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Ethnomathematics: Exploring Geometric Shapes and Patterns in *Sasak* Snacks

Fitri Indah Rahmawati[1], Intan Dwi Hastuti[2], Yuni Mariyati[3], Syaharuddin[4]
[1,2,3]Department of Elementary School Teacher Education, Universitas Muhammadiyah Mataram, Mataram, Indonesia
[4]Department of Mathematics Education, Universitas Muhammadiyah Mataram, Mataram, Indonesia
[1]indahmawati519@gmail.com

ABSTRACT

Mathematics is often viewed as a discipline that is detached from the social and cultural context of society, even though historically its development is rooted in the practices of community life. This study aims to identify and analyze the representations of geometric shapes and patterns contained in traditional snacks of the Sasak community in Montong Tangi Village, East Sakra District, East Lombok Regency, through an ethnomathematics perspective. This study uses a qualitative approach with an ethnographic design, in which data is obtained through participatory observation and in-depth interviews with snack makers, traditional leaders, and community leaders, then analyzed interactively through the stages of data reduction, data presentation, and conclusion drawing with validity testing through source triangulation. The results of the study show that traditional snacks such as cerorot, lupis, jaje abuq, and renggi represent geometric concepts in the form of cones, triangular prisms, triangular pyramids, and circles formed through traditional techniques of folding, rolling, and wrapping ingredients. These geometric representations are not only structural in nature, but also reflect cultural values such as order, harmony, and togetherness in Sasak society. The novelty of this research lies in the study of traditional culinary artifacts as ethnomathematical objects, which have been relatively unexplored in previous literature. Theoretically and pedagogically, this research contributes to expanding the scope of ethnomathematics studies in the culinary field while providing a conceptual basis for the development of contextual, relevant, and meaningful culture-based geometry learning.

Keywords: Ethnomathematics, geometry, traditional Sasak snacks, local culture, learning

Corresponding Author:
Fitri Indah Rahmawati,
Elementary School Teacher Education,
Universitas Muhammadiyah Mataram,
Jl. KH. Ahmad Dahlan No. 1, Kota Mataram, Nusa Tenggara Bar, 83115, Indonesia.
indahmawati519@gmail.com

1. INTRODUCTION

Indonesia is known as a country rich in ethnic, linguistic, religious, and cultural diversity spread across various regions. This diversity is a national treasure that reflects the pluralistic identity and character of the nation (Riyadi et al., 2024). Each region has different traditions, local wisdom, and cultural works, which are continuously preserved through various forms of social and educational activities. Education plays an important role as a means of fostering awareness of cultural values while integrating local knowledge into the learning process (Septarinjani et al., 2025). This integration began to appear in mathematics education, which was no longer understood as a science separate from community life, but as part of cultural practice. Studies emerged that specifically examined the relationship between culture and the mathematical activities of communities, which became the basis for the development of the concept of ethnomathematics (Wangge, 2023).

Ethnomathematics is a discipline that studies the relationship between mathematics and culture. The term was introduced by Ubiratan D'Ambrosio, who conceptualized ethnomathematics as mathematical knowledge that arises from cultural practices and social interactions within a community (Aisyah et al., 2024;Salsabil, 2022). Through the triadic framework of ethnomathematics, D'Ambrosio explains that mathematics develops from culturally embedded activities in understanding, explaining, and organizing reality using techniques and strategies shaped by everyday life. From this perspective, mathematics is viewed as a cultural product rooted in human interaction with the social and natural environment. As a pedagogical approach, ethnomathematics allows for the integration of students' cultural experiences into

formal mathematics learning, thereby connecting abstract concepts with meaningful real-life contexts (Sunzuma, 2020). This integration not only enhances conceptual understanding but also strengthens cultural identity and the social relevance of mathematics. Therefore, various cultural artifacts, including traditional Sasak snacks with distinctive geometric structures, can be explored as representations of mathematical concepts.(Lubis et al., 2024).

