Research Article

Tube Volume in the Malamang Tradition

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Abstract. This research aimed to apply mathematics to study the Malamang tradition of Nagari Ulakan Pariaman in West Sumatra, Indonesia. The research used observations and secondary documents. Malamang is Mawlid's community tradition to celebrate the Prophet Muhammad. The Malamang tradition involves making lamang (a traditional food). When making lamang, there is an equation that is used for tube volume, which is: tube volume = cylinder base × height = (π × r2) × t. Lamang is made of sticky rice and coconut milk burned in the reed (bamboo tube). The research results showed that the volume of the tube that is represented by the amount of sticky rice and coconut milk in the reed is determined by the diameter and length of the bamboo tube. The bigger and longer the tube, the more sticky rice and coconut milk are needed.

Keywords: ethnomatematics, lamang, tube, mathematics learning

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1. INTRODUCTION

Ethnic mathematics is a form of mathematics that is influenced by culture. Therefore, if there is a lot of research on the development of national mathematics, it is not impossible to teach mathematics simply through the local culture. Mathematics is a cultural form. As a cultural form, mathematics has been integrated into all aspects of community life. National mathematics believe that the development of mathematics is basically inseparable from the existing culture and values in society at any time [1].

The ethnic mathematics in Balinese crafts uses the principle of inlay on the weaving pattern. Mosaic uses one type of geometric shape, rectangle. The weaving patterns in tikeh sanggah and tikeh flase also use the principle of inlay. Inlay also uses a square geometry. Because it uses square geometry, the weave patterns on sanggah and tikeh flase are classified as regular inlays. Ethnic mathematics in Bali handicrafts can be used as a learning resource to improve students' insight into the existence of mathematics in one of its cultural elements, increase learning motivation, and promote students to connect the concepts they have learned with the real world [2].

Exploration of ethnic mathematics, another form of ethnic mathematics at Rumah Gadang, South Solok, reflects the results of various mathematical activities including the following mathematical concepts:

1. Carving Patterns / Rumah Gadang there is a nagari located in Batanghari District, Nagari Abai. Because the walls of the Rumah Gadang have been replaced with concrete, the Rumah Gadang (Minangkabau Traditional House) is not carved. The number of uncarved Gadang houses in South Solok is 44.44 percent. There were 34 carving patterns of Rumah Gadang or circular lines, including tendrils, shady roots, flowers and fruit. The carving patterns of Rumah Gadang are mostly symmetrical. [3, 4]

2. The Rumah Gadang room has a rectangular shape, an ordinary pavilion, and a terraced pavilion. Rumah Gadang has room because it is a place of public privacy regardless of whether they are married or not. The number of rooms varies from Rumah Gadang to Rumah Gadang. It's prime and even. [3,6].

3. The gonjong roof at Rumah Gadang has various types of gadang houses, 62.96% of the type of rumah gadang of grimbi aceh bagonjong ciek, 25.93% of the type of house of the type of maharam elephant, and 7.41% are gonjong ampek sibak clothes. Two Kenagarians in South Solok, namely Nagari Sitapui and Nagari Abai, have a symmetrical roof shape on almost all of the gadang houses, while the other nagari are varied. The number of national roofs in South Solok varies according to the mathematics of even and odd numbers. [3, 5]

The Malamang tradition is usually carried out on certain days, such as the Prophet's Birthday or the anniversary of the death. Malamang means cooking lamang. lamang is a typical food of West Sumatra made from white glutinous rice and black glutinous rice and added coconut milk mixed into bamboo which is burned over coals.

1.1. Ethnomathematics

The basic words of "mathematics" often mean explaining, understanding and performing activities such as coding, measuring, classifying, summarizing and modeling. The suffix "tic" is derived from technique and has the same meaning as technique [7]. Ethnic mathematics, as a product of mathematical culture and history, can have different forms and developments under the development of user groups. Ethnic mathematics uses a

wide range of mathematical concepts related to various mathematical activities, Including group activities, arithmetic, designing buildings or tools, measuring, positioning, etc.

1.2. Mathematics as a Cultural Product

Mathematics develops in different parts of the world. Mathematics is also produced and developed in India, the United States, Arabia, and even Indonesia and other regions. The growth and development of mathematics is due to the life challenges faced by human beings in various regions with different cultural backgrounds. Sembiring “mathematics is the construction of human culture” [8].

1.3. Culture

Mention that culture is thought, reason, as a result of human activities and creations (reason), such as beliefs, arts, and customs, while historians interpret culture as customs or traditions. Even anthropologists consider culture as a way of life, way of life and behavior [7]. Culture is a unified whole and comprehensive that applies in society. Taylor defines culture as the totality of human activity, including knowledge, belief, art, morals, law, customs, and other habits [9]. Meanwhile, according to anthropology, culture is the totality of thoughts, actions and works formed by humans through learning within the framework of social life [10].

