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ETHNOMATHEMATICS: AN EXPLORATION OF GEOMETRIC SHAPES AND STRUCTURES IN THE "*UMA LENGGE*" TRADITIONAL HOUSE

Ririn Fitriatunnisa[1], Intan Dwi Hastuti[2], Yuni Mariyati[3], Saba Mehmood[4]

[1,2,3] Universitas Muhammadiyah Mataram, Mataram, Indonesia, [4]University of Management and Technology, Pakistan

**Corresponding author.*

E-mail: *fitriatunnisaririn@gmail.com* [1)]
Intandwihastuti88@ummat.ac.id [2)]
yunimariyati31@gmail.com [3)]
saba.mehmood@umt.edu.pk[4)]

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Abstract

This research aims to explore the geometric shapes and structures found in the Uma Lengge traditional house with a qualitative approach based on the ethnographic model. This research was conducted in Maria Village, Wawo Sub-district, which was chosen because of the existence of the Uma Lengge traditional house and its role in cultural preservation and the development of the tourism sector. The problem raised in this research is the lack of studies linking the architectural design of Uma Lengge with mathematical concepts, especially within the framework of ethnomathematics, which has the potential to provide new insights into the relationship between culture and science. Respondents were selected using a purposive sampling technique, including custodians, cultural experts, and conservationists who have in-depth knowledge of the history and construction of Uma Lengge. Data collection was conducted through direct observation, literature study, and in-depth interviews. Data analysis techniques include data reduction, data presentation, and verification to ensure the validity and reliability of research findings. The results show that the architectural design of Uma Lengge combines geometric concepts in flat and spatial shapes, including patterns of triangles, squares, rectangles, triangular prisms, cubes, blocks, and pyramid frustums. These geometric structures not only reflect beauty and function, but also reflect local wisdom in the use of traditional mathematical concepts. This research makes an important contribution in expanding the understanding of ethnomathematics as part of cultural heritage that can be integrated into the mathematics learning process. It is recommended to conduct more comprehensive follow-up research on the application of other mathematical concepts, as well as develop ethnomathematics-based learning modules to increase students' appreciation of mathematics in a cultural context.

Keywords: ethnomathematics, geometry, *Uma Lengge* traditional house

Abstrak

Penelitian ini bertujuan untuk mengeksplorasi bentuk geometris dan struktur yang terdapat pada rumah adat Uma Lengge dengan pendekatan kualitatif berdasarkan model etnografi. Penelitian ini dilakukan di Desa Maria, Kecamatan Wawo, yang dipilih karena keberadaan rumah adat Uma Lengge dan perannya dalam pelestarian budaya dan pengembangan sektor pariwisata. Permasalahan yang diangkat dalam penelitian ini adalah kurangnya penelitian yang mengaitkan desain arsitektur Uma Lengge dengan konsep matematika, khususnya dalam kerangka etnomatematika, yang berpotensi memberikan wawasan baru tentang hubungan antara budaya dan sains. Responden dipilih dengan menggunakan teknik purposive sampling, termasuk juru kunci, budayawan, dan konservasionis yang memiliki pengetahuan mendalam tentang sejarah dan konstruksi Uma Lengge. Pengumpulan data dilakukan melalui observasi langsung, studi literatur, dan wawancara mendalam. Teknik analisis data meliputi reduksi data, penyajian data, dan verifikasi untuk memastikan validitas dan reliabilitas temuan penelitian. Hasil penelitian menunjukkan bahwa desain arsitektur Uma Lengge menggabungkan konsep geometris pada bangun datar dan bangun ruang, antara lain pola segitiga, bujur sangkar, persegi panjang, prisma segitiga, kubus, balok, dan limas. Struktur geometris ini tidak hanya mencerminkan keindahan dan fungsi, tetapi juga mencerminkan kearifan lokal dalam penggunaan konsep matematika tradisional.

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Penelitian ini memberikan kontribusi penting dalam memperluas pemahaman tentang etnomatematika sebagai bagian dari warisan budaya yang dapat diintegrasikan ke dalam proses pembelajaran matematika. Disarankan untuk melakukan penelitian lanjutan yang lebih komprehensif tentang penerapan konsep matematika lainnya, serta mengembangkan modul pembelajaran berbasis etnomatematika untuk meningkatkan apresiasi siswa terhadap matematika dalam konteks budaya.

