

Exploring Local Culture as a Medium for Mathematics Learning in Elementary and Secondary Schools

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Abstract

This study aims to explore and analyze several mathematical concepts contained in traditional games and traditional foods of the Bugis tribe in Bone Regency. This research is an exploratory-descriptive study with an ethnographic approach. The instrument used in this study is a human instrument, where the researcher is directly related to the research and acts as a data collector. Data collection techniques are carried out through observation, interviews, and documentation. Data analysis techniques use an interactive model, namely data reduction, data presentation, and conclusion drawing. The results of the study show that traditional games such as mabbelle, mangngasing, mabendi bendi, mappadekko, and Mappasajang, and traditional foods such as doko doko cangkuli, barongko, and Putri sallang contain mathematical concepts consisting of flat and solid shapes such as squares, rectangles, kites, circles, pyramids, primes, and cubes. These mathematical concepts have relevance to mathematical concepts at elementary and secondary school levels in geometry material. Therefore, traditional games and traditional foods are used as a medium for learning mathematics in schools, especially elementary and secondary schools, so that learning is more innovative and meaningful and as a source of evaluation in learning mathematics related to local culture in the area.

Keywords: Local Culture, Ethnomathematics, Traditional Food, Traditional Food

1. Introduction

Culture and education are two inseparable elements. Culture plays a multifaceted role in supporting the implementation of education (Rawani & Fitra, 2022). Indonesia is known for its diverse local cultures, stretching from Sabang to Merauke. This should serve as Indonesia's capital for cultural expansion (local education). However, Indonesia's local culture continues to be eroded by globalization without a cultural preservation strategy. Yet, education plays a crucial role in preserving Indonesia's local heritage. Beyond its role as a preserver, education can also be a vanguard of a nation's success. One component of education provided in schools is mathematics. The development of science and technology is inextricably linked to the role of mathematics. Mathematics is essential for practical needs and problem-solving in everyday life (Aprilyani & Hakim, 2020). For example, it can be used to calculate volume and weight, and to collect, process, present, and interpret data.

Based on data from the 2023 *Trends in International Mathematics and Science Study* (TIMSS), it is known that the mathematical abilities of Indonesian students in grades 4 and 8 are still very low, with scores at 400 (Khorramdel et al., 2024), (Von Davier et al., 2024). Furthermore, based on the results of the 2022 *Programme for International Student Assessment*

(PISA), it is known that Indonesia is ranked 69th out of 80 countries (OECD, 2023), (Schleicher, 2023). These data indicate that Indonesian students' mathematical achievement at the global level is still very low. The biggest challenge in mathematics learning today is the relevance of teaching materials to real life (Sape & Syamsuddin, 2025). Mathematics is often considered an abstract, rigid subject, and detached from the realities of everyday life. As a result, many students have difficulty understanding mathematical concepts.

Ethnomathematics is an educational approach that integrates local cultural elements into the mathematics learning process (Ardiansyah et al., 2023). Ethnomathematics was first introduced by Ubiratan D'Ambrosio, a Brazilian mathematician, who recognized the importance of mathematics learning across cultures. According to (Utami et al., 2021) ethnomathematics is an approach used to explain the relationship between cultural contexts and mathematics as a branch of knowledge. The use of ethnomathematics facilitates students' understanding of the concepts or material being studied, as the learning directly relates to their culture, which is part of their daily activities (Ramadhani et al., 2025). Real-world mathematics learning is inextricably linked to the surrounding local culture, as a culture often incorporates mathematical concepts that are applied in everyday life and passed down through generations (Rismawati et al., 2019).

Bone Regency, South Sulawesi Province, is a region rich in traditions and local wisdom, with its dominant Bugis ethnic group. Several cultural practices, such as traditional foods and games, have great potential for use in mathematics learning (Bandung, 2020). This culture can be used as a learning resource because of its unique shape, resembling geometric and geometric shapes, assuming that the culture being promoted is already known and can help students learn mathematics (Syarifuddin et al., 2022). However, this potential has not been widely utilized for formal teaching and learning activities in schools, especially at the elementary and secondary school levels. This indicates a gap between local culture and mathematics learning materials (Sape & Syamsuddin, 2025). In fact, mathematics learning in elementary and secondary schools is interesting to study because of the differences in characteristics, especially between the nature of children and the nature of mathematics (Yunian Putra & Indriani, 2017).

Elementary and middle schools in Bone Regency, South Sulawesi Province, are spread across several sub-districts with diverse cultural backgrounds. This diversity serves as a benchmark for optimizing the strengths of the ethnomathematics approach. By utilizing local culture as a learning resource, teachers not only enrich students' learning experiences but also encourage contextual and meaningful learning (Simamora & Rokan, 2023). This approach also aligns with the current curriculum, which emphasizes the importance of contextual learning and strengthening the Pancasila student profile (Putri et al., 2024).

