Furthermore, developing thematic modules or teaching materials that combine aspects of history, culture, and mathematics in an integrated manner is highly recommended. Thus, students will gain a more thorough and contextual understanding of their study material.

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## REFERENCES

Achilla, S. (2024). Inovasi Pembelajaran Matematika dengan Menggunakan Pendekatan Etnomatematika pada Motif Kain Troso sebagai Project Kearifan Lokal. … , Prosiding Seminar Nasional Matematika, 7. https://proceeding.unnes.ac.id/prisma/article/view/2997

Andriono, R. (2021). Analisis Peran Etnomatematika dalam Pembelajaran Matematika. ANARGYA: Jurnal Ilmiah Pendidikan Matematika, 4(2). https://doi.org/10.24176/anargya.v4i2.6370

Atmaja, T. S., & Tanjungpura, U. (2023). Upaya Meningkatkan Nasionalisme Peserta Didik Melalui Pembelajaran Berbasis Budaya. 3, 4335–4344.

Hardiyanti, T. A., Syaf, A. H., & Widiastuti, T. (2022). Pengembangan Modul Berbasis Etnomatematika Pada Materi Barisan Dan Deret. Seminar Nasional Pendidikan, FKIP UNMA, 285–300.

Journal, M. N., Cetak, I., & Online, I. (2022). Tahun 2022. 4(November), 3130–3154.

Luvy Sylviana Zanthy, Fitri Indah Maulani. (2020). ANALISIS KESULITAN SISWA DALAM MENYELESAIKAN SOAL MATERI TRANSFORMASI GEOMETRI. Gammath : Jurnal Ilmiah Program Studi Pendidikan Matematika, 5(1), 16–25. https://doi.org/10.32528/gammath.v5i1.3189

Mardhotillah, I., & Yazidah, N. I. (2023). Eksplorasi Etnomatematika Pada Proses. Jurnal Pendidikan Matematika, 4(2), 239–245. http://fkip-unswagati.ac.id/ejournal/index.php/snpm/article/download/850/399

Pratiwi, J. W., & Pujiastuti, H. (2020). Eksplorasi Etnomatematika Pada Permainan Tradisional Kelereng. 05(02), 1–12.

Safira, F., Prabawati, A. T., Safiri, A. D., & Kusuma, J. W. (2021). Etnomatematika : Nilai filosofis dan konsep Matematika pada motif batik Banten. 1, 162–168.

Safitri, S. yuliana, Latifah, D., & Angelani, N. (2022). Etnomatematika Pada Batik Kawung Sebagai Referensi Konteks Barisan Dan Deret Aritmatika. Jurnal Pendidikan Matematika Undiksha, 13(1), 21–27. https://doi.org/10.23887/jjpm.v13i1.36881

Tradisi, M., Dan, D., & Said, H. A. (n.d.). Islam dan Budaya Di Banten : 10, 109–138.