Kata kunci: *etnomatematika, geometri, rumah tradisional Uma Lengge*

INTRODUCTION

Indonesia is a country rich in culture and natural resources spread from Sabang to Merauke, from Miangas to Rote Island. This diversity is reflected in the various tribes, religions and traditions that create a unique and diverse cultural wealth (Park et al., 2020). Each tribe in Indonesia has distinct cultural characteristics, including language, folk songs, traditional weapons, dances, clothing, and traditional architecture (Fatmawati, 2021).

Indonesia's cultural diversity is reflected in every province, including West Nusa Tenggara (NTB), which consists of 8 districts and 2 cities (Kurniawan et al., 2023). One of NTB's cultural treasures can be found in Bima Regency, known for its distinctive traditional house, *Uma Lengge* (Nurannisa, 2022). This traditional house is not only a symbol of traditional architecture, but also reflects the values of local wisdom and cultural identity of the people of Bima, which has an important role in preserving local cultural heritage (Taneo & Madu, 2023). In addition, *Uma Lengge* architecture also contains mathematical concepts that can be analyzed through an ethnomathematics approach, thus making a contribution to understanding the rela-tionship between culture and mathematics in Bima society (Mariamah et al., 2021).

In the context of learning, many researchers agree that the ethno-mathematics approach can be an effective pedagogical tool to bridge between mathematical knowledge and students' experiences and culture (Mosimege & Egara, 2022). According to Saltifa et al. (2021), Ethno-mathematics shows that mathematics is influenced by the history, geography and social conditions of a society. Therefore, learning that integrates cultural elements in mathematics can increase student learning motivation, especially at the elementary school level, where the connection of material to everyday life is very important to foster students' logical thinking (Perdana & Suswandari, 2021).

On a broader scale, Umbara et al. (2021) asserts that ethnomathematics is the application of mathematics by a cultural group in their daily activities. This approach emphasizes the importance of understanding mathematics as a cultural product that develops along with people's practices in running their lives (Barrett, 2022). This is in line with the view of Widada et al. (2018), which states that mathematics is a cultural activity that reflects the procedures and knowledge used by a society to solve problems in their cultural context.

Several studies have shown how ethnomathematics can be found in the architecture of traditional houses, which often contain mathematical elements, especially in geometry and spatial aspects (Fauzi et al., 2021). Research the concept of geometry in traditional

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architecture such as joglo houses and temples, including elements such as lines, angles, flat shapes, and geometric transformations (Kyeremeh et al., 2023). The findings show that mathematical elements are not only present in modern constructions, but also in traditional building structures that are rich in cultural values (Lidinillah et al., 2022). Sudirman et al. (2020) found that *Uma Lengge* has many geometric concepts that can be integrated in math learning. The shape and spatial structure of *Uma Lengge* reflect the principles of geometry that are naturally internalized by the community in building their traditional houses (Oliveira, 2022).

Uma Lengge, as one of Bima's cultural heritages, has a unique architecture that is interesting to study from an ethnomathematics perspective (Chen & Faruddin, 2021). According to Cumino et al. (2021)The pyramidal shape of the building and the efficient use of space indicate the application of geometry concepts, which if explored further can be relevant and contextual learning materials for students. By examining geometry in *Uma Lengge*, students can be invited to understand that mathematics is not only present in textbooks, but also in their daily lives and culture (Rieder & Silke, 2020).

Exploration of ethnomathematics in Indonesia, especially in the context of traditional architecture, has been studied by a number of researchers, such as studies on the Javanese *Joglo* traditional house (Faiziyah et al., 2024) and geometry analysis in Borobudur Temple (Muhammad et al., 2019). The results showed the application of geometry concepts in the construction of traditional buildings. Based on previous research, no study has specifically explored the shape and structure of geometry in the *Uma Lengge* traditional house in Bima, West Nusa Tenggara. Therefore, this study aims to explore geometric elements in the structure of *Uma Lengge* from an ethnomathematics perspective. Based on this, the purpose of this study is to explore the geometric elements in the *Uma Lengge* structure from an ethnomathematics perspective.

METHODS

This research uses a qualitative approach with an ethnographic model (Jamali, 2018) which aims to explore the geometric forms and structures of traditional *Uma Lengge* houses. The research was conducted in stages, including the planning stage (which included literature studies and preliminary observations), the field data collection stage, and the data analysis and interpretation stage. The research location was in Maria Village, Wawo District, Bima Regency, West Nusa Tenggara. This location was chosen purposively because it still preserves the existence of traditional *Uma Lengge* houses and is known as an area that is active in cultural preservation and local tourism development. The subjects in this study include traditional leaders, guardians, and community members who have in-depth knowledge of the construction and cultural values of *Uma Lengge*. The subjects were selected using purposive sampling, based on their relevance to the study and their level of knowledge about the subject matter.