The use of local culture as a medium for mathematics learning is expected to increase student interest and learning outcomes, especially in elementary schools in Bone Regency. According to (Aprilyani & Hakim, 2020), learning using ethnomathematics can be done by introducing, linking, and utilizing the surrounding culture as a learning resource, both media or teaching aids related to sub-materials in the teaching and learning process so that learning can be more meaningful. This is in line with the results of research conducted by (Kumalasari et al., 2025) that the integration of local culture not only strengthens the connection between mathematical concepts and students' real experiences but also provides a contextual foundation that aligns with the spirit of a curriculum based on local wisdom.

The ethnomathematics approach to traditional games and traditional foods for elementary and middle school students can be used to connect mathematics material in school with students' socio-cultural lives (Baka et al., 2019). Furthermore, the application of ethnomathematics to traditional games and traditional foods can serve as a vehicle for preserving local culture, specifically traditional games and traditional foods, for children as the

nation's future generation. Traditional games and traditional foods serve as learning media that can train students' critical thinking skills (Suherman & Vidákovich, 2025). Based on this, the author feels the need to further explore the mathematical concepts inherent in traditional games and traditional foods of the Bugis people.

2. Method

The type of research used in this study is descriptive exploratory research with an ethnographic approach aimed at exploring and analyzing several mathematical concepts contained in traditional games and traditional foods of the Bugis Tribe in Bone Regency, namely by identifying the tools and rules of the game. The traditional games in question are *mabelle*, *mangngasing*, *mabendi bendi*, *mappadekko*, and *mappasajang*. While the traditional foods in question are *doko doko cangkuli* cake, *barongko* cake, and *putri sallang* cake. The instrument used is a human instrument, in this case the researcher is directly related to the research and acts as a data collector, and his role cannot be replaced. Data collection techniques are carried out by observation, interviews, and documentation. In addition, the author also uses Library Research (literature study) where information is obtained from various sources including scientific journal articles. The data analysis technique used is through the interactive model type. This type of data analysis classifies the analysis into three steps, namely: (1) data reduction, (2) data presentation, and (3) drawing conclusions (Aulia et al., 2025).

3. Results and Discussion

The results of this study produced a picture of the local culture of the Bugis Bone tribe (traditional games and traditional foods) in relation to mathematics learning, specifically the geometry of flat and solid shapes. Based on the results of the research data collection, the following data were obtained:

3.1. Traditional Games

3.1.1. *Mabelle*

Mabelle is a traditional game popular in its time and mostly played by girls. In other regions, this game is called 'Engklekan'. 'Dende' is usually played by four or five children. To play this game, first draw squares on the ground or floor according to the type of dende to be played. These squares are then the ones the players must jump over, using one foot or two. The rules of the game are adjusted according to the shape of the squares or dende being played. The player with the most squares wins the game (Syam, 2021). This traditional game, when modeled mathematically, contains geometric elements, namely plane and solid shapes. The geometric model of the *Mabelle* game can be seen in Figure 1 below:

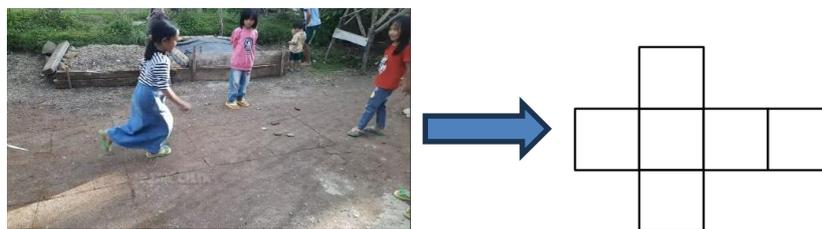


Figure 1. Geometric Modeling of the *Mabelle* Game

Based on the analysis results in Figure 1, it is known that the playing area in the *Mabelle* game contains geometric elements, namely flat shapes and spatial shapes. The modeling, in addition to forming flat shapes in the form of squares, also forms spatial shapes in the form of cube nets. This game can be used in learning mathematics concepts of flat shapes and spatial shapes. Based on the findings in schools related to the implementation of local culture, especially traditional learning games in geometry learning, as expressed by one of the mathematics teachers in junior high schools, that in mathematics learning, especially the

material of flat shapes, existing local culture is often implemented in mathematics learning, but the problem is that traditional games such as Mabbelle are rarely played by children.