Culture is a concrete manifestation of human creativity, taste, and will that reflects ways of thinking and acting in social life (Widyastuti, 2021). Mathematics is understood as the science of form, structure, and patterns used to understand phenomena around humans. The two are closely related because the development of mathematics cannot be separated from cultural dynamics and community needs, so that mathematics can be viewed as a cultural product (Zulaekhoh & Hakim, 2021). Within this framework, the concept of cultural mathematical knowledge emerged, namely mathematical ideas and practices implied in traditional activities, cultural artifacts, and social interactions within a community. Although not always expressed through formal symbols, these practices reflect systematic reasoning involving patterns, symmetry, proportion, similarity, and spatial structures. Identifying these implicit structures allows cultural products to be understood as epistemological sources of mathematical thinking, rather than merely contextual objects of learning. Ethnomathematics is an approach that reveals mathematical practices and ideas in the cultural activities of communities, while also opening up space for exploration of geometric shapes and patterns in various local cultural products, including traditional Sasak snacks that have aesthetic value and mathematical conceptual representation. (Bela et al., 2025).

Several previous studies have examined the geometric shapes and patterns found in Sasak snacks, including (Ilmiah & Madrasah, 2024; Lalu & Nurmawanti, 2023; Rosila & Mahmudah, 2025; Nur et al., 2020;**)** Herayanti (2023) Explaining local culture has great potential as a source of contextual mathematics learning. A number of studies have examined the relationship between mathematical concepts and cultural values through objects such as batik motifs, woven crafts, traditional architecture, and folk games. Nur et al, (2020) reveals that every cultural activity contains representations of geometric shapes, patterns, and structures that reflect the systematic thinking of a society. Traditional snacks are also beginning to be viewed as cultural artifacts with mathematical dimensions. Snacks typical of the Sasak people display unique shapes and patterns of presentation that can be explored to identify representations of geometric concepts. Wayan et al, (2023) Through an ethnomathematical approach, the exploration of traditional Sasak snacks opens up new avenues for understanding the relationship between culture and mathematics as two entities that complement each other in people's lives.

Fauzi et al, (2023) states in his research that traditional Sasak snacks display unique shapes, patterns, and structures that can be interpreted as representations of geometric concepts. Various types of snacks such as cerorot, jaje abuq, lupis, and jaje renggi display different geometric shapes, reflecting the creativity of the community in processing ingredients while internalizing cultural values. The cone shape of *cerorot*, the circle of *renggi*, the triangle of *lupis*, and the triangular or square pyramid of *jaje abuq* demonstrate order, balance, and proportion that represent the principles of three-dimensional geometry. Meanwhile, research Firmanti et al, (2022) reveals that the patterns of folds, arrangements, and symmetry in the manufacturing process also illustrate the natural application of geometric concepts in cultural practices. Through an ethnomathematical perspective, Sasak snacks not only serve as culinary heritage, but also as a manifestation of the mathematical knowledge of a community that has grown from cultural experiences and daily practices.

Fauzi et al, (2020) The presentation of ethnomathematics in Indonesia has so far focused on cultural objects such as woven fabrics, batik, traditional games, and architecture, while exploration of geometric shapes and patterns in traditional snacks is still rare, especially Sasak snacks. Traditional snacks of the Sasak people have complex variations in shape and structure, where geometric elements such as symmetry, proportion, and balance are evident in both their visual appearance and manufacturing techniques. The mathematical potential contained within them has not been widely revealed through scientific studies. Most previous studies have only placed cultural elements as a medium for learning, not as a source of mathematical knowledge that can be analyzed conceptually. Huda (2018) states that

traditional Sasak snacks are not merely a culinary heritage, but also a representation of the community's way of thinking in understanding form and space.