Data collection was obtained through participatory observation techniques, in-depth interviews, and documentation. The instruments used in this process include semi-structured interview guides, observation sheets, and visual documentation tools such as cameras and voice recorders. The

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interview guide was developed based on the geometric concept indicators to be examined, including building shapes, symmetry patterns, and spatial structures. To ensure data validity, this study applied triangulation techniques, including source triangulation, technique triangulation, and time triangulation. Source triangulation was conducted by comparing information from various sources; technique triangulation was conducted by comparing the results of interviews, observations, and documentation; while time triangulation was conducted by collecting data at different times to avoid temporal bias. The data analysis process in this study can be understood through Figure 1, which presents the components of data analysis based on the model proposed by Miles and Huberman. Figure 1 is presented to clarify the stages of data analysis used in this study.

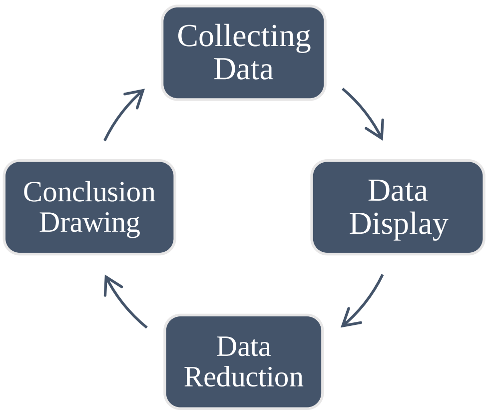

Figure 1. Components of Miles and Huberman data analysis

Data analysis in this study refers to three main stages that are interrelated according to Miles and Huberman, namely data reduction, data presentation, and conclusion drawing or verification. The data reduction process is carried out by filtering and simplifying relevant data, especially those related to geometric concepts in the architectural structure of *Uma Lengge*, such as triangular patterns, squares, and symmetry in building elements. Next, the data presentation stage is carried out by organizing the reduction results into visual forms, such as tables, diagrams, or descriptive narratives, to facilitate analysis and understanding of the relationships between data.

Respondents in this study were selected using purposive sampling, considering that this study required informants with specific characteristics or qualifications relevant to the object of study, namely the traditional *Uma Lengge* building. The selected respondents consisted of caretakers, cultural experts, and preservationists who play an important role in maintaining, exploring cultural aspects, and managing the sustainability of the *Uma Lengge* building. Data collection was carried out through direct observation of the building, related literature studies, and in-depth interviews with community leaders or residents who have a deep under-standing of the history and construction of *Uma Lengge*. The research stages included documenting aspects related to the building, conducting interviews to explore further information, and drawing conclusions based on the findings. The data analysis techniques used include data reduction to classify and sharpen the focus of the research, data presentation related to the problem formulation, and a verification stage through in-depth analysis to ensure the validity of the data and obtain conclusions in line with the research objectives.

RESULTS AND DISCUSSION

Uma lengge is a traditional building and part of the ancestral heritage of the mbojo tribe, located in Maria Village,

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Wawo District, Bima Regency, this building has been a cultural icon of the local community since the 18th century. The people of Bima consistently maintain and preserve *Uma Lengge* as a form of respect for their traditions and cultural identity. The function of *Uma Lengge* in Bima society is not only as a storage place, but also as a symbol of local wisdom in managing food resources, especially rice. The maintenance of *Uma Lengge* is an effort to maintain local wisdom and preserve the cultural wealth of the Bima community. The construction process of *Uma Lengge* is inseparable from the application of traditional mathematical activities carried out by the people of Bima. These activities include traditional measurement methods used to determine the proportion and size of the various components that make up the *Uma Lengge* structure.

In general, the building structure of *Uma Lengge* incorporates geometric architectural elements in its design (one of example can be seen in Figure 2). The door of *Uma Lengge* is rectangular, while the floor of the building, which consists of (*lante awa, woha, and ese*) is cube-shaped, with the surface of the *lante* being square. The roof of the building has a triangular prism shape, while the *pali peto* (coating between the pillar and the stone) uses square blocks. In addition, there are *ceko* (a pair of elbows) that form a right-angled triangle pattern, and *nggore* (a beam that supports the seat of the *lante ro awa*) that is in the shape of a block. Before further examining the flat geometric shapes found in traditional *Uma Lengge* buildings, it is necessary to first understand their architectural structure and physical components. Understanding these aspects is an important basis for exploring the representation of geometric concepts inherent in these buildings. Thus, the next section will describe in detail the flat geometric shapes embodied in the construction elements of *Uma Lengge*.

