Ethnomathematics of Bugis Food: Exploration of Traditional Cakes as a Resource for Learning Mathematics

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ABSTRACT

Local culture can be used as a contextual learning resource. The Bugis are one of the largest tribes in Indonesia, and local culture is an important and inseparable part of people's lives. One of the famous Bugis cultural heritages is their traditional food. The aim of this research is to find out the ethnomathematics exploration of traditional Bugis food, namely Barongko, Onde-onde, Roko-roko' Unti, Putu Coppa and Doko-doko Cangkuning which is associated with learning mathematics, namely geometry. This research is descriptive qualitative with an ethnographic approach. The data collection techniques are carried out through observation, interviews and documentation. The research results show that there is a geometric concept, namely flat shapes and spatial shapes in traditional Bugis cakes. Such as the flat building concept in Roko-Roko Unti and the space building concept in Barongko, Onde-Onde, Putu Soppa and Doko-Doko Cangkuning cakes.

Keywords: Ethnomathematics, Bugis Food, and Geometry

ABSTRAK

Kebudayaan lokal bisa dimanfaatkan sebagai sumber belajar yang kontekstual. Bugis adalah salah satu suku terbesar di Indonesia, serta budaya lokal merupakan bagian penting dan tidak terpisahkan dari kehidupan masyarakat. Salah satu warisan budaya Bugis yang terkenal adalah makanan tradisionalnya. Tujuan dari penelitian ini adalah mengetahui eksplorasi etnomatematika pada makanan tradisional bugis yaitu Barongko, Onde-onde, Roko-roko' Unti, Putu Coppa dan Doko-doko Cangkuning yang dikaitkan dengan pembelajaran matematika yaitu geometri. Penelitian ini bersifat deskriptif kualitatif dengan pendekatan etnografi. Adapun teknik pengumpulan data dilakukan melalui observasi, wawancara, dan dokumentasi. Hasil penelitian menunjukkan terdapat konsep geometri yaitu bangun datar dan bangun ruang pada kue tradisional bugis. Seperti konsep bangun datar pada Roko-Roko Unti dan konsep bangun ruang pada kue Barongko, Onde-Onde, Putu Soppa serta Doko-Doko Cangkuning.

Kata Kunci: Etnomatematika, Makanan Bugis, dan Geometri

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1). INTRODUCTION

In the era of globalization which is full of challenges in developing and improving the quality of human resources, education is needed. Education is a systematic and sustainable effort that aims to improve the quality of human life (Amir, et al., 2022; Sulistyani & Masrukan, 2017). In line with this opinion, Barta (2022) states that the aim of education is to prepare students for life, education not only provides theoretical knowledge but also to develop various students' skills. One effort to improve the nation's quality of life and education is by learning mathematics (Kosasih, et al., 2022).

Mathematics learning is learning that has an important role in advancing human thinking power in a nation. Therefore, learning mathematics has an important meaning that students must learn and master at school (Sulistiani & Masrukan, 2017). This is in line with mathematics education in schools which aims to develop students' reasoning, so that students can become individuals who are trained in how to think, consistent, active, independent and have the ability to solve problems in social life. Therefore, mathematics learning in schools needs to be handled and considered seriously, especially educators as the spearhead in planning, implementing and evaluating mathematics learning in the classroom.

Mathematics is often taught in schools as a subject that is culture-free and unrelated to the realities of everyday life (Rosa & Orey, 2011), while mathematics is deeply rooted in culture and is an inseparable unit (Abdullah, 2016; Brandt & Chernoff, 2014). The relationship between mathematics and culture in the form of traditional food in the Bugis community was also stated by Hikmawati Pathuddin and Siti Raehana (2019), they stated that traditional food is also a source of learning mathematics that is easily found in everyday life. The same thing was expressed that traditional food is a medium for learning mathematics (Nanda Sari, et al., 2020). Mathematical concepts emerge through the knowledge and perspectives of people who are present and develop naturally in a particular culture without going through a formal education process(Hikmawati Pathuddin and Nawawi 2021). Some people may never study, but they can practice math concepts well. This shows that mathematics will always be used in social life, no matter how primitive the social group is. However, most people don't realize it, and people sometimes think mathematics is difficult. This indirectly forms students' complicated perceptions of mathematics. As a result, mathematics loses its neutral nature and is no longer seen as objective(H. Pathuddin and Nawawi 2021).

The mismatch between mathematical problems at school and mathematical problems in everyday life often makes students confused and difficult to relate mathematical concepts acquired at school to mathematics in the real world. As a result, it is often found that there are students who are able to solve mathematical problems in everyday life, but have difficulty solving mathematical problems in class (D'Ambrosio, 1985). Therefore, mathematics learning should be able to bridge the gap between mathematics in the classroom and mathematics in everyday life, one of which is local culture.

