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AN EXPLORATION OF ETHNOMTHEMATICS IN THE CIBUNTU TOFU INDUSTRY

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Abstract

Ethnomatematics is a science that studies or unites culture with mathematics. Culture is a habit of the people that is often carried out every day and Mathematics has many benefits for human life, so without realizing it, many mathematical concepts are applied in everyday life. Like calculating sizes and drawing a plane shape, buying and selling transactions are related to integer operations. This is in line with the research conducted, namely studying and analyzing ethnomathematics exploration in making tofu in Cibuntu which is a daily livelihood in order to obtain basic information in developing ethnomathematics for learning mathematics in the field of geometry specifically on the shape and size of tofu and learning mathematics in the field of social arithmetic specifically in tofu price. The goal in making Ethnomathematics is to harmonize the culture of the Cibuntu residents into the concept of Mathematics. The method used in this study is the Exploration method, which is to search in depth about Cibuntu Tofu. The instruments used in this study were interviews and documentation.

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INTRODUCTION

One learning model is the learning approach model, where this model prioritizes student activities in a variety of cultural backgrounds, where this approach model can also be said to be like Ethnomathematics (Wahyuni et al., 2013). In line with previous thinking, ethnomathematics can also be packaged in the form of problems that provide a bridge for students in discovering mathematical concepts (Martyanti & Suhartini, 2018). So Ethnomathematics is combining Mathematics with Culture, where it turns out there are lots of concepts or historical heritage that can be used as material for Mathematics lessons

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that can support contextual learning for students. As stated previously, according to Afifah et al (2020), ethnomathematics is a science that studies the relationship between human culture or habits and mathematics.

Learning is a process of communication, interaction between teachers and students or vice versa, where in this learning the teacher not only conveys theories but the teacher also becomes a facilitator for students in developing students' basic abilities so that they are more honed and more focused. One type of learning that allows for intensive direction from the teacher is mathematics learning, where learning mathematics requires an understanding of concepts, which can be initial capital or as a basis for students to think and solve problems, whether problems in Geometry, Statistics, Building. space and so on (Kesumawati, 2008).

In applying mathematical concepts, there are several materials that become obstacles for students, one of which is Building Space material. As stated by Chintia et al (2021), students still have difficulty solving problems involving cube shapes. In line with previously, according to Fahlevi & Zanthy, (2020), students still lack understanding of a concept, so whether low ability students or high ability students find it difficult to work on flat-sided geometric shapes problems. Students can understand the material about flat shapes, but when it is implemented into spatial shapes, students experience difficulties. This difficulty is closely related to not understanding the basic concepts of the material. Not understanding concepts also results in poor skills in analyzing a problem(Damayanti & Rufiana, 2020). Therefore, students need contextual understanding, whether in examples or learning media that relate to everyday life, such as Rubik's Rubik's, Cupboard, Tofu, Tempe and so on.

By studying tofu we can get a lot of concepts that can be applied to students, one of which is the concept of building space, flat building and other concepts, by studying tofu we can also get to know more about the culture or habits of the surrounding community which, without us realizing it, can actually be used as food. teaching materials to improve students' understanding in Mathematics Learning. Exploring the knowledge that there are mathematical concepts, including geometric concepts of two-dimensional flat shapes (squares, rectangles) and three-dimensional shapes (tube without lid, half sphere, block, block without base and lid, block without lid, rectangular pyramid, and ball), the concepts of division, equal comparison and congruence (Kumala, 2022a).

From the results of the thoughts above, we as writers created "Ethnomathematics exploration in the Cibuntu tofu factory" as contextual mathematics learning and as a preservation of the culture of local residents which will later become Ethnomathematics.

METHOD

This research is research that discusses in detail the tofu factory in Cibuntu. The research uses an exploration method where the research takes samples by means of observation, interviews, documentation and literature review. By using this method, the author hopes to be able to search for information widely and look for things or causes of Cibuntu tofu production. This research also uses an ethnographic approach, which is an approach that seeks to explore a community's culture. In line with the opinion above, according to Rachmawati (2012), the ethnographic approach is an empirical-theoretical approach which aims to describe and analyze culture in depth based on intensive research. The aim

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of this research is to harmonize the culture of Cibuntu residents by exploring knowledge that can be linked to mathematical concepts.