Figure 2. Depicting the structure of a traditional *Uma Lengge* house

Exploration of flat geometric shapes on *uma lengge*

Based on the results of analysis from a geometric perspective, as shown in Figure 3, the ethnomathematical elements found at the bottom of the *Uma Lengge* structure include a component called Ceko.

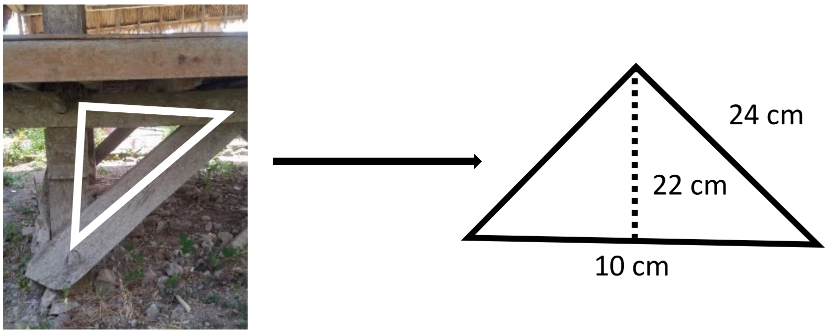

Figure 3. Depicting the *ceko* (pair of elbows) of *uma lengge*

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Ceko functions as a support for the foot of the house and has the geometric shape of an isosceles right triangle. An isosceles right triangle is characterized by two sides that have the same length, which are the sides that form right angles. The formula for calculating the area of this triangle is expressed as half the product of the length of the base (a) and the height (t), ie:

$$L = {}^{1}/_{2} \times a \times t$$
$$L = {}^{1}/_{2} \times 10 \times 22 = \frac{1}{2} \times 220 = 110\ cm^2$$
$$K = 2s + a = s + s + s$$
$$K = 10 + 24 + 24$$
$$K = 58\ cm^2$$

Ceko, or a pair of elbows in *Uma Lengge* construction, has a deep philosophical meaning as a symbol of the importance of building a solid foundation for life. In traditional community life, *ceko* not only acts as a structural component to maintain the stability and balance of the building, but also reflects the values of life that need to be upheld. This concept illustrates that humans need to have a strong foundation to face various challenges in life, both in spiritual, moral and social aspects. This philosophy emphasizes that a solid foundation will provide stability and durability, both in maintaining relationships between individuals and in creating balance in life as a whole. In accordance with the research Nebratenko (2021), It is revealed that a solid foundation in a traditional building structure not only has a technical role as a building support, but also serves as a philosophical symbol that illustrates the fundamental principles of life.

Figure 4. Square pattern on *Lante*

Based on analysis from a geometric point of view, as shown in Figure 4, the ethnomathematical elements found in the central space of *Uma Lengge* include a floor structure called *lante*. This *lante* serves as the base of an open space called *ro woha*, which is used as a place to rest for residents of the house or to receive guests. Geometrically, the *lante* has a basic square shape, characterized by four sides of equal length, and four corners each measuring 90°. This distinctive geometric configuration fulfills the defining properties of a square. The formula for calculating the area of a square is $L = s \times s$.

$$L = s \times s$$
$$L = 250 \times 250 = 62.500\ cm^2 = 6{,}25\ m^2$$

In addition to area, the square shape of the *lante* also has distinctive symmetry properties. The square has four folding symmetries and four turning symmetries, reflecting the balance and order in *Uma Lengge's* architectural design.

Lante, in the cultural perspective of traditional communities, has a deep meaning as a place to hold deliberative

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meetings. As a space used for discussion and collective decision-making, the *lante* reflects the values of democracy and solidarity that are highly upheld in the community's social structure. The existence of the *lante* as a meeting location for community members reflects the importance of dialogue and consensus in reaching a fair and wise agreement. Through deliberations held in the *lante*, communication between individuals can take place openly, prioritizing the principles of mutual cooperation and mutual respect. This philosophy also teaches that decisions made together are stronger and more binding, as they are based on a shared understanding developed through constructive discussions. In accordance with the research Siso & Kerong (2022), said that the place where community members gather to carry out customary deliberations has the purpose of solving social problems and making important decisions related to the common life.