Local culture can be used as a contextual learning resource. Culture-based learning can be an innovation in mathematics learning. The study of culture-based mathematics is ethnomathematics. Ethnomathematics learning is considered to be able to increase students' reasoning power because ethnomathematics learning describes all the things that form the cultural identity of a group which will stimulate students' reasoning power because with ethnomathematics it is easier for students to remember the essential characteristics of an object to be studied.(Hikmawati Pathuddin and Raehana 2019)Ethnomathematics is defined as cultural anthropology of mathematics, namely the study of the relationship between culture and mathematics. Ethnomathematics differentiates between mathematics in schools and mathematics embedded in cultures that are sometimes rarely touched by the school system (Turmudi, 2017).

The term ethnomathematics was first introduced by a Brazilian mathematician, namely D'Ambrossio. Ethnomathematics comes from the word ethnomathematics, which consists of three syllables, namely ethno, mathema, and tics. The prefix ethno refers to identifiable cultural groups, such as tribal associations in a country and professional classes in society, including their language and daily habits. Mathema means explaining, understanding, and managing real things specifically by calculating, measuring, classifying, ordering, and modeling patterns that appear in an environment, while tics means art in technique. In terms of terms, ethnomathematics is defined as mathematics practiced within cultural groups such as national communities, tribes, labor groups, children of certain age groups and professional classes (D'Ambrosio, 1985).

According to Imswatama & Setiadi (2017), research in the field of ethnomathematics has reached many sectors, such as architecture, weaving, sewing, ornaments, and spiritual and religious practices which are often aligned with patterns that occur in the environment. Ethnomathematics uses many mathematical concepts that are directly related to culture, for example the concepts of spatial shapes and flat shapes. One area of mathematical study that is often researched in ethnomathematics is

geometry. Geometry is a branch of mathematics that studies points, lines, planes, plane figures and spatial figures. Geometry discusses problems that exist in everyday life. Natural phenomena, the shapes of objects, and the activities carried out are largely the result of geometry (Isnawati & Putra, 2017).

Applications in other fields of geometry can also be found in Bugis society. The Bugis are one of the largest tribes in Indonesia, and local culture is an important and inseparable part of people's lives. The Bugis people really maintain their cultural values and always try to preserve their cultural heritage which has existed since time immemorial. One of the famous Bugis cultural heritages is their traditional food. Traditional food used as a learning medium must be food that is familiar to students. One of the foods that is familiar to the Bugis community is Barongko, Onde-onde, Roko-roko' Unti, Putu Coppa and Doko-doko Cangkuning.

Traditional Bugis cakes such as Barongko, Onde-onde, Roko-roko' Unti, Putu Coppa, and Doko-doko Cangkuning have a rich history from generation to generation. Barongko, for example, comes from Bugis-Makassar culture and is generally served at weddings or big holidays. Onde-onde, which contains green beans, is often served at Chinese New Year or Eid celebrations. Roko-roko' Unti, a cake made from coconut and brown sugar, is usually found in the traditions of the Bugis community. Putu Coppa, sticky rice cake layered with grated coconut, is often served at family events or thanksgiving. Meanwhile, Doko-doko Cangkuning, a cake made from rice flour, is usually offered at Bugis traditional ceremonies as a symbol of fertility. These cakes can vary depending on the Bugis community's activities or celebrations.

Figure 1

A collection of traditional Bugis cakes

Traditional Bugis food is always served at every event held in the Bugis community. This makes traditional Bugis food very familiar, including among students. Physically, traditional Bugis food comes in various forms and has remained largely unchanged since ancient times. If you look closely, the shape of this food contains the concept of geometry. Based on its distinctive shape, the author needs to dig deeper into the geometric concepts found in traditional Bugis food so that it can be used as a source of mathematics learning that is very close to students' lives.

Based on this background, the aim of this research is to determine the ethnomathematics exploration of traditional Bugis food, namely Barongko, Onde-onde, Roko-roko' Unti, Putu Coppa and Doko-doko Cangkuning which is associated with mathematics learning, namely geometry. By integrating the cultural values of traditional Bugis food, it is hoped that students will be able to explore

the culture around them, linking it to material and concepts in mathematics learning. In this way, students will become more enthusiastic and motivated in learning mathematics.