Although a number of previous studies have identified the existence of geometric shapes and patterns in traditional Sasak snacks, most of these studies are still descriptive in nature and tend to position cultural objects solely as a medium for contextual learning. Studies that systematically examine traditional snacks as structured geometric entities through context and mathematical modeling within the framework of D'Ambrosio's ethnomathematics are still very limited. In addition, the interpretation of traditional snacks as a source of implicit cultural mathematical knowledge has not been elaborated in depth. Therefore, a comprehensive ethnomathematics analysis is needed, integrating cultural interpretation and geometric conceptual studies to fill this gap.

Based on this gap, this study aims to explore the geometric shapes and patterns contained in traditional Sasak snacks from an ethnomathematics perspective. The focus of the study is on identifying and analyzing the representation of geometric concepts such as symmetry, proportion, similarity, and three-dimensional shapes reflected in the physical structure of traditional snacks. Through this approach, the study seeks to reveal the mathematical and cultural values inherent in the process of making and presenting Sasak snacks as a form of integration between mathematics and culture. This study is expected to enrich the understanding of how the local knowledge of the Sasak people represents geometric principles in everyday life while expanding the study of ethnomathematics in Indonesia.

2. RESEARCH METHOD

This study uses a qualitative approach with ethnographic research aimed at describing in depth the geometric shapes and patterns contained in traditional Sasak snacks through an ethnomathematics perspective. This approach was chosen because it provides space for researchers to understand cultural phenomena contextually based on the views and experiences of the people directly involved in these cultural practices. The research was conducted in East Lombok Regency, West Nusa Tenggara, which is known for its rich Sasak culture and diverse culinary traditions. This study involved five informants consisting of one traditional snack maker (PJT), one community leader (TM), one traditional leader (TA), one youth leader (TP), and one mathematics teacher (GM) who understood the symbolic meaning and philosophy behind the shapes and patterns of Sasak snacks.

Table 1.
Categories and Number of Research Informants

Information categories	Number	Selection criteria
Traditional snack makers	1	Has 10 years of experience in producing traditional snacks
Community leaders	1	Understanding history and cultural values
Traditional leaders	1	Having knowledge about symbolic meanings in Sasak traditions
Youth leader	1	Involved in local cultural preservation activities
Math teacher	1	Theaching mathematics and understanding cultural Integration in learning

The determination of informant categories was based on their social roles and level of participation in cultural preservation efforts, including their understanding of the symbolic meaning and geometric representation of traditional Sasak snacks. Informants were selected using purposive sampling techniques, with the following criteria: (1) having direct experience and involvement in the production and preservation

of traditional snacks, (2) having a good understanding of the cultural values contained therein, and (3) being willing to provide information openly and cooperatively during the research process.

A. Interview procedure

In-depth interviews were conducted using a semi-structured approach based on interview guidelines developed according to the focus and objectives of the study. Each interview session lasted approximately 45–60 minutes and was conducted face-to-face at the production site or at the informant's residence. The questions focused on the symbolic meaning of the snack shapes, the stages of structure formation, and the informants' understanding of the concepts of shape and pattern from a mathematical perspective. The entire interview process was recorded with the informants' consent and subsequently transcribed for data purposes.

B. Observation procedure

Observations were conducted participatively by directly observing the process of making traditional snacks, starting from the preparation stage to the final serving stage. The aspects observed included the geometric shapes produced, the shaping or folding techniques, the arrangement patterns, the size proportions, and the spatial structure of each culinary product. Observations were made on all types of snacks that were the subject of the study to ensure consistency and completeness of data. The findings of the observations were systematically recorded in observation sheets and reinforced through visual documentation in the form of photographs to support the data.

C. Research instruments

The research instruments used in this study consisted of: (1) semi-structured interview guidelines compiled based on geometric concept indicators and relevant cultural dimensions, (2) observation sheets containing aspects of shape, pattern, symmetry, and spatial structure, and (3) visual documentation in the form of photographs and field notes. All instruments were developed with reference to the ethnomathematics theoretical framework and were subsequently reviewed through discussions with mathematics education experts to ensure the consistency of the substance and construction of the instruments with the research objectives. The review process was carried out to ensure content validity, so that each item of the instrument represented the indicators of the concepts being studied accurately and proportionally.