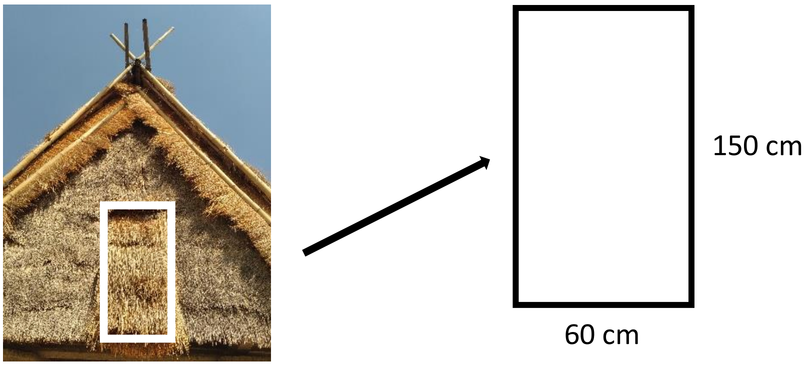

Figure 5**.** Rectangular Pattern on *Kabu Tandacai*

Based on the analysis from a geometry point of view, as shown in Figure 5, at the top of the *ro woha* there is a *kabu tandacai*, which is a door with a function as an entrance for the residents of the house. This *kabu tandacai* has a rectangular shape, with a size that is adjusted based on the height of the occupants of the house. Geometrically, the *kabu tandacai* consists of two pairs of sides that have the same length, thus obeying the basic properties of a rectangle. The solution given is as follows;

$L = P \times L$
$L = 150 \ \times 60 = 9.000 \ cm^2 = 90 \ m^2$

$K = 2(P \times L)$
$K = 2(150 \times 60)$
$K = \ 2(9.000) = 18.000 \ cm^2 = 180 \ m^2$

The *Kabu tandacai*, or door at *Uma Lengge*, has a deep meaning and philosophy in the cultural tradition of the Bima people. This door not only functions as an architectural part that allows access in and out of the building, but also holds significant symbolic values. *Kabu tandacai* represents the concept of openness in welcoming guests and strengthening social relationships, as well as a reminder of the importance of maintaining privacy and protecting family harmony within the home. The philosophy embodied in this door also emphasizes the importance of balance between openness to the outside world and internal peace in domestic life. In addition, in the spiritual dimension, the *kabu tandacai* is often interpreted as a gateway to a life full of blessings,

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reflecting respect for ancestors and traditional values that have been preserved for generations. As per the research Yudanti et al. (2022), says that the doors of traditional houses are designed with protection against natural disturbances in mind, while also reflecting social values. This door design not only serves as a barrier to protect residents from potential external threats, but also symbolizes openness in welcoming guests who come with good intentions.

Exploration of Spatial Geometry in *Uma Lengge*

Based on an analysis from a geometric point of view, as shown in Figure 6, in the *ro woha* section of *Uma Lengge*, there are four supporting poles called *ro ese*.

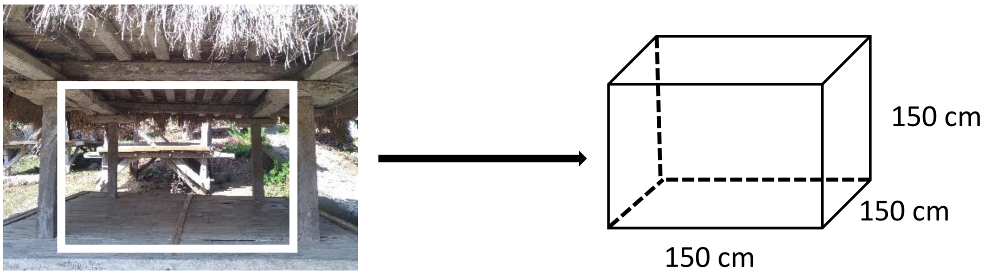

Figure 6. Concept and Principle of Cube in *ro woha*

These poles are limited by the *lante* at the bottom and the roof at the top. With a design that is open on all four sides and closed at the base and roof, the *ro woha* section forms a cube-shaped structure. Geometrically, this cube has 6 sides, 8 corner points and 12 ribs. The rectangle also has 2 folding symmetries and 2 turning symmetries, showing balance in its design. The solution given is as follows;

$V = s \times s \times s$
$V = 150 \times 150 \times 150$
$V = 3.375.000\ cm^3 = 3{,}375\ m^3$

$L = 6 \times s \times s$
$L = 6 \times 150 \times 150$
$L = 135.000\ cm^2 = 13{,}5\ m^2$

Ro woha, which is cubical in shape, is one of the main elements in the *Uma Lengge* structure and is loaded with philosophical meaning. Its cube shape represents the principles of balance and stability, which are important cornerstones of traditional community life. This structure is supported by four main pillars called *ro ese*, which act as the main support for the building. The existence of *ro ese* reflects the values of togetherness and mutual support among community members, as the four pillars work together to support the entire building. Symbolically, *ro ese* also illustrates the importance of harmony between the four aspects of spiritual, social, moral and cultural life that form the foundation of community life. As per the research Adityaningrum et al. (2020) about the *Joglo* traditional house in Java shows that the structure of this building has four main pillars that not only function as the main support to give sturdiness to the building, but also symbolize the power of the four cardinal directions. This symbol represents the principle of balance and harmony that is the basis of Javanese life.

