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EXPLORATION OF ETHNOMATHEMATICS AS A LEARNING RESOURCE IN CULINARY TOURISM KAMU MARKET

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Abstract

Ethnomathematics is a culture-based learning concept in the context of mathematics. The presence of mathematics with cultural nuances will make a major contribution to learning mathematics. The purpose of this study is to identify and describe mathematical objects and concepts found in Malay culture at the Kamu market. This type of research is qualitative research with ethnographic methods. Data analysis techniques used are literacy studies, observation, interviews, and documentation. The results showed that the culture at Kamu market has various ethnomathematics concepts found in traditional cakes from various regions such as Katimus cakes, Gadong cakes, Dangai cakes, Karas cakes, Lapet cakes, and Putu Bambu cakes. The mathematical concepts found are geometric shapes such as rectangles, spheres, cuboids, isosceles triangles, quadrilateral pyramids, and cylinders. This ethnomathematics exploration can be used as a learning medium that is expected to help and add insight into understanding the concepts of flat shapes and geometric shapes in learning mathematics.

Keywords: ethnomatematics; culture; geomtery

Abstrak

Etnomatematika merupakan konsep pembelajaran berbasis budaya dalam konteks matematika. Kehadiran matematika yang bernuansa budaya akan memberikan kontribusi besar dalam pembelajaran matematika. Tujuan dari penelitian ini adalah untuk mengidentifikasi dan mendeskripsikan objek dan konsep matematis yang terdapat pada budaya Melayu di pasar Kamu. Jenis penelitian ini adalah penelitian kualitatif dengan metode etnografi. Teknik analisis data yang digunakan adalah studi literasi, observasi, wawancara, dan dokumentasi. Hasil penelitian menunjukkan bahwa budaya di pasar Kamu memiliki berbagai konsep etnomatematika yang terdapat pada kue tradisional dari berbagai daerah seperti kue Katimus, kue Gadong, kue Dangai, kue Karas, kue Lapet, dan kue Putu Bambu. Konsep matematika yang ditemukan adalah bentuk-bentuk bangun geometri seperti persegi panjang, bola, balok, segitiga sama kaki, limas segiempat, dan tabung. Eksplorasi etnomatematika ini dapat digunakan sebagai media pembelajaran yang diharapkan dapat membantu dan menambah wawasan dalam memahami konsep bangun datar dan bangun ruang dalam pembelajaran matematika.

Kata Kunci: etnomatematika; budaya; geometri

INTRODUCTION

Mathematics is one of the subjects in school that has an important role to learn for every student from elementary school to university. The magnitude of the role of mathematics can be seen from (Ruseffendi,

2020) that mathematics can be interpreted as a deductive study, as a language, as the queen and servant of knowledge, as art, and as human activity. Therefore, students must be able to master mathematics, especially their ability to solve mathematical problems in everyday life. The knowledge that students have in solving mathematical problems will provide opportunities for students to apply the knowledge they have to understand problems in real life.

Facts on the ground show that mathematics is still considered difficult, scary, and boring by most students, and they feel required to think critically and creatively when solving math problems. Even though thinking is a mental activity to help formulate or solve a problem, make a decision, and understand curiosity (Sidiq, 2019). However, the low achievement of learning mathematics is caused by the difficulty of thinking students understand the problem. This is by the statement of (Nabillah & Abadi, 2020) that the low learning outcomes of students in mathematics are due to difficulties in understanding mathematics and students are less motivated in learning mathematics due to poor and interesting study habits. One of the mathematical materials that is close to students' lives is geometry. However, not a few students find it difficult to understand the material. The results of research by (Natsir, 2023) that students' basic mathematical abilities are very low in geometric elements. Based on the analysis conducted by (Wahyuni, 2023), one of the difficulties students experience when solving geometry word problems is the difficulty in building mathematical concepts with everyday life. In this case, students need to improve their ability to visualize and describe geometric shapes.