RESULTS AND DISCUSSION

The city of Bandung has many diverse culinary delights, especially tofu production. Tofu is a daily food for Indonesian people, especially in the city of Bandung, its distinctive taste at a cheap price is popular with many people. One of the famous tofu production places is the Cibuntu area, so it is famous for Cibuntu tofu. The tofu factory that we observed was Galih Sutra Dabeda, precisely on Jl. terusan Pasir Koja Gang Aki Padma Selatan No 27 Rt 01 Rw 08. Tofu is often involved in big events in Indonesian society because of its texture and taste which is easy to mix with other ingredients too. so that tofu has become a tradition in society.

Figure 1. Sample of Cibuntu's tofu.

Tofu has shapes and sizes that contain mathematical concepts. The basic shape of tofu is cubes and blocks that are not symmetrical and the sides are of course flat, rectangular shapes with the top side slightly curved towards the top, making the tofu look more voluminous. As said by Kumala, (2022b), by exploring, we know that there is a mathematical concept, namely in the form of geometric shapes from three-dimensional shapes. In line with previous thoughts according to Febrianti & Afri (2013), mathematical concepts discovered from the process of making tofu include the concepts of numbers, arithmetic, calculations, geometry, comparisons and water discharge and volume.

Figure 2. The connection between tofu and cube

Apart from shape and size, you know it contains mathematical concepts. As stated by Sadiyah & Suparni, (2022), the typical regional food of the region, tofu aci, can help concretely abstract mathematical concepts. In line with previous thoughts expressed by Dardiri & Arhasy (2020), using yellow tofu as a medium for mathematical concepts has

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been proven to increase student activity and learning outcomes. The equipment in the manufacturing process also contains mathematical concepts. The concept of mathematics as a result of measuring activities, containing patterns and calculating can be revealed from the process of making tofu.

The tofu production process consists of several stages, namely, soaking, grinding, boiling, filtering, clotting, pressing, molding and cutting. The first process is process of soaking soybeans. The process of soaking soybeans, the top of the place used for soaking soybeans contains a mathematical concept, namely circles.

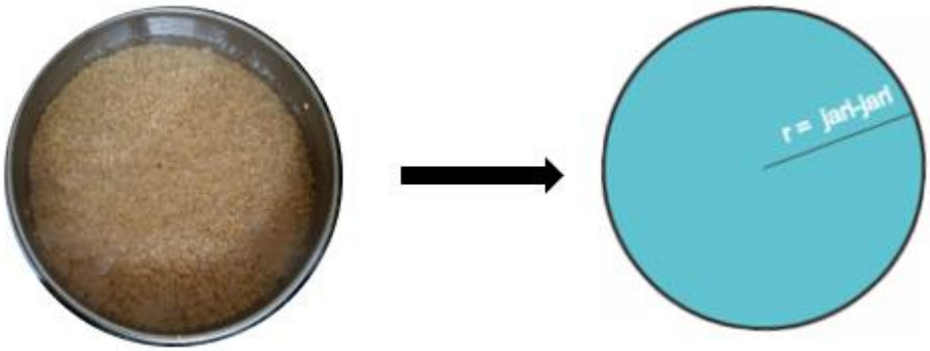

Figure 3. Mathematics concept from the process of soaking soybeans

From this circle, the circumference of the circle, area of the circle, diameter and radius of the soybean soaking place can be determined. By using the circle concept, we can determine the area and circumference of the top circle where the soybeans are soaked.

$$\text{Around: } k = 2 \times \pi \times r \qquad \text{or} \qquad k = \pi \times d$$

$$\text{Wide: } l = \pi \times r^2$$

The Next process is grinding soybeans, where there is a pipe in the grinding machine to channel the ground product into a container. In the milling process there is a mathematical concept in the shape of the pipe, namely the concept of tube space.

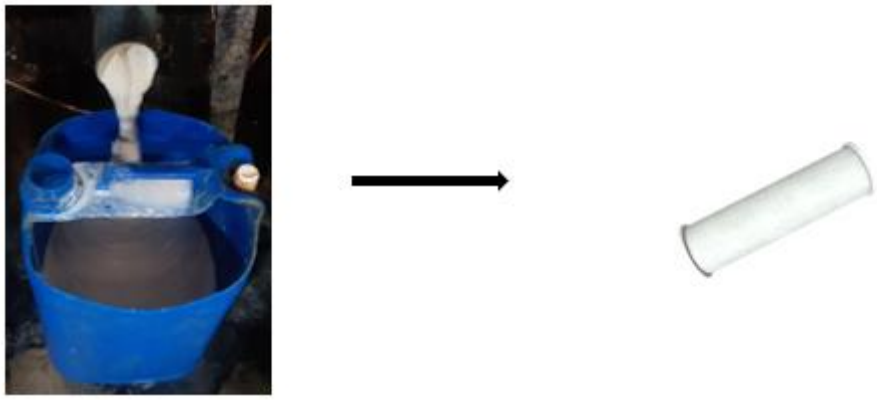

Figure 4. Mathematics concept from the process of grinding soybeans

Filter the ground soybean dregs, and put them into a large tube where there is a mathematical concept, namely building a tube chamber, then heating it to a high temperature.