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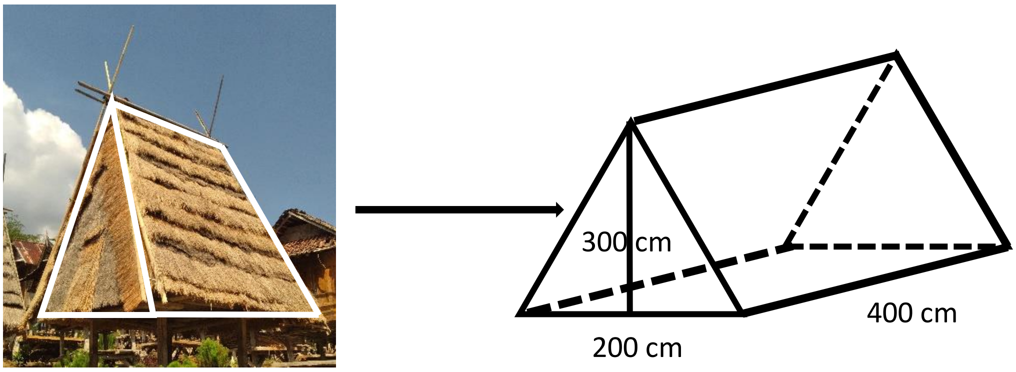
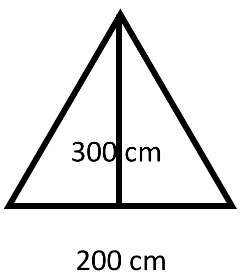


Figure 7. Concept and Principle of Triangular Prism in *Ro Ese*

Ro ese (Roof) *Uma Lengge* is made using natural materials such as alang-alang or bamboo shingles obtained from the forest, as shown in Figure 7. The utilization of these natural materials is carried out by traditional Bima people, considering that in the past there were no modern building materials available. *Ro ese* (Roof) *Uma Lengge* has a triangular prism shape which is a three-dimensional space. The roof is bounded by a triangular base and lid, while the sides are upright squares. This geometric shape allows the application of formulas to calculate the volume and surface area of a prism. To get the value of the hypotenuse using the *phytagorean* theorem, use the following formula:

$c^2 = a^2 + b^2$
$c^2 = 100^2 + 300^2$
$c^2 = 10.000 + 90.000$
$c \ = \sqrt{100.000} = 10.000\ cm$



Pedestal Area $= \frac{1}{2} \times$ pedestal $\times$ high

Pedestal Area $= \frac{1}{2} \times 200 \times 300$
Pedestal Area $= 30.000\ cm^2 = 3\ m^2$

Perimeter of the base $= s + s + s$
$= 200 + 10.000 + 10.000 = 20.200\ cm$
$= 202\ m$

$V =$ Pedestal Area $\times$ high
$V = 30.000\ cm^2 \times 300\ cm$
$V = 9.000.000\ cm^3 = 9\ m^3$
$Lp = (2 \times$ Pedestal Area$) +$ Perimeter of the base $\times$ High$)$
$Lp = (2 \times 30.000\ cm^2) + (20.200\ cm \times 400\ cm)$
$Lp = (60.000\ cm^2) + (8.080.000\ cm^2)$
$Lp = 8.140.000\ cm^2 = 841\ m^2$

Ro ese, or the roof of the *Uma Lengge* structure, is made from natural materials such as *alang-alang*, which holds deep meaning and philosophy in the lives of traditional communities. *Alang-alang* is considered a natural and pure material, which reflects the harmony between man and nature. In the perspective of traditional culture, the choice of natural materials such as *alang-alang* is not only based on practical considerations, but also as a symbol of respect for nature and life itself. The *alang-alang* roof plays a role in establishing a balanced relationship between humans and natural elements, while teaching the importance of maintaining a balanced ecosystem in everyday life. This philosophy reflects

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how the local wisdom of the community integrates functional aspects with spiritual and ecological values, so that the material is more than just a structural element, but also a reflection of the close relationship between humans and nature. In addition, the shape of the roof that resembles a triangular prism has strong symbolic values. The triangular prism symbolizes stability, strength and balance, which are in line with key principles in people's lives. According to research Kosuke et al. (2023), said that the use of *alang-alang* as a roofing material carries a deep spiritual meaning, as it is considered a pure and natural material, reflecting the harmony between humans and nature.