Therefore, this problem can be overcome by creating innovations in learning so that it is more enjoyable. This innovation can be done by introducing students to ethnomathematics, where students will understand mathematical concepts from the culture they are introduced to. Culture-based mathematics learning will be more interesting so that it can make students active and think creatively in exploring their findings (Fauzi & Arisetyawan, 2020). Mathematics is said to be sociocultural-historical which means that mathematics is social which is related to culture and history (Fatmahanik, 2019). Ethnomathematics can create good learning motivation and can support the basic concepts of learning mathematics, where students are trained to construct mathematical concepts as part of learning mathematics based on students' knowledge of their socio-cultural environment (Putra, 2022). In line with this, (Astuti & Firdaus, 2023) consider that ethnomathematics is a program that aims to learn how students can know, process, and then use mathematical ideas to be able to solve problems related to their daily lives so that they can realize that there are many different ways of doing mathematics, one of which is by considering academic mathematics that has developed in society by paying attention to the existing culture. Ethnomathematics

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can build bridges between community traditions and education, especially in learning mathematics at school. As we know, Indonesia has a quite complete cultural diversity with their respective traditions (Diniyati, 2022). One of the traditions of the people in Indonesia is the traditional cake dish that is exhibited at an event, such as Pasar Kamu which is the object of this research. Pasar Kamu (Breakfast Week by Young Children) is a tourist attraction that can create a learning atmosphere with an ethnomathematics approach.

Based on the problems above, to make learning geometry more interesting, researchers need a learning method that is related to the culture that is often encountered, namely by conducting an ethnomathematics exploration of traditional snacks at Kamu Market. Therefore, researchers are interested in conducting this research because there are still very few of these studies being carried out in your market. By conducting this research, it is hoped that it will be able to build students' interest in exploring their mathematical abilities from introduced cultures so that they can be used as good learning resources.

RESEARCH METHODS

The research method used is qualitative with an ethnographic approach, where researchers only emphasize efforts to discover how people organize their culture in their minds and then use that culture in life (Sari, 2023). The techniques used in collecting data are observation, interviews, documentation, and literature study. This research was conducted at Kamu Market (Breakfast Week by Young People) Jalan Perintis, Denai Lama, Pantai Labu District, North Sumatra.

This study uses 6 stages in ethnographic research based on the statement of Spradley (Dalimunthe, 2022), namely:

1. Selection of an ethnographic project. This stage begins with selecting an ethnographic project based on consideration of the scope of the research. In this study, researchers chose to carry out research in Pasar Kamu, Pantai Labu District. The scope of this research is limited to an ethnomathematics exploration of traditional cakes in your market.
2. Submission of ethnographic questions. At this stage, the researcher seeks information about the traditional pastries served by asking the informants directly, namely people who participate in selling and making traditional breakfast cakes at Kamu Market.
3. Collection of ethnographic data. At this stage, the researcher directly observed traditional cake-selling booths in your market to collect data and information. The data obtained is in the form of

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a description of the results of questions and answers from informants related to research questions and direct observations.

4. Ethnographic record. This stage produces pictures of traditional cakes which are predicted to have a relationship with geometric concepts.
5. Analysis of ethnographic data. At this stage, the researcher analyzed the data that had been collected from the field using domain and taxonomy analysis.
6. Research presentation based on the results of interviews, observations, and documentation which contains the relationship between the concept of geometry and traditional cake Pasar Kamu.

RESULTS AND DISCUSSION

Pasar Kamu stands for Breakfast Week by Young Children, which is located on Jalan Perintis, Denai Lama, Pantai Labu District, North Sumatra. Pasar Kamu only operates every Sunday from 06.30-11.30 WIB, very suitable for tourists who want to find breakfast while enjoying a traditional atmosphere. The majority of traditional foods sold at Pasar Kamu are Javanese and Malay specialties, but there are also Batak specialties. Every visitor who wants to buy food in advance as a means of payment in the form of coins from a coconut shell is called a "tempu". One Tempu is priced at IDR 2,000.00. Pasar Kamu not only provides a variety of traditional foods and drinks but also displays beautiful music from traditional musical instruments that are played.

In this study, researchers conducted observations and interviews with informants who were three traditional cake traders. Based on the results of the research conducted, there are many traditional cakes from various regions that are served in your market. However, in this study, 6 types of cakes were taken, because not all types of cakes are related to the concept of geometry. The samples are Katimus cake, Gadong cake, Dangai cake, Karas cake, Lapet cake, and Putu Bambu cake. The following is a discussion of mathematical concepts from the ethnomathematics exploration results obtained in your market.