2) METHODS

This research is descriptive qualitative with an ethnographic approach. Qualitative descriptives are used to obtain and explain overall and in-depth information (Prahmana et al., 2018). Meanwhile, ethnography is a qualitative approach that describes culture (Spradley, 2007). Ethnography provides answers to questions about what the culture of a group is (Sulateri et al., 2020). The aim of this research is to reveal the ethnomathematics in the activity of making Barongko cakes among the Bugis community. Based on the type and approach of this research, the instrument used is a human instrument, in this case the researcher is directly related to the research and acts as a data collector, and his role cannot be replaced. Data collection techniques are carried out through observation, interviews and documentation.

3) RESULTS AND DISCUSSION

From observations, 5 types of traditional Bugis food were identified, including Barongko, Onde-Onde, Roko-Roko' Unti, Putu Coppa, and Doko-doko Cangkuning. Through analysis of the shapes of these traditional foods, it turns out that these foods display geometric shapes from flat shapes and spatial shapes. The flat concept found in traditional Bugis food is as follows:

a. Roko-Roko' Unti

Roko-Roko Unti, one of the traditional cakes typical of South Sulawesi which is generally available in markets, is made from plantains coated with a mixture of rice flour and a little warm water, creating a dense layer around the banana. The mixture also includes shredded coconut for added savory flavor. After this process, this cake is steamed and wrapped in young banana leaves which are folded into a rectangular shape.

Figure 2

Through image analysis, it can be seen that Roko-Roko Unti applies the concept of geometry in a rectangular shape. The characteristics of the rectangle that can be seen from the image include:

a. Has four corners in the form of right angles

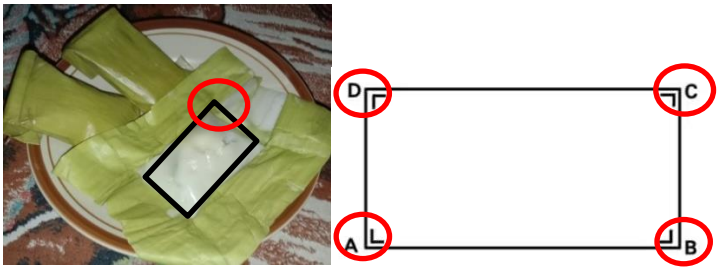
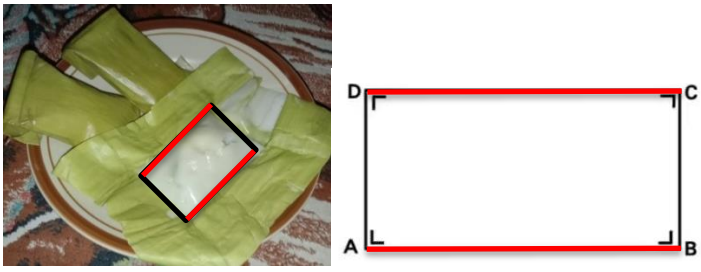


Figure 2.a

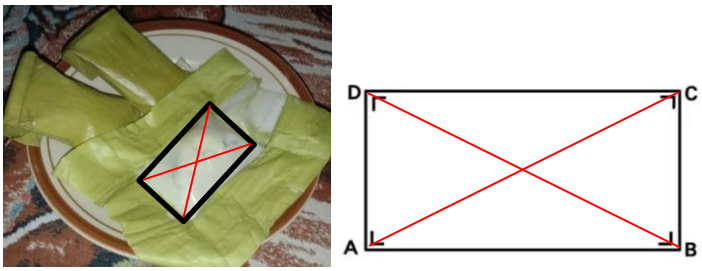
b. Each side facing each other has the same length



AB = DC and AD = BC

Figure 2.b

c. The two diagonals of the rectangle that meet at the intersection point divide each other, each diagonal into two parts of the same length.



AC and BD

Figure 2.c

d. Has 2 lines of symmetry

e. Has 2 rotational symmetries

The flat concept found in traditional Bugis food is as follows:

a. Barongko

Barongko, is a typical food in South Sulawesi which is popular among the Bugis and Makassar tribes. The name "Barongko" comes from the phrase "barangku mua udoko" in Bugis language which describes the goods that I pack myself. This refers to banana dough wrapped in banana leaves. This food is often served at traditional Bugis tribal events, such as wedding celebrations.

Figure 3

Geometric barongko modeling.