1.4. Malamang

Malamang is a tradition for West Sumatran. This tradition is usually carried out on certain days, such as religious holidays or the day of death [11, 12]. According to Tambo (a narrative of the origins of Minangkabau and past events), Sheikh Burhanuddin diligently visits people’s homes to keep in touch and teach Islam. Residents often invite him to dinner. However, Sheikh Burhanuddin seems to be quite suspicious of the halal food provided. He also suggested that every community he visited find bamboo and then a base for growing banana leaves. Then put the white glutinous rice and coconut milk into it, and then bake it on the wood stove [10]. The individual Maraman activities are usually completed with the division of tasks, that is, finding a place for bamboo as dough, finding firewood for baking, preparing raw materials for making Ramang, etc. Usually, lamang is made in large quantities and served as a snack in the Mawlid incident

of the prophet of surau (mosque) [12]. In the Malamang tradition, there are mathematics learning materials, which is to determine the volume of the tube

2. METHODOLOGY/ MATERIALS

The research method is descriptive [13] through the use of observation techniques and documents. The subject of this study is the Malamang tradition in the Lapau pen area in the Nagari Ulakan subdivision of Nagari Ulakan in the Pariaman subdistrict of Ulakantapaki. In this study, researchers collected data by observing, recording, and experimenting with the manufacture of reeds of different diameters and lengths.

3. RESULTS AND DISCUSSIONS

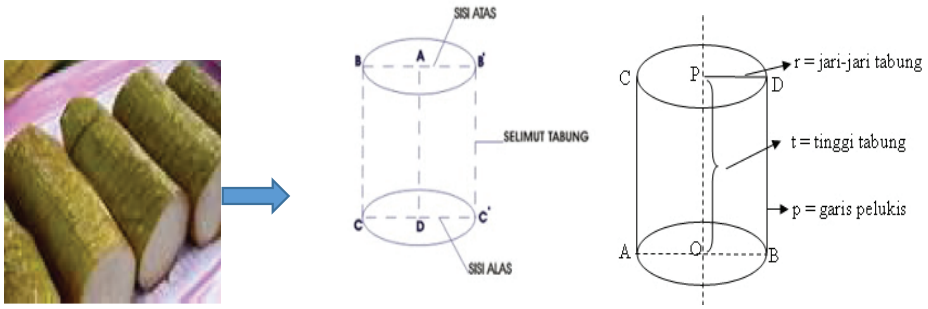

Figure 1: Tube.

In the tradition of *Malamang,* there are the subjects of Mathematics lessons, like Determining the Volume of Tubes. Before determining the tube volume of lamang, we must first know what a tube is. ”The tube or cylinder or reed is a three-dimensional space constructed by two identical parallel rings and a rectangle surrounding the two circles, the tube has the top side, the sides of the base and the tube blanket”. In the *Malamang* tradition in Pariaman, the shape of the jaw is shaped like a tube.

In Figure 1 we can see how the shape of the *lamang* is the same as the tube having the upper side, the base, and the blanket, while the tube has the radius, the height of the tube, and the painter line is shown in the figure.

In the *malamang* tradition, people use the reed as a container or tool used in cooking in which banana leaves are given so that sticky rice is not mixed or sticky with bamboo and easy when removing the *lamang* from the reed. The reed is not too young and not too old. And usually, in Malamang tradition, bamboo diameter is not too small and not

too big because the people there say it will look better if the *lamang* is not too big and not too small.

Therefore the researcher experimented with making the *lamang* with various kinds of diameter and length of bamboo tubes to determine the volume or content of tubes / *lamang*. The table of the experiment can be seen below:

Table 1: Length and Diameter of *Lamang* during Observation

No	Length of *Lamang* (cm)	Diameter of *Lamang* (cm)
1	51.5	4.25
2	65	6
3	71.5	5.6
4	56	5.2
5	66	4.9
6	61	6.1
7	44.5	5
8	51	6.1
9	68	4.6
10	75	5.1

The table above shows a variety of lengths and diameters of the *lamang*. Before cooking lamang, the bamboos are cleared and banana leaf is heated, then sticky rice and coconut milk that has been given salt and garlic are put into the bamboo. Finally an amount of glutinous rice and coconut milk is put into in the bamboo. We can know the volume of the *lamang* in Table below:

Table 2: The Amount of Sticky Rice and Coconut Milk in Making *Lamang* as Well as Content/Volume