JURNAL EDUSCIENCE (JES)
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1. **Katimus**

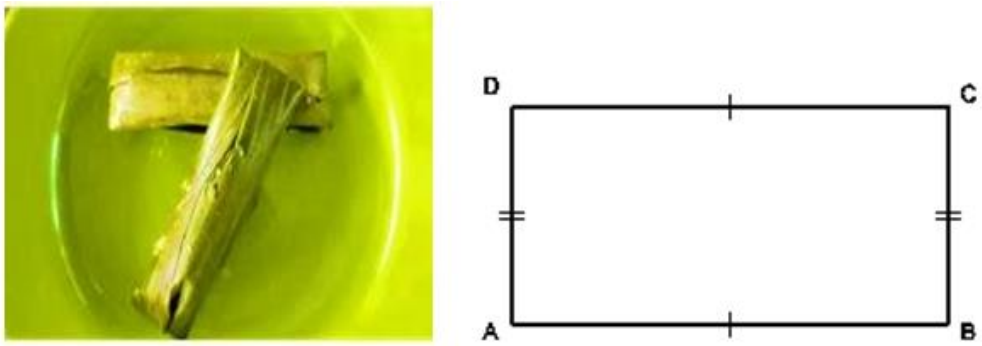

Figure 1. Katimus Cake and Rectangles

Katimus is a typical Sundanese snack/cake made from a mixture of sweet potato and grated coconut and brown sugar wrapped lengthwise in banana leaves. Katimus is processed by steaming. Based on Figure 1, the Katimus has a rectangular shape. A rectangle is a quadrilateral with one right angle and two pairs of parallel sides (Suharjana, 2019). This flat side shape has $Area = length \times width$ with $Circumference = 2\ (length + width)$. This information was also obtained based on the following interview summary:

Researcher : "Morning Mom... do you sell any cakes?".
Informant I : "Morning. There are lots of Katimus, Putu Bambu, Getuk, Cenil, Tiwul cakes".
Researcher : "I just heard about Katimus, ma'am, where is this cake from, ma'am?".
Informant I : "Sunda, this is delicious because the ingredients are sweet potato, grated coconut, using brown sugar again. Moreover, it is steamed in a banana leaf package so it smells very good inside".
Researcher : "Oh, is that so, ma'am, for the shape it is like this, ma'am?".
Informant I : "Yes.. the shape is elongated like this, rectangular, if people say".

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2. Gadong

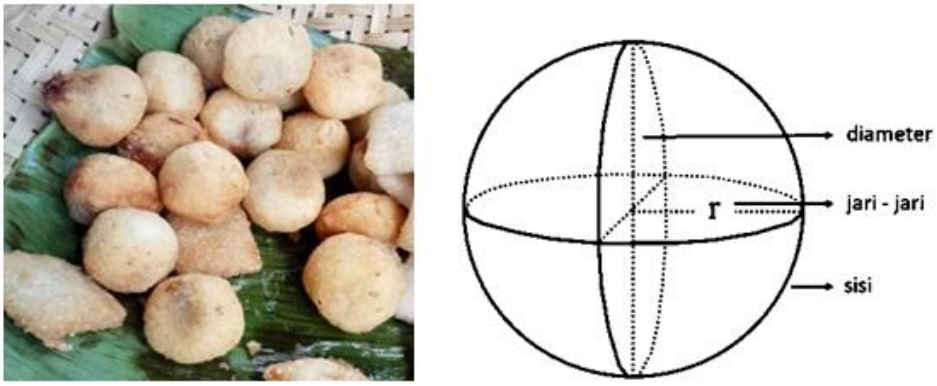

Figure 2. Gadong Cake and Sphere

Gadong is a typical Batak cake or snack made from a mixture of cassava and grated coconut, then filled with brown sugar inside. Gadong is processed by frying. As seen in Figure 2, Gadong has a round shape like a sphere. A sphere is a curved side shape formed by circles that have the same radius and are centered at the same point. The sphere has several properties, including one side in the form of a curved plane called a spherical blanket, which has no ribs and no corners (Suharjana, 2019). The area of a sphere is 4 times the area of a circle with the same radius, namely $L = 4\pi r^2$. The volume of a sphere is the product of $\frac{4}{3}\pi$ to the cube of the radius of the sphere, namely $V = \frac{4}{3}\pi r^3$. While the circumference of the sphere is the product of $\frac{4}{3}\pi$ with the square of the ball's radius, namely $V = \frac{4}{3}\pi^2$. This information was also obtained based on the following interview summary:

Researcher : "Morning madam, what's the name of this round cake?".
Informant II : "This Gadong cake is called a traditional Batak cake".
Researcher : "Ooh what is this cake made of ma'am?".
Informant II : "From sweet potato, grated coconut, filled with brown sugar".
Researcher : "Like Katimus cake the ingredients?".
Informant II : "Yes.. but the difference is that it is shaped like a ball, the cooking is also fried isn't it steamed like Katimus cake".
Researcher : "Usually there are a lot of enthusiasts, isn't it, ma'am? How much for this cake ma'am?"
Informant II : "Oh, there are many decks, because this is also often found, yes, and it tastes good too. Price two tempu get 3 of these cakes".

JURNAL EDUSCIENCE (JES)
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3. Dangai

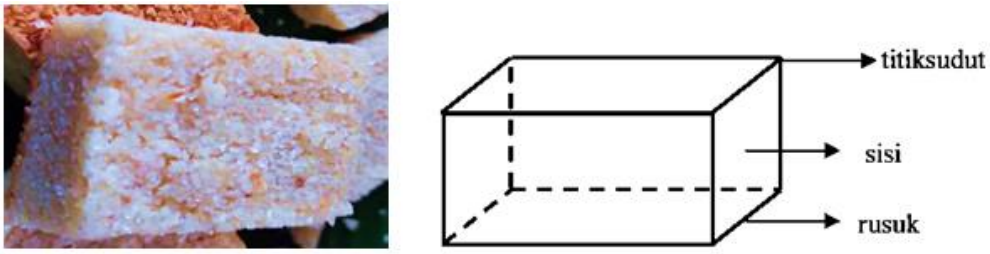

Figure 3. Dangai and Cuboid

Dangai is a traditional Malay cake made from pulut flour, sugar, and grated coconut. Dangai is processed by roasting or baking. As seen in Figure 3, dangai cakes have a cuboid like shape. A beam is a geometric shape bounded by six sides, each of which is rectangular, where each pair of sides is parallel and the same length (Suharjana, 2019). The volume of a cuboid can be found by the formula $V = length \times width \times height$, while its area is $L = 2 \times (length \times width + length \times height + width \times height)$. This information was also obtained based on the following interview summary:

Researcher : "Good morning.. Do you sell these cakes?".

Informant III : "Morning. There are many kinds of this, I sell typical Malay cakes, there are Karas, Dangai, Rasidah, Bangkit, Lepat".

Researcher : "This cake is beautiful, looks like a flower, ma'am. What is the name of this cake ma'am?".

Informant III : "Oh yes, this one is called Bangkit cake. Malays also call it Melati cake because the color and shape are like a jasmine flower".

Researcher : "Oh, I see, ma'am, then what is this cuboid like cake called, ma'am?".

Informant III : "Well, this one's cake is called Dangai, these 3 cakes are valued at two temps. This cake is included favorite snack here because according to tourists this cake is delicious. This cake is special, it's cooked in the oven, the ingredients are also made of glutinous rice flour, sugar and grated coconut".