After analyzing the image, it can be seen that Barongko applies a geometric concept similar to a triangular prism. The properties or characteristics of a triangular prism that can be observed from the image are:

a. It has two triangles that are parallel but lie in different planes

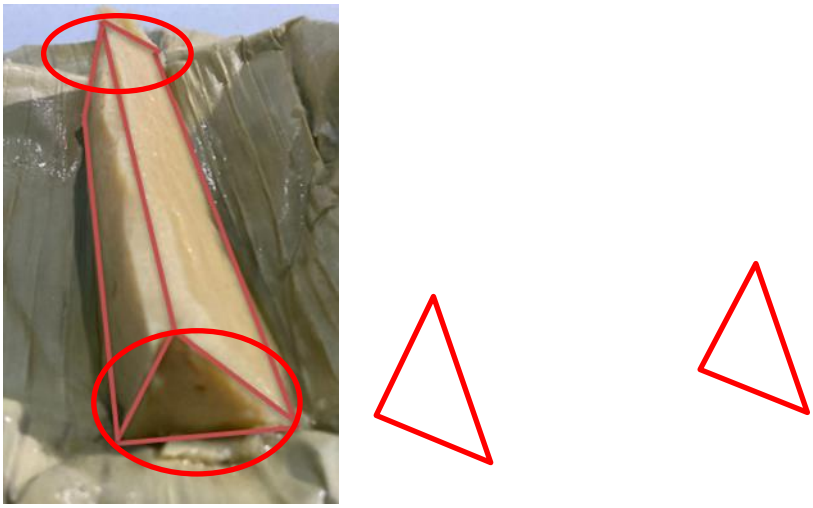


Figure 3.a

b. It has a rectangular base to connect the two sides of the triangle

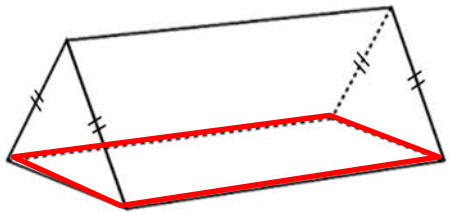


Figure 3.b

c. There are 5 sides

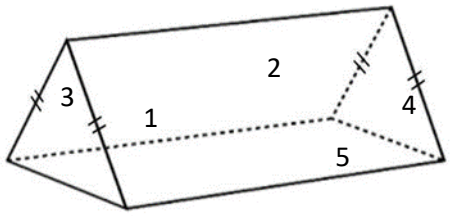


Figure 3.c

d. There are 9 ribs

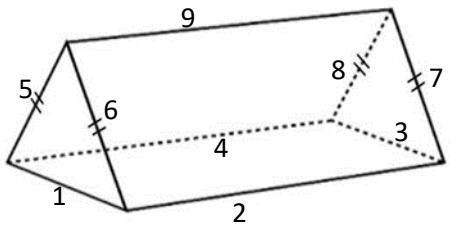


Figure 3.d

b. Onde-Onde

Onde-onde is a traditional food that is part of thanksgiving celebrations in Bugis-Makassar culture. This special cake has a special taste. The melted brown sugar in it gives it a distinctive sweet taste, while the mixture of rice flour and grated coconut provides a soft savory taste.

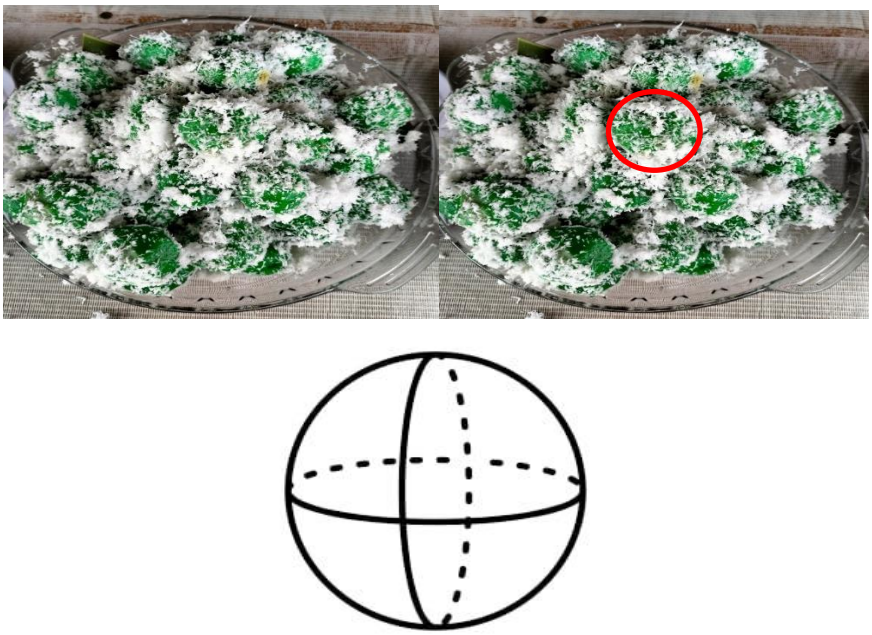


Figure 4

Geometric modeling of onde-onde.