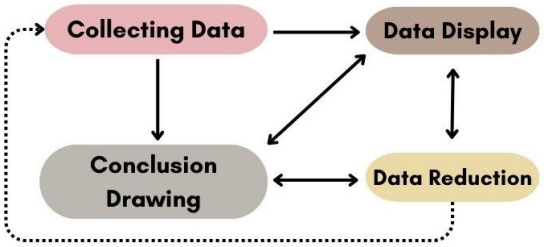

Fig. 1. Data analysis components (Miles and Huberman)

This study applies Miles & Huberman's data analysis technique, which consists of four stages: *data collection, data reduction, data presentation,* and *conclusion drawing* and *verification*. The first stage, data collection, was carried out through participatory observation, in-depth interviews, and visual documentation of various types of traditional snacks of the Sasak people in East Lombok. The data collected included the shapes, patterns, and geometric structures of snacks such as *cerorot, jaje tujak, lupis, jaje abuq,* and *renggi,* along with their symbolic meanings as explained by community leaders and snack makers. The second stage, data reduction, was carried out by selecting, focusing, and simplifying data relevant to the research focus, namely geometric shapes and patterns related to the concept of geometry from an ethnomathematics perspective. In the third stage, data presentation, the research findings were compiled descriptively in the

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form of narrative descriptions, tables, and visual documentation to show the relationship between cultural elements and the representation of geometric concepts. The final stage, *drawing* and *verifying conclusions*, was carried out through the interpretation of the data presented to identify geometric patterns and mathematical and cultural values contained in traditional Sasak snacks.

3. RESULTS AND DISCUSSION

A. Representation of Geometric Forms in Sasak Traditional Snacks

Traditional Sasak snacks are found to have characteristics in their shape and pattern that reflect geometric concepts that occur naturally in everyday cultural practices. Each type of snack, such as *cerorot*, *jaje tujak, lupis, abuq,* and *jaje renggi*, displays a visual structure and manufacturing technique that involves regularity of shape, symmetry, folds, and patterns rooted in tradition that has been passed down from generation to generation. This finding is in line with the ethnomathematics perspective, which views mathematics as part of cultural construction, so that local cultural objects have the potential to become sources of contextual learning. The following section provides an in-depth description of the shapes, patterns, and cultural values of each type of traditional snack based on the geometric representations found in them. There are several typical Sasak snacks that have geometric shapes and patterns, including:

1. Cerorot Snacks

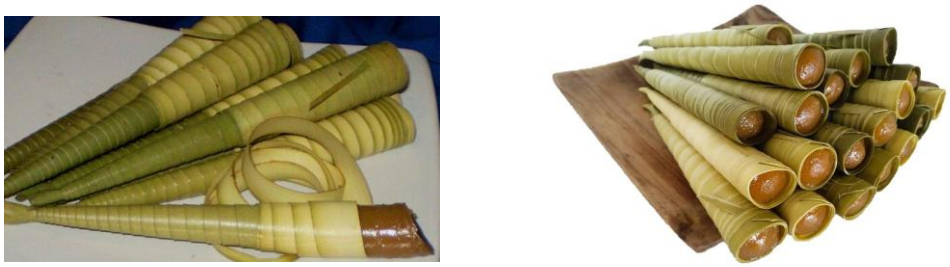

Fig. 2. Traditional Cerorot Snacks of the Sasak People

Fig. 2 shows a traditional snack from Lombok made from coconut milk, flour, and brown sugar. In Montong Tangi Village, cerorot is not only a food, but also has a symbolic role in various traditional activities such as nyongkolan, roah, and begawe nyiwaq (a nine-day ceremony). The technique of rolling coconut leaves has been passed down from generation to generation. Mathematically, cerorot snacks represent spatial shapes in the form of cones, spiral patterns, and rotational symmetry that emerge from the way the leaves are rolled. The spiral structure contains elements of regularity, proportionality, and stable proportions, making it a geometric material that can be explored from an ethnomathematical perspective. In addition, the cone shape is understood as a symbol of steadfastness and honor in Sasak customs.