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4. Karas

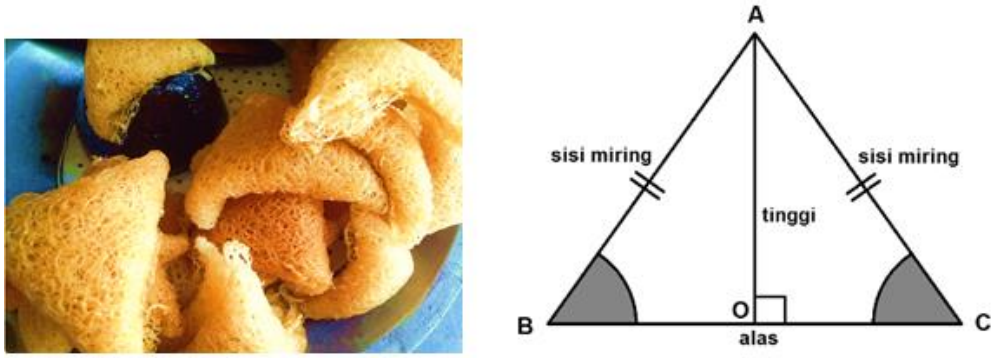

Figure 4. Karas Cake and Isosceles Triangles

Karas is a traditional Malay cake originating from Batubara, North Sumatra. Karas is made from a mixture of rice flour and coconut milk using a coconut shell with fine holes as a tool to slide the dough ingredients into the pan when they are about to be fried. As seen in Figure 4, this cake is in the form of an isosceles triangle, which has exactly two sides that are the same length and the angles on the legs are the same size (Suharjana, 2019). The area of an isosceles triangle is the same as the area of any other triangle, namely $L = \frac{1}{2} \times base \times height$. Meanwhile, the circumference only needs to add up all the side lengths of the shape, namely $K = side\ 1 + side\ 2 + side\ 3$. This information was also obtained based on the following interview summary:

Researcher : "Mom, is this Karas cake? How much does it cost ma'am?".

Informant III : "Yes, this is a typical Malay cake, the price for one pack is 3 tempu".

Researcher : "It seems crunchy, ma'am, what are these made of, ma'am?".

Informant III : "Yeah, it's very crunchy when you bite it, the Karas cake is made of flour as the main ingredient rice and coconut milk".

Researcher : "Oh, I see, ma'am, then how can it be shaped like a triangle like this, ma'am, keep going the texture is like a nest, isn't it, ma'am?".

Informant III : "Yes deck, the texture is like a nest because the dough container uses a shell coconut that has been given small holes. Well when fried in hot oil spread the dough like that and then half cooked it is folded to form a triangle".

JURNAL EDUSCIENCE (JES)
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5. Lappet

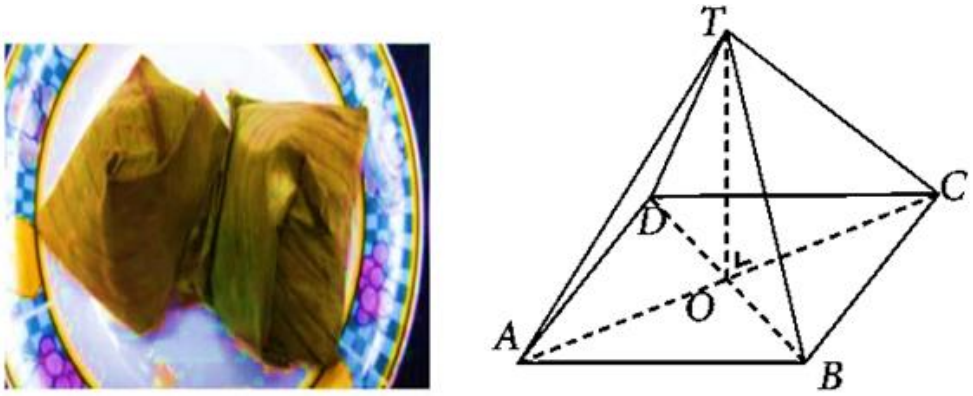

Figure 5. Lappet Cake and Quadrilateral Pyramid

Lappet is a traditional Batak cake made from rice or glutinous rice flour filled with brown sugar and coconut. The lappet is wrapped in banana leaves and shaped like a rectangular pyramid. A quadrilateral pyramid is a geometric figure bounded by a rectangular area and four triangular regions which have one common corner point, where this geometric shape has 8 edges and 5 corner points and one of the corner points is the vertex (Suharjana, 2019). The volume of the pyramid is the product of $\frac{1}{3}$ with the area of the base and the height of the pyramid, namely $V = \frac{1}{3} \times Area\ of\ the\ Base \times Height$. In this case, the volume of the Lappet cake can be translated as $V = \frac{1}{3} \times length\ of\ the\ base \times width\ of\ the\ base \times height\ of\ the\ pyramid$. Meanwhile, the surface area of the pyramid is the sum of the area of the base and the area of all the vertical sides, namely $L = Area\ of\ the\ Base + Total\ Area\ of\ the\ Vertical\ Sides$. This information was also obtained based on the following interview summary:

Researcher : "This cake is typical of Batak too, Ma'am?".
Informant II : "Yes, it's true, this is a Lappet cake whose name is shaped to be tapered up like this and inside banana leaf packets".
Researcher : "Ooh what is this cake made of ma'am?".
Informant II : "Made from rice flour or it could be from glutinous rice flour, then the contents are given grated coconut and brown sugar".
Researcher : "Is it cooked or steamed, ma'am?".
Informant II : "No, the cooking is steamed, so the result is also more fragrant".