Based on the analysis of the image, it can be seen that the onde-onde has a shape that resembles a ball in geometry. The characteristics or properties of the ball that can be seen from the image are:

1. Only has 1 side
2. It has no corners and flat areas

c. Putu Soppa

Putu soppa is a traditional cake made from a combination of sticky rice and regular rice as the main composition. Its presence is limited to morning time, starting after Fajr prayers until 9 am. This cake is long and round, coated with grated coconut, and wrapped in coconut leaves.

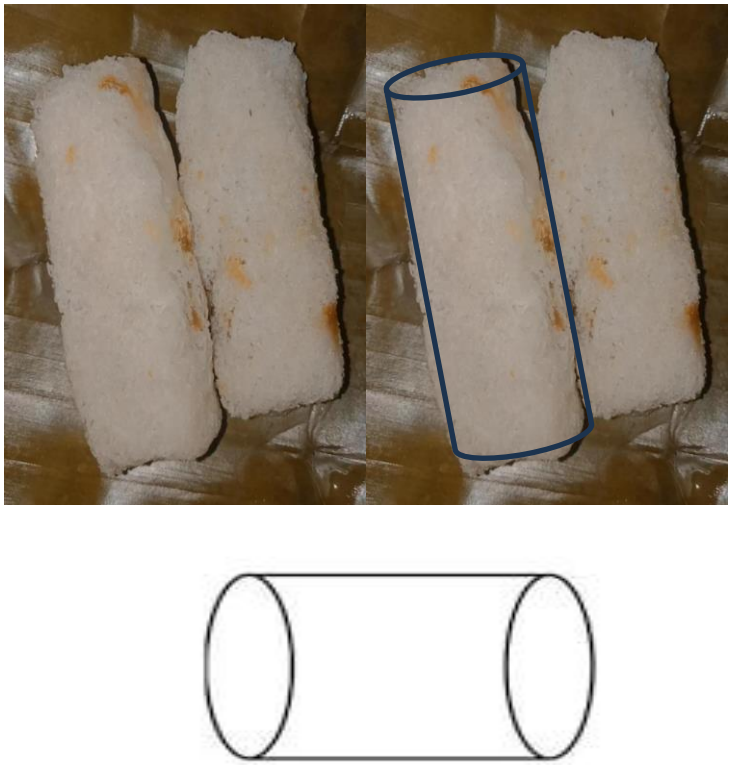


Figure 5

Geometric modeling of putu Sopppa.

After analysis, it can be seen that putu coppa has a geometric shape similar to a tube. The characteristics or properties of the tube that can be seen from the picture are:

a. There are 2 sides in the shape of a circle

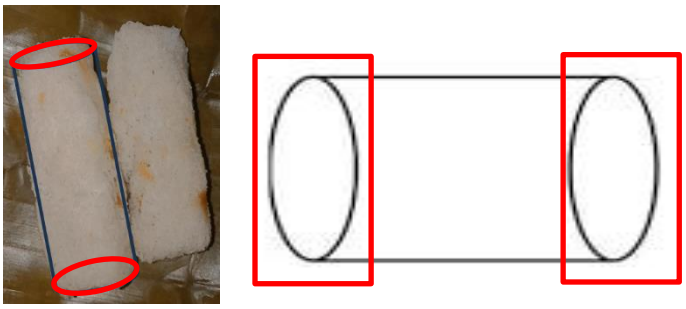


Figure 5.a

b. It has a side called a blanket which functions as a connection between the two sides of the circle

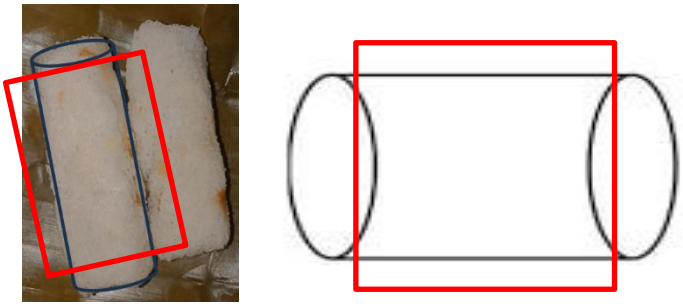


Figure 5.b

c. Has no corner points

d. Doko-Doko Cangkuning

Doko-doko cangkuning, a traditional cake typical of the Bugis tribe in South Sulawesi, is also known as a Bugis cake which is commonly found on the market. Made from a mixture of sticky rice flour and thick coconut milk, this cake is filled with a mixture of grated coconut and brown sugar, then wrapped in banana leaves. It tastes sweet and delicious and is suitable to be eaten with coffee or hot tea.