No	Sticky Rice (tablespoon)	Sticky Rice (gram)	Coconut Milk (can)	Coconut Milk (gram)	*Lamang* Volume (gram)	*Lamang* Volume (Liter)
1	22	220	1.25	500	720	0.72
2	62	620	3	1200	1820	1.82
3	59	590	3	1200	1790	1.79
4	49	490	1.75	700	1190	1.19
5	59	590	1.5	600	1190	1.19
6	57	570	3	1200	1770	1.77
7	36	360	1.25	500	860	0.86
8	48	480	2.5	1000	1480	1.48
9	29	290	2	800	1090	1.09
10	52	520	2.5	1000	1520	1.52
Note : 1 tablespoon of stick rice = 10 gram; 1 can of coconut milk = 400 gram						

The table above shows that to determine the content volume of the *lamang* obtained from the amount of sticky rice and coconut milk are put into the reed, the volume of the

lamang (gram) is multiplied by 1 per 1000. The content/volume of the calf is calculated only based on the amount of glutinous rice and coconut milk without measuring the weight of the banana leaf. The table below shows the content/volume of the lamang based on the formula:

$Tube\ Volume\ Formula = cylinder\ base\ \times height$, (the base is circle)

$$= (\pi \times r^2) \times t, (\pi = \frac{22}{7}\ atau\ \pi = 3,14).$$

From the formula above we obtained the volume of the tube or reed below.

Table 3: Determining Volume of *Lamang* Based on Formula No Length (cm) Diameter (cm)

No	Length (cm)	Diameter (cm)	Volume of *Lamang*	Volume (Liter)
1	51.5	4.25	730.8862	0.730886
2	65	6	1836.9	1.8369
3	71.5	5.6	1760.158	1.760158
4	56	5.2	1188.678	1.188678
5	66	4.9	1243.958	1.243958
6	61	6.1	1781.801	1.781801
7	44.5	5	873.3125	0.873313
8	51	6.1	1489.702	1.489702
9	68	4.6	1129.521	1.129521
10	75	5.1	1531.339	1.531339

In Table 2 it can be seen that the content/volume of the *lamang* is almost the same as Table 3 based on the formula, so it is proven that in the *Malamang* tradition there is a Mathematics subject matter that is the volume of the tube.

4. CONCLUSION AND RECOMMENDATION

In the *Malamang* tradition, there is a mathematics learning on the volume of tube material, that is the shape and volume of *lamang* are the same as a tube.

References

[1] Bishop JA. The simbolic technology calet mathematics its role in education. Bullatin De La Societe Mathematique, De Belgique. 1991:43.

[2] Rahayu KP, I Gst. Ngurah Nila Putra. The ethnomathematics behind Balinese woven crafts. Jurnal Matematika Universitas Mahasaraswati Denpasar. 2014;4(2):80-89

[3] Fauziah, Niniwati. Ethnomathematical exploration of the Rumah Gadang in South Solok district. Padang: Laporan Penelitian Dosen Pemula Dikti; 2017.

[4] Fauziah, Niniwati. Ethno-mathematic exploration on the carvings of Rumah Gadang in South Solok Regency of West Sumatra**.** Jurnal IJRDO-Journal of Educational. 2017;2(11):134-148.

[5] Fauziah, Niniwati. Ethno-mathematic exploration at Gonjong Rumah Gadang in South Solok Regency of West Sumatra. Prosiding International ICASFAM-SIMPI. Tanggal 4-6 Oktober 2017:117-125.

[6] Fauziah, Niniwati, Wahyuni Yusri. Ethnomathematics in the room of the Rumah Gadang. Jurnal IndoMath-Indonesia Mathematics Education. 2020;3(2):100-109.

[7] Wahyuni Astri, Aji Ayu Wedaring Tias, Sani Budiman. Matematika dan Pendidikan Matematika Peran Etnomatematika dalam Membangun Karakter Bangsa. Yogyakarta: Universitas Negeri Yogyakarta. Tanggal 9 September 2013:113-118.

[8] Prabowo A, Pramono S. Memahat Karakter Melalui Pembelajaran Matematika. Paper presented at: Internasional Conference on Teacher Education. 8-10 November 2010; Bandung, Indonesia.

[9] Ratna NK. Sastra dan cultural studies: Representasi fiksi dan fakta. Yogyakarta: Pustaka Pelajar; 2005.

[10] Koetjaraningrat Koetjaraningrat. Pengantar ilmu antropologi. Jakarta: Aksara Baru; 1985.

[11] Budaya Minangkabau. http://id.wikipedia.org/wiki/budaya_Minangkabau#Ukiran. Posting 20 Februari 2017. Akses 24 Mei 2017.

[12] Kasmaja Hadi DS. http://www.kompasiana.com/hadi_dsaktyala/etnomathematics-matematika-dalam-perspektif-budaya. Jakarta Utara. Posting 26 Desember 2013. Akses 24 Mei 2017.

[13] Gulo W. Research methodology. Jakarta: Grasindo; 2000.