> *(TA) states: Cerorot snacks are made in a cone shape because coconut leaves are rolled to form a pointed tip. This method has been taught by our elders and has never changed. The rolling must be just right so that the dough can fill the space evenly and not spill out. If the rolling is not neat, the shape of the cerorot is usually not good when cooked. Therefore, the people here consider the neatness and uniformity of the shape of cerorot as a sign of the skill of the maker, especially when prepared for traditional ceremonies.*

Field findings show that neatness and uniformity of shape not only have practical functions, but also reflect the aesthetic standards and cultural values of the local community. The precision in the process of rolling the leaves shows an understanding of proportion and stability of form. Thus, cerorot is not just a culinary product, but also represents the integration of traditional skills and mathematical structures that develop naturally in the cultural practices of the Sasak people. Therefore, cerorot has the potential to be used as a source of contextual and meaningful ethnomathematics learning in geometry education.

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2. Abuq Snacks

Fig. 3. Traditional Abuq Snacks of the Sasak People

Figure 3 Jaje abuq is a traditional snack from Lombok made from rice flour wrapped in banana leaves and shaped like a triangular pyramid. This snack is often served during traditional rituals such as selamet and religious celebrations and is considered sacred because it is completely enclosed by leaves. The process of wrapping jaje abuq requires a certain degree of precision so that the folds of the leaves form symmetrical angles. Geometrically, the structure represents a triangular pyramid with a triangular base and vertical sides that meet at a single apex. The leaf folding pattern applies to the principles of flat planes, folding symmetry, and proportions between parts that form a stable structural unity.

(PJT) explains: "When making abuq snacks, banana leaves are usually folded into triangles so that the sticky rice and coconut filling can be compact and not easily spill out. This folding method has been used by our elders since long ago, and the method remains the same today. If the folds are not done correctly, the abuq will not stand neatly and its shape will change when steamed. So for us, the triangular shape is not just about appearance but also shows the neatness and skill of the person making it, especially if the abuq is prepared for traditional purposes."

This statement shows that the triangular shape of jaje abuq does not merely serve as packaging, but also reflects the aesthetic values, precision, and skill standards maintained in the community's traditions. The consistency and precision of the folds so that jaje abuq can stand upright indicate an imaginative understanding of the principles of balance, symmetry, and spatial proportion. Based on field exploration results, jaje abuq represents the integration of cultural practices and geometric concepts internalized in the culinary activities of the Sasak community. The triangular pyramid structure formed through the technique of folding leaves shows that the concepts of symmetry and proportion have been applied for generations, even though they are not expressed in formal mathematical terms. Jaje abuq can be positioned as a potential ethnomathematics object to be developed in geometry learning based on the local cultural context.

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3. Lupis Snacks

Fig. 4. Traditional Lupis Snacks of the Sasak People

Figure 4 Lupis is a sticky rice dish wrapped in banana leaves to form a triangle. This lupis cake is usually served with grated coconut and sweet sugar sprinkled on top. In Sasak tradition, lupis is often served as part of family events and traditional celebrations. Its formation requires the ability to wrap the leaves with consistent size and angles so that the prism shape is perfectly formed. Geometrically, lupis represents a triangle, and the wrapping technique demonstrates a regular ratio between the length and width of the leaves, reflecting the community's ability to intuitively manage proportions.