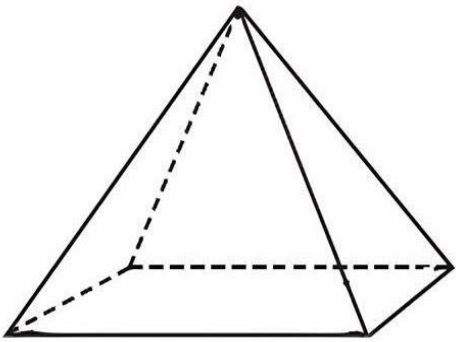


Figure 6

Geometric modeling of cangkuning doko-doko

From the image analysis, it can be seen that Doko-Doko Cangkuning resembles the geometric shape of a pyramid. Limas characteristics include:

a. Has 4 triangular sides

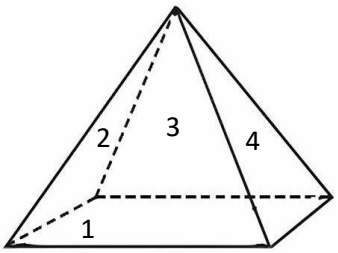


Figure 6.a

b. There is 1 side in the shape of a rectangle

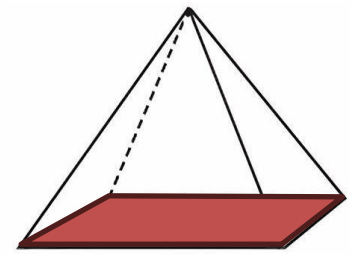


Figure 6.b

c. Has 4 corners

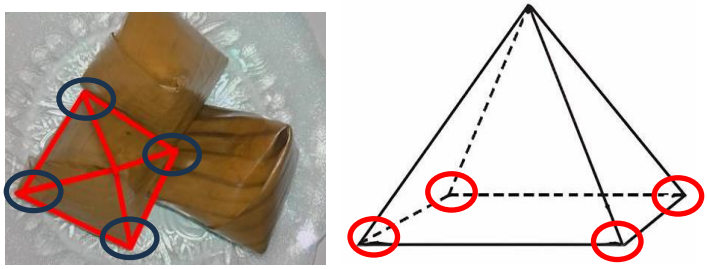


Figure 6.c

d. There is 1 peak point

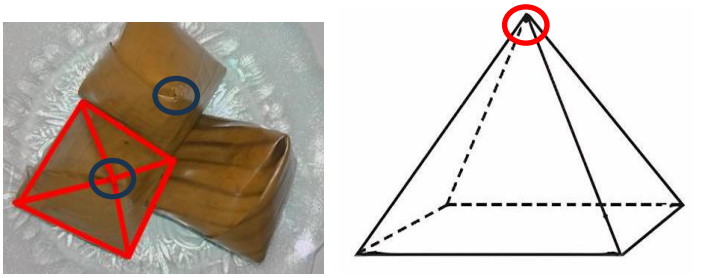


Figure 6.d

Based on the results of this research, it is known that traditional Bugis food has an important role in the daily lives of students. Almost all students not only consume this food, but also have experience making it. Therefore, traditional Bugis food can be used as a more realistic means of learning mathematics. Students can be asked to observe this traditional food and identify the geometric concepts contained in it.

At the elementary school level, educators can instruct students to bring one type of traditional Bugis food into the classroom. After that, students can make observations and recognize the shape and special characteristics of the food. This process facilitates students in understanding geometric concepts in more real situations. At the secondary school level, educators can expand learning materials related to the introduction of perimeter and area of flat shapes and space, using traditional Bugis food as the focus of learning. Educators can also ask questions related to these foods to stimulate students' creative thinking abilities.

Pictures of Bugis Traditional Food	**Ethnomathematics Concept**	**Questions and Answers**
	The ethnomathematics concept from the picture beside is related to a flat shape, namely a rectangle. The characteristics of the rectangle that can be seen from the image include: 1) Has four corners in the form of right angles 2) Each side facing each other has the same length 3) The two diagonals of the rectangle that meet at the intersection point divide each other, each diagonal into two parts of the same length. 4) Has 2 lines of symmetry 5) Has 2 rotational symmetries	Pak Goni is a seller of traditional food, one of which is roko roko unti. This Roko Roko Unti itself is a cake passed down from generation to generation by the Bugis community which is made from coconut and brown sugar, usually found at Bugis community events/traditions such as celebrations, weddings and other big events. This Roko Roko Unti basically has a rectangular shape. If the unti roko roko sold by Mr. Goni is 8 cm long and 4 cm wide, determine the area and perimeter of the unti roko roko sold by Mr. Goni. Answer : **Known** $p = 8\ cm$ $l = 4cm$ Asked: The area and perimeter of the rook rook unti Solution: Around $K = 2 \times (p + l)$