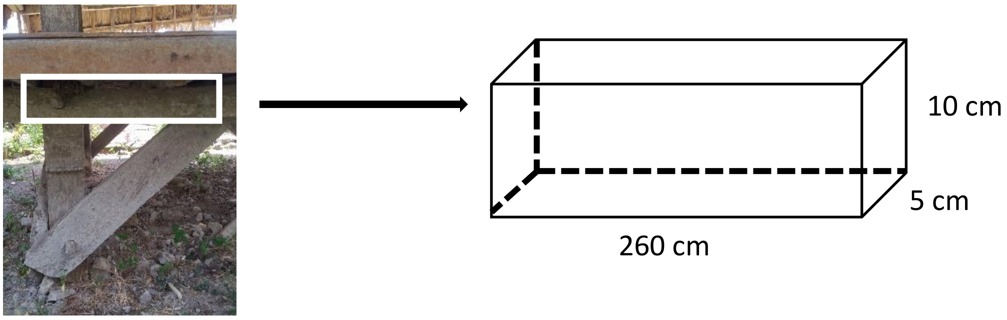

Figure 8. Concepts and Principles of Beams in *Nggore*

Based on analysis from a geometric point of view, as shown in Figure 8, *Nggore* is a beam placed on top of a *nggapi* (pole flank) with a predetermined size and distance. The function of the *nggore* is as a support for the seat on the *lante ro awa*. It can be explained that the layer between the base pole and the lower chamber of *Uma Lengge* is built in three-dimensional space, in the form of a pair of beams formed by three pairs of squares and rectangles, consisting of twelve ribs of non-uniform length. Here are the formulas for the volume, perimeter and surface area of a block, namely:

$V = p \times l \times t$
$V = 260 \times 5 \times 10$
$V = 13.000\ cm^3 = 0{,}013\ m^3$

$K = 4(p + l + t)$
$K = 4(260 + 5 + 10) = 1.100\ cm$

$Lp = 2 \times (p \times l) + (p \times t) + (l \times t)$
$Lp = 2 \times ((260 \times 5) + (260 \times 10) + (5 \times 10))$
$Lp = 2 \times ((1.300) + (2.600) + (50))$
$Lp = 2 \times 3.950 = 7.900\ cm^2 = 0{,}79\ m^2$

Nggore, as the support used to sit on the *lante ro awa*, has a very deep philosophical meaning in the context of traditional community life. As an element that serves to stabilize and strengthen the structure of a building, *nggore* symbolizes the importance of supporting strength in maintaining the balance and integrity of a living system. This philosophy states that, just like a building, life also requires strong supporting elements to ensure balance and avoid collapse. Without a solid support, both the building and life would be vulnerable to external disturbances. Therefore, *nggore* not only functions as part of the building's structure, but also symbolizes the principle of balance in life that requires a solid foundation to face change and survive. This philosophy underscores the importance of supporting elements that make up a solid foundation in

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social, spiritual and moral life, in order to keep life harmonious and balanced. Based on research Tackie & Haq (2024) explains that poles have a very vital role in maintaining the stability of the building so that it can withstand various pressures coming from the surrounding environment.

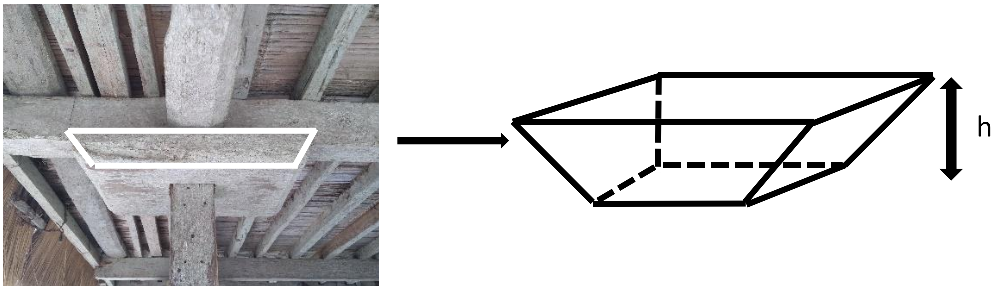
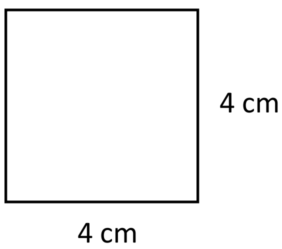