> *(TA) states: "In our tradition, lupis is always shaped like a triangle because this shape is considered most suitable for maintaining the density of the sticky rice filling and making it easy to arrange in traditional dishes. The method of folding the leaves to form a triangle has been taught by our elders and has not changed much to this day. For us, uniformity of shape is not just a matter of neatness, but a sign that the maker respects the traditional ceremony being held. Dishes with uniform shapes are seen as a symbol of order and harmony within the family and community. Therefore, the triangular shape of lupis has become part of the unwritten rules of Sasak tradition that are still upheld today."*

This statement shows that the triangular shape of lupis not only serves a practical function in maintaining the density of the contents and ease of arrangement, but also has symbolic value related to social order and harmony. The consistency of the shape reflects the standards of neatness maintained in tradition, while also demonstrating an intuitive understanding of angles, proportions, and structural balance. Lupis snacks can be understood as a representation of the integration of cultural values and mathematical structures in Sasak society. The technique of folding leaves to produce a triangular shape demonstrates the informal application of geometric principles, which have been passed down from generation to generation through culinary practices. Lupis has the potential as an object of ethnomathematics study that is relevant for revealing the relationship between local cultural practices and geometric concepts in contextual learning.

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4. Renggi Snacks

Fig. 5. Traditional Renggi Snacks of the Sasak People

Figure 5 Renggi is a traditional snack of the Sasak people made from steamed sticky rice, which is then shaped into flat circles, dried in the sun, and fried until puffed and crispy. In Montong Tangi Village, renggi is often served at family gatherings, celebrations, and traditional events as a symbol of togetherness and social warmth. The manufacturing process is done manually and passed down from generation to generation. Mathematically, renggi has a flat circular shape with symmetrical rotation that has been passed down from generation to generation. Mathematically, renggi displays a flat circular shape with symmetrical rotations, repeating texture patterns on the surface, and relatively uniform thickness, reflecting the community's understanding of the concepts of regularity of form and proportionality.

(TA) States, "Jajan Renggi has always been flat and round in shape, made from sticky rice that has been cooked and then shaped by hand before being dried in the sun. It is deliberately made round because it is considered easier to dry evenly and does not break easily when fried. In our community, renggi is often served at family events and simple traditional ceremonies. The method of making it has not changed much, as it follows the customs passed down by our elders. For us, preserving its shape and method of making it is part of preserving tradition."

Based on the results of the study, renggi snacks show the integration between traditional culinary practices and geometric structures that are internalized in the culture of the Sasak people. The consistent flat circular shape and relatively uniform thickness confirm the existence of standards of regularity that are maintained in the manufacturing process. Thus, renggi can be positioned as a tangible representation of how mathematical concepts are naturally present in cultural activities, while also having the potential as an object of ethnomathematics study that is relevant to context-based geometry learning.

Results of Interviews with Mathematics Teachers (GM)

(GM) States, "The geometric shapes that appear in traditional Sasak snacks are not created for mathematical purposes, but are the result of cultural adaptation that considers function, ease of production, and aesthetics that have been passed down from generation to generation. Examples include cone-shaped cerorot, triangular lupis, triangular pyramid jaje abuq, rectangular jaje tujak, and flat circular renggi, all of which are formed using traditional techniques: rolling, folding, flattening, and manual molding. Therefore, these shapes are highly relevant to geometry lessons in school, as they provide concrete examples of the concepts of area, perimeter, volume, symmetry, and proportion through cultural objects that are familiar to students. Geometric formulas such as the area of a triangle, the volume of a cone, or the surface area of a pyramid become easier to understand when students relate them to real objects from their cultural heritage."

The teacher's statement reinforces that cultural object, in this case traditional Sasak snacks, practically represent mathematical concepts implicitly. This shows that local culture is not only a cultural asset but also a source of contextual and relevant mathematical knowledge for education. Thus, integrating cultural objects into learning can help bridge formal mathematics with students' real experiences, improve their understanding of geometric concepts, and strengthen their cultural identity in the learning process.