		$K = 2 \times (8 + 4)$ $K = 24\ cm$ Wide $L = p \times l$ $L = 8 \times 4$ $L = 32\ cm$
	The ethnomathematics concept from the picture beside is related to spatial shapes, namely triangular prisms. The properties or characteristics of a triangular prism that can be observed from the image are: a) It has two triangles that are parallel but lie in different planes b) It has a rectangular base to connect the two sides of the triangle c) There are 5 sides d) There are 9 ribs	Barongko was a special dish for kings during the kingdoms of the Bugis and Makassar tribes. It is also served at traditional events such as weddings. At a traditional Bugis wedding event, a traditional cake called barongko is served which, if you look at its shape, looks like a triangular prism. If the shape of the barongko has a height of 12 cm with a base in the form of a right triangle whose length is 9 cm and the base is 8 cm. Determine the volume of the barongko. **Answer :** Known: $a = 8\ cm$ $t\Delta = 9\ cm$ Prism height $=12\ cm$ Asked Barongko Volume Completion

		$V = \left(\frac{1}{2} \times a \times t\Delta\right) \times t\ prisma$ $V = \left(\frac{1}{2} \times 8 \times 9\right) \times 12$ $V = 432\ cm^3$
	The ethnomathematics concept from the picture beside is related to the shape of space, namely the ball.The characteristics or properties of the ball that can be seen from the image are: 3. Only has 1 side 4. It has no corners and flat areas	At a thanksgiving event held by Mr. Andi, one of the traditional Bugis foods, namely onde onde, was served. Onde onde is a round food that has been around since the 13th-14th century and is a cake that must be present in the thanksgiving ritual of the Makassar Bugis community because this onde-onde brings hope and prayers. The onde onde served is shaped like a ball. So determine the surface area of the onde onde which has a diameter of 7 cm. (with$\pi = \frac{22}{7}$) **Answer** Known $d = 14\ cm, r = \frac{14}{2} = 7\ cm$ $\pi = \frac{22}{7}$ Asked The surface area of the onde-onde Completion $L_{onde-onde} = 4\pi r^2$ $L_{onde-onde} = 4\left(\frac{22}{7}\right)(7)^2$

		$L_{onde-onde} = 616\ cm^2$
	The ethnomathematics concept from the picture beside is related to the shape of space, namely the tube. The characteristics or properties of the tube that can be seen from the picture are: 1) There are 2 sides in the shape of a circle 2) It has a side called a blanket which functions as a connection between the two sides of the circle 3) Has no corner points	Ahmad's mother wanted to make putu coppa to serve at a thanksgiving event. Putu Coppa is a traditional Bugis food that has been passed down from generation to generation, made from sticky rice coated with grated coconut, which is often served at family events or thanksgiving. Generally, the shape of the putu coppa is shaped like a tube. Determine the surface area of the putu coppa that Mrs. Ahmad wants to make if it is known that her radius is 7 cm and the height is 10 cm. (with$\pi = \frac{22}{7}$) **Answer** Known $r = 7\ cm$ $t = 10\ cm$ Asked Surface Area of Putu coppa Completion $L_{Permukaan} = 2\pi r(r + t)$ $= 2 \times \frac{22}{7} \times 7(7 + 10)$ $= 44 \times 17$ $= 748\ cm^2$

	The ethnomathematics concept from the picture beside is related to the geometric shape of a pyramid. The characteristics of pyramids include: 1) Has 4 triangular sides 2) There is 1 side in the shape of a rectangle 3) Has 4 corners 4) There is 1 peak point	Cangkuning doko-doko is a cake made from rice flour, usually offered at Bugis traditional ceremonies as a symbol of fertility. This doko doko cangkuning is usually shaped like a pyramid. If the doko doko cangkuning has a base side length of 10 cm and a height of 12 cm. Determine the volume of the doko doko cangkuning **Answer** Known $s = 5\ cm$ $t = 6\ cm$ Asked Doko doko cankuning volume Completion $V = \frac{1}{3} \times L_a \times t$ $V = \frac{1}{3} \times s \times s \times t$ $V = \frac{1}{3} \times 5 \times 5 \times 6$ $V = 60\ cm^3$