JURNAL EDUSCIENCE (JES)
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6. Putu Bamboo

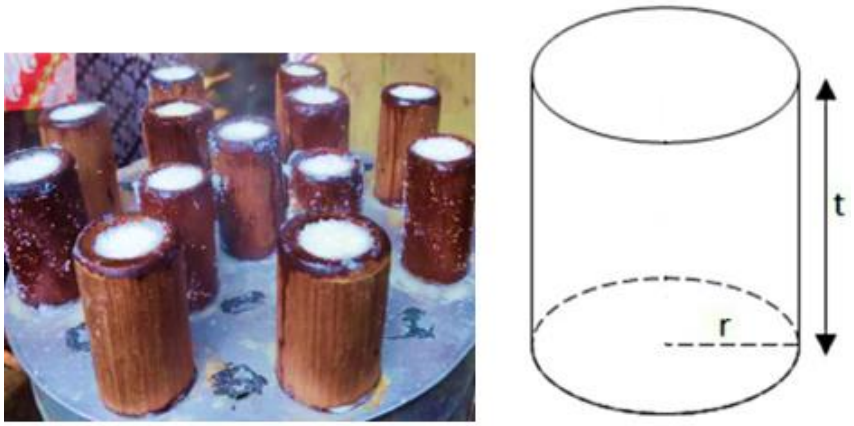

Figure 6. Putu Bamboo Cake and Cylinder

Putu bamboo is a traditional cake typical of East Java which is made from rice flour and grated brown sugar. The Putu Bambu is then loaded into a bamboo container which is shaped like a tube without a lid, then it is steamed and served with a layer of grated coconut sprinkled with granulated sugar. The cooked bamboo putu will be removed from the bamboo container so that it has a tube-like shape. The tube is a geometric shape that is bounded by two parallel circles and has the same radius, where this geometric shape has two curved edges and no corner points (Suharjana, 2019). The volume of the cylinder can be determined by the formula $V = \pi r^2 t$, which is the product of the area of a circle times the height of the cylinder. Meanwhile, to determine the entire surface area of the tube is obtained by the formula $L = 2\pi r(r + t)$. This information was also obtained based on the following interview summary:

Researcher : "This cake is the most common one, ma'am. If I may know, what are the basic ingredients, ma'am?".

Informant I : "Yes, it's true, Putu Bambu is still often found in our area, isn't it? The base material rice flour and grated brown sugar".

Researcher : "If you don't use a tube container like this, can it not form like a tube? Ma'am if it's only printed by hand?".

Informant I : "Maybe it can, but it can't be formed perfectly. The name alone is Putu Bamboo cake, which typically uses a container made of bamboo tubes".

Researcher : "Oh, is that so, Mrs. What area is this cake typical of, ma'am?".

Informant I : "From East Java".

Based on some of the explanations above, students and educators can take advantage of your market culinary tour as a source of learning mathematics, because many kinds of traditional pastries have shapes related to the concept of geometry, namely flat geometry and space. Students can get to know culture as well as mathematical concepts easily in it, especially for students who find it difficult to recognize geometric shapes (Hasanah et al., 2021; Latif et al., 2020; Romaito et al., 2021; Romansyah et al., 2019; Safitri et al., 2019; Safitri & Hasibuan, 2018; Siregar & Safitri, 2020).

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the traditional cakes found in the Kamu market actually have geometric building elements, such as the Katimus cake which comes from the Sunda region and has a rectangular shape, the Gadong cake which comes from the Batak area which has a spherical shape which is shape curved side chambers, Dangai cake and Karas cake originating from the Malay region have the shape of a cuboid and isosceles triangle respectively, Lappet cake originating from the Batak region has the shape of a quadrilateral pyramid, and Putu Bamboo cake originating from the East Java region which has the shape build a cylinder. Therefore, students and educators can find the concept of the area and volume of the traditional cakes found.

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