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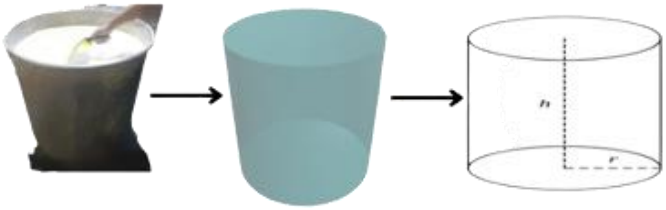

Figure 4. Mathematics concept from the process of filtering soybeans

Heating at high temperatures uses a furnace, where the form of the furnace also contains mathematical concepts.

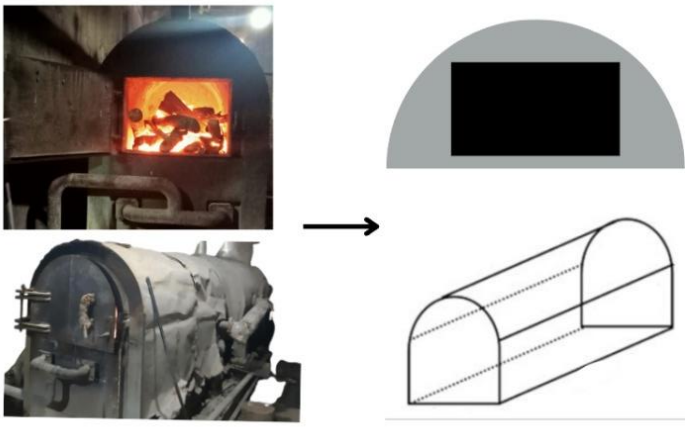

Figure 5. Mathematics concept from the process of heating soybeans

The front of the stove also contains mathematical concepts, namely rectangular and semicircular shapes. If you look at the whole furnace, the mathematical concept is that it is in the shape of a half tube. And then the next process is clumping the tofu, where the tofu that has been separated from the dregs is put into a mold. In this process there is also a mathematical concept of a flat shape, namely a square.

Figure 6. Mathematics concept from the process of clumping the tofu

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Then finally the process of flavoring the tofu and coloring using natural dye, namely turmeric and boiling water is used to color the tofu yellow. The coloring process is carried out in a large tofu oven at a hot temperature. The dyeing furnace contains a mathematical concept, namely in the form of a large tube.

$$l = alas \times tinggi$$

$$l = \pi \times r^2 \times tinggi$$

By using the concept of the tubes' structure, we can determine the volume of the furnace.

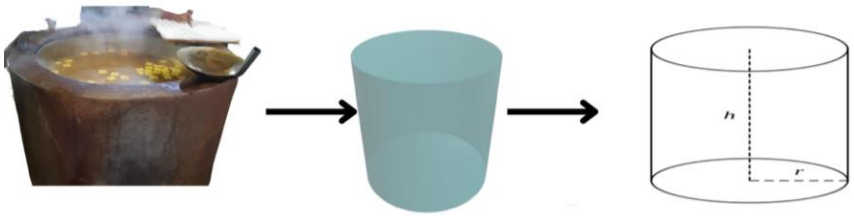

Figure 7. Mathematics concept from the furnace

Tofu molding boards made of wood also contain a mathematical concept, namely a square. This wooden molding board has a side length of 57 cm which will later print tofu in different sizes but the size of the wooden molding board remains the same.