4). CONCLUSIONS

Based on the research results, it can be concluded that there are elements of ethnomathematics in traditional Bugis food, namely the concept of geometry consisting of flat shapes and spatial shapes. There are five types of traditional Bugis food that contain geometric concepts, namely Barongko, Onde-Onde, Roko-Roko Unti, Putu Soppa and Doko-Doko Cangkuning. The flat shape concept found is the rectangle in the Roko-Roko Unti cake, while the space shape concepts found include the

prism in the barongko cake, the ball in the Onde-Onde cake, the tube in the Putu Soppa cake and the Doko-Doko Cangkuning pyramid. Educators can utilize these traditional Bugis food forms as a more concrete and innovative mathematics learning resource, and can be used to improve students' critical thinking processes. In this way, mathematics learning will become more meaningful because learning resources come from the environment around students.

REFERENCES

Choeriyah, Laelinatul, Toto Nusantara, Abd. Qohar, and Subanji. 2020. "Studi Etnomatematika Pada Makanan Tradisional Cilacap." *AKSIOMA : Jurnal Matematika dan Pendidikan Matematika* 11(2): 210–18. https://journal.upgris.ac.id/index.php/aksioma/article/view/5980/3690.

Fitriani, Desi, and Aan Putra. 2022. "Systematic Literature Review (SLR): Eksplorasi Etnomatematika Pada Makanan Tradisional." *Journal of Mathematics Education and Learning* 2(1): 18.

Fitriani, Fitriani, and Azmidar Azmidar. 2023. "Etnomatematika Budaya Bugis : Inovasi Pembelajaran Matematika Pada Burasa." *Journal of Mathematics Learning Innovation (JMLI)* 2(1): 20–38.

Herayanti, Suhendra, and Dadang Juandi. 2023. "Ekplorasi Etnomatematika Pada Makanan Tradisional Masyarakat Majalengka." *JUMLAHKU: Jurnal Matematika Ilmiah STKIP Muhammadiyah Kuningan* 9(1): 163–74.

Kurniaman, Otang, and Eddy Noviana. 2017. "Penerapan Kurikulum 2013 Dalam Meningkatkan Keterampilan, Sikap, Dan Pengetahuan." *Primary: Jurnal Pendidikan Guru Sekolah Dasar* 6(2): 389.

Ningrum, Yeni Dwi, and Wiryanto. 2022. "IMPLEMENTASI ETNOMATEMATIKA MELALUI MAKANAN TRADISIONAL 'KUE WAJIK' PADA MATERI PENJUMLAHAN DAN PENGURANGAN." *Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan dan Hasil Penelitian* 4(2): 140–54.

Pathuddin, H., and M. I. Nawawi. 2021a. "Buginese Ethnomathematics : Barongko Cake." *Journal on Mathematics Education* 12(2): 295–312.

———. 2021b. "BUGINESE ETHNOMATHEMATICS: BARONGKO CAKE EXPLORATIONS AS MATHEMATICS LEARNING RESOURCES." *Journal on Mathematics Education* 12(2): 295–312.

Pathuddin, Hikmawati, and M Ichsan Nawawi. 2021. "ETNOMATEMATIK BUGIS : EKSPLORASI KUE BARONGKO." *Jurnal Pendidikan Matematika* 12(2): 295–312.

Pathuddin, Hikmawati, and Sitti Raehana. 2019. "Etnomatematika: Makanan Tradisional Bugis Sebagai Sumber Belajar Matematika." *MaPan* 7(2): 307–27.

Pradiati, S, A A Armielia, and O P Triutama. 2023. "Sejarah Gastronomi Kue Barongko Dari Makassar." *Jurnal Pendidikan Tambusai* 7: 3794–99. https://garuda.kemdikbud.go.id/documents/detail/3403628.

Ramadhani, Astri, and St Nurul Mutmainna. 2023. "Peran Etnomatematika Dalam Pembelajaran Matematika Pada Kurikulum 2013." *COMPETITIVE : Journal of Education* 2(1): 53–68.

Saniyah, S M, and A S Ardiansyah. 2023. "Eksplorasi Etnomatematika Pada Makanan Tradisional Pekalongan Dan Kaitannya Dengan Pembelajaran Matematika." *Himpunan: Jurnal Ilmiah Mahasiswa* … 3: 25–36. https://www.jim.unindra.ac.id/index.php/himpunan/article/view/8584.

Werdiningsih, Condro Endang. 2022. "Kajian Etnomatematika Pada Makanan Tradisional (Studi Kasus Pada Lepet Ketan)." *Jurnal PEKA (Pendidikan Matematika)* 5(2): 112–21.