B. Cultural Meaning in the Geometric Structure of Traditional Sasak Snacks

The findings of this study indicate that the geometric shapes of traditional Sasak snacks are not merely the result of technical considerations, but rather a representation of cultural values that have been passed down from generation to generation. The cone, triangular pyramid, triangle, rectangle, and circle structures reflect the principles of order, balance, harmony, and togetherness that exist in the social practices of the community. The uniformity of form maintained in the manufacturing process indicates the existence of aesthetic standards and cultural norms that are internalized as part of respect for tradition. The regularity of form in each production not only serves to maintain the quality and neatness of the presentation, but also symbolizes social harmony and order in community life. The geometric structures of traditional snacks can be understood as a medium for expressing cultural values that are manifested through everyday culinary practices.

C. Mathematical Concept Analysis

From a mathematical perspective, these shapes embody the concepts of flat and spatial figures and the relationships between their elements, such as symmetry, proportionality, structural balance, and pattern regularity. The techniques of rolling, folding, flattening, and shaping by hand demonstrate an intuitive understanding of angles, size consistency, and spatial stability. Although snack makers do not use formal mathematical terminology, these practices show that geometric concepts operate implicitly in everyday cultural activities. Structures formed through collective experience and the inheritance of traditions show that mathematics is not always present in the form of symbols and formulas, but also in patterns, shapes, and proportions that are internalized in the social practices of society.

D. Implications for Learning

These findings have important implications for geometry learning in elementary schools. Integrating local cultural objects into learning allows students to understand flat and spatial shapes through contextual experiences that are close to their lives. This approach has the potential to reduce the abstract nature of geometry material and encourage the formation of more meaningful conceptual understanding. The use of local cultural contexts in learning not only increases student motivation and engagement, but also strengthens cultural identity and fosters awareness that mathematics is part of the social practices and cultural heritage of society. Thus, ethnomathematics can serve as an integrative bridge between cultural values and mathematical structures in the educational process, making geometry learning more reflective, contextual, and relevant to the realities of students.

4. CONCLUSION

This study confirms that traditional Sasak snacks represent geometric structures formed through cultural practices that have been passed down from generation to generation. The cone, triangle, triangular pyramid, rectangle, and circle shapes found in various types of snacks not only reflect the technical skills of the community, but also represent the values of order, balance, harmony, and social symbolism in Sasak customs. Thus, the geometric structures in traditional snacks can be understood as a manifestation of the integration between cultural practices and mathematical concepts that are alive in the daily lives of the community.

Pedagogically, this study contributes conceptually and contextually to the development of geometry learning in elementary schools. The findings indicate that local cultural objects can be operationalized as learning resources that bridge abstract geometric concepts with students' concrete experiences. The integration of traditional snacks as a learning medium not only supports a more meaningful understanding of concepts such as area, perimeter, volume, symmetry, and proportion, but also strengthens the connection between mathematics and the students' socio-cultural reality.

The main contribution of this study lies in strengthening the ethnomathematics framework in the context of traditional cuisine, which has been relatively unexplored compared to other cultural artifacts. This study expands the scope of ethnomathematics by showing that traditional culinary practices have a systematic mathematical structure and the potential to be developed as a contextual learning model. Thus, this research not only documents mathematical representations in Sasak culture but also offers an academic basis for the integration of local culture into mathematical pedagogical innovation.

Based on these findings, it is recommended that educators strategically utilize local cultural objects as sources of contextual learning to deepen students' conceptual understanding while fostering appreciation for cultural heritage. Schools and education policymakers are expected to encourage the development of local wisdom-based learning tools as part of a more relevant learning transformation rooted in the socio-cultural context. In addition, further research needs to be conducted to explore other cultural artifacts in the West Nusa Tenggara region to enrich the mapping of mathematical representations in cultural practices, so that the contribution of ethnomathematics to the development of mathematics education becomes more comprehensive and sustainable.

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