Figure 9. The concept of pyramid frustum on the *Pelampu*

Based on analysis from a geometric point of view, as shown in Figure 9, *Uma Lengge* has a distinctive architectural structure at the top of the building, where there are wooden cut elements that function as a link between the lower room and the roof, known as *pelampu*. On the roof of *Uma Lengge*, there is a piece of wood that functions as a barrier so that rats cannot enter the food storage barn, which is commonly called *pelampu*. The *pelampu* has a pyramidal frustum shape that is placed upside down, with an architectural structure in the form of a three-dimensional space that is the inter-section of a cone or pyramid with two parallel planes. Here is the formula to calculate the volume of the frustum, namely:



$L = s \times s$
$L = 4 \times 4 = 16\ cm^2$

$V = \frac{1}{3} \times \text{Pedestal area} \times \text{high}$
$V = \frac{1}{3} \times 16\ cm^2 \times 6\ cm = 32\ cm^3$

Pelampu, which is a piece of wood in the structure of a traditional house, has a deep philosophical meaning as a link between the lower room and the roof. In this philosophy, the *pelampu* symbolizes the balanced relationship between the physical and spiritual worlds, and between human life on earth and the universe. The *Pelampu* reflects the importance of connectedness and balance in human life, where the two aspects are inseparable and mutually supportive. In addition, the *pelampu* can also be interpreted as a symbol of transition and continuity, which reminds us that every element of life must be harmoniously connected to achieve balance in everyday life. The four main pillars in the *Uma Lengge* building structure do not merely serve as structural supports, but also have symbolic meanings that reflect the harmonious relationship between humans, nature, and the surrounding environment. These meanings are reflected in the cultural perspective of the local community, which interprets this traditional building as the embodiment of harmony between human life and the order of the universe as a whole.

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This study shows that the architecture of traditional Uma Lengge houses incorporates various geometric concepts, both in two dimensions (flat geometry) and three dimensions (spatial geometry), which are fully implemented in the structure and design of the buildings. This reflects that the Bima people have traditionally adopted and applied mathematical principles in their cultural practices, particularly in the construction of traditional houses. For example, the triangular shape of the ceko, the square shape of the lante, and the rectangular shape of the kabu tandancai are examples of flat geometry, while the triangular prism shape of the ro ese, the cube shape of the ro woha, the rectangular prism shape of the nggore, and the truncated pyramid shape of the pelampu are examples of spatial geometry. The factors influencing these findings include the sustainability of local traditions among the Bima people in constructing traditional houses based on sizes, proportions, and shapes that have been passed down from generation to generation through empirical experience. The role of traditional leaders, guardians, and cultural preservers also contributes to maintaining the integrity of geometric values in traditional architecture.

When compared to other research findings, such as the study conducted by Laksmiyanti et al. (2023) on Joglo house architecture and by Damanik & Yusuf (2022) on Borobudur Temple, the results of this study further reinforce the understanding that traditional buildings in Indonesia contain significant mathematical elements, particularly in geometric forms, and have the potential to serve as a source of contextual learning in mathematics education. However, this study has limitations in the scope of its research subjects and has not yet explored numerical aspects or traditional measurement systems in depth.

Theoretically, this study contributes to the development of ethnomathematics as a learning approach that is in line with local cultural values. From a practical standpoint, these findings can be implemented in the development of context-based geometry teaching materials at the elementary school level, with the aim of improving conceptual understanding and encouraging students to appreciate their cultural heritage.

CONCLUSIONS AND SUGGESTIONS

From the results of a study of the architectural structure of the *Uma Lengge* traditional house, it can be concluded that this building contains elements of flat geometry and spatial geometry that reflect the integration of mathematical knowledge and the local wisdom of the Bima people. Flat geometry is reflected in the shapes of triangles, squares, and rectangles, while spatial geometry is evident in the shapes of triangular prisms, cubes, blocks, and truncated pyramids. This finding indicates that the traditional Bima community has traditionally implemented geometric concepts in their architectural designs, reflecting harmony between functional, aesthetic, and cultural values.

In line with the results of this study, it is recommended that further research expand the scope of the study by exploring other mathematical concepts contained in local cultural heritage. Additionally, the development of ethnomathematics-based mathematics learning modules should be encouraged as an effort to support

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contextual and meaningful learning, particularly at the elementary school level. This step is expected to enhance students' appreciation of mathematics while strengthening cultural preservation through education.

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