Keliling = 4 x sisi

Luas = sisi x sisi

By using the square concept, we can find out the perimeter and area of the square on the wooden tofu molding board. In fact, there are several types of tofu, but the one that is most widely produced is the yellow tofu which measures 7x7, 8x8, 9x9, and 10x10, due to the greater market demand for this tofu. The only difference is that there is a unit size because the printing still uses the same mold, namely a 57x57 mold. So, you know that the size 7x7 is actually the largest size and of course you know that the size 10x10 is the smallest. Then for the price, of course each type is different if sorted like this:

Table 1. Tofu's Price list

No.	Type	Price (@ 1 pcs)
1.	Tofu 10×10	Rp. 700
2.	Tofu 9×9	Rp. 800
3.	Tofu 8×8	Rp. 1250
4.	Tofu 7×7	Rp. 2500
5.	Tofu sticks	Rp. 1000
6.	Tofu sticks	Rp. 800

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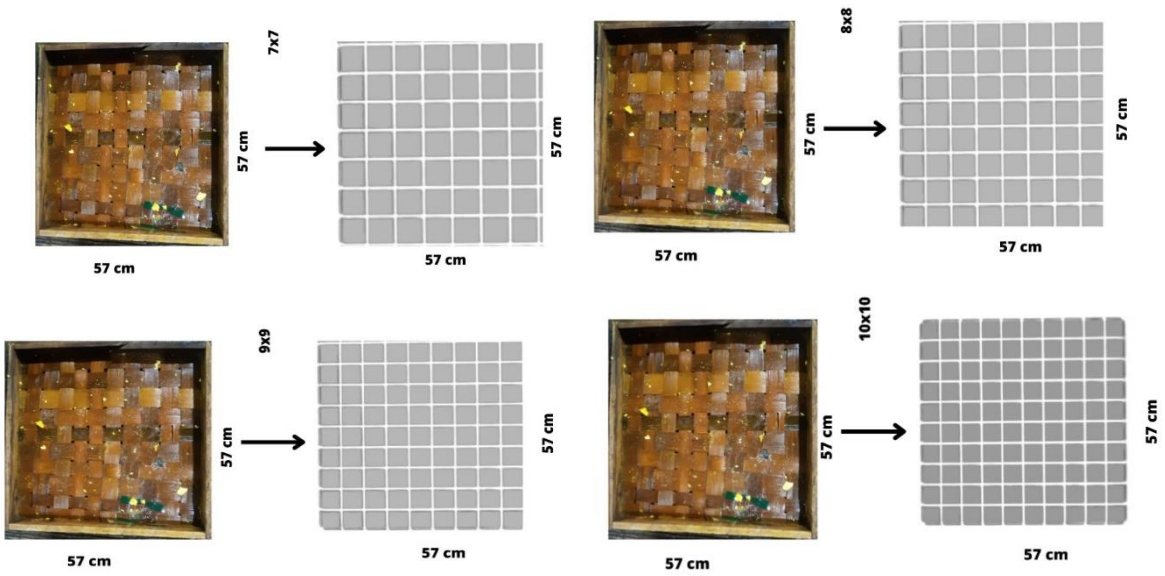

Figure 8. Mathematics concept from the process of printing tofu

After the tofu has been successfully printed, the tofu is stored and arranged on a shelf, which contains mathematical concepts at a distance between each corner in the shape of a rectangle.

Figure 9. Mathematics concept from the shelf

In accordance with the discussion above regarding the mathematical concepts contained in traditional tofu food, even in every process there are mathematical concepts which make us increasingly aware that mathematics lives in every activity that goes hand in hand with what we do. Even in an era when mathematics was not yet known, its concepts were already being applied. As revealed by Ilmiyah et al (2022), there are several mathematical concepts contained in the process of making tofu, including geometric concepts, namely there are flat shapes such as squares, rectangles, etc., and there are also concepts of flat-sided shapes such as cube blocks, etc. In line with the thoughts above, it was also expressed by Resya & Nurnoviyati (2022) that regional specialties contain mathematical concepts such as latopia cake, olos, alu-alu, bogis poci, kamir, apem and aci

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tofu, where aci tofu has a mathematical concept regarding flat shapes. Having the concept of flat shapes can also make it easier for students to learn mathematics more contextually, making students more inspired to continue to find examples of mathematical concepts in everyday life so that students' understanding and motivation in learning mathematics increases.

CONCLUSION

Based on the results and discussion that have been presented, it can be concluded that the research results show that the shape and size of tofu contain mathematical concepts, the production equipment in the tofu making process also contains mathematical concepts. Indonesian people have applied mathematical concepts in everyday life by using ethnomathematics. These mathematical concepts in the form of the results of measuring activities, containing patterns and counting can be revealed from the process of making this tofu. The equipment used for tofu production contains mathematical concepts consisting of spatial shapes and flat planes. The basic forms of tofu are cubes and blocks.

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