3.1.2. *Mangngasing*

Mangngasing is a traditional Bugis game played by children and teenagers, both men and women. The number of players is 4-8 people and at least 2 teams. This game can be played by all levels of society (Anggriawan, 2024). The playing field is approximately 6 x 6 m, outlined in a square or rectangular shape for longer playing areas. This traditional game, when modeled mathematically, contains geometric elements, namely flat shapes. The geometric modeling of the *Mangngasing* game can be seen in Figure 2 below:



Sumber: (Nurhikmah et al., 2022)

Figure 2. Geometric Modeling of the *Mangngasing* Game

Based on the analysis results in Figure 2, it is known that there is a geometric concept, namely a square or rectangle. The implementation of this game in learning, as found by researchers, this game is adopted by teachers in mathematics learning, especially the material of flat geometry. The concept of application is mainly related to the properties of flat shapes (squares and rectangles). This is consistent with the results of an interview conducted with an elementary school teacher who said that the game of *mangngasing* is a traditional game often played by students in sports learning, making it easier to implement in mathematics learning.

3.1.3. *Mabendi bendi*

Mabendi bendi is a traditional game often played by children. In ancient times, this material was made from rattan shaped into a circle, but some children prefer to use used motorcycle tires. This game is usually competed by children through speed (Pathuddin & Raehan, 2019). This traditional game, when modeled in mathematical form, contains geometric elements, namely circles. The geometric modeling of the *Mabendi bendi* game can be seen in Figure 3 below:

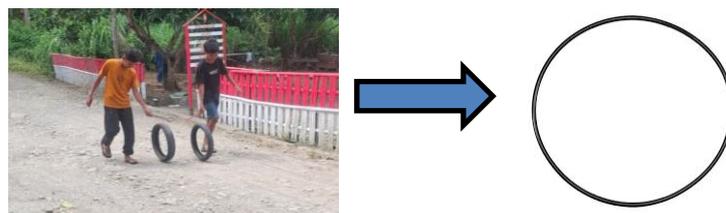


Figure 3. Geometric Modeling of the *Mabendi bendi* Game

Based on the analysis in Figure 3, it is known that the *Mabendi bendi* game contains a geometric concept, namely the circle. The implementation of this game in learning, as found by researchers, is that this game is adopted by teachers in mathematics lessons, especially the topic of circles. Based on information obtained through interviews, this game is often competed in competitions to compare the speed of rolling motorcycle tires, making it easier for teachers to formulate learning, especially regarding circles.

3.1.4. *Mappadekko*

The *mappadekko* game, commonly known as *Mappadendang*, is a Bugis tradition and traditional celebration as an expression of gratitude for the rice harvest. It is performed with alternating rhythms of pestles and mortars to create a harmonious melody, accompanied by

singing and dancing. This tradition also contains spiritual and communal values, creating an atmosphere of joy and solidarity among residents (Prasetio et al., 2024). This traditional game, when modeled mathematically, contains geometric elements, namely circles. The geometric modeling of the Mabendi bendi game can be seen in Figure 4 below:

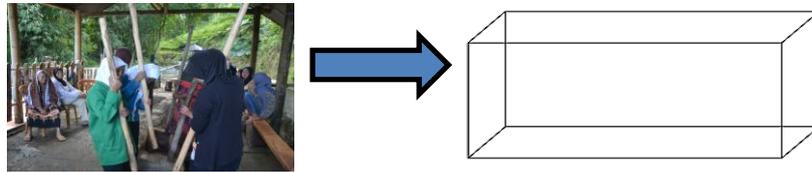


Figure 4. Geometric Modeling of the *Mappedekko* Game

Based on the analysis results in Figure 4, it is known that the Mappedekko game contains a geometric concept, namely blocks. Its implementation in mathematics learning, as found by researchers through interviews, is that teachers use this game in mathematics learning about circles to describe the properties of circles.

3.1.5. *Mappasajang*

Mappasajang, or kite flying, was originally played simply for fun and to pass the time, but later evolved into a competitive game. Historically, the material used was originally large, wide, dried leaves tied with string. After the use of paper became known, it became the primary material for kites. Kite variations have evolved over time. This game is often played after the rice harvest as a form of joy, happiness, and gratitude (Andriani & Sari, 2024). This traditional game, when modeled mathematically, contains geometric elements, specifically plane shapes. The geometric model of the mappasajang game can be seen in Figure 5 below:

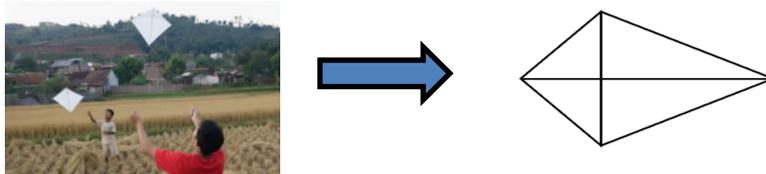


Figure 5. Geometric Modeling of the *Mappasajang* Game

Based on the analysis results in Figure 5, it is known that the Mappasajang game contains a geometric concept, namely the flat shape of a kite. Its implementation in mathematics learning, as found by researchers through interviews, is that teachers use this game in mathematics learning on the flat shape material, sub-material of kites, to describe the properties of kites, and the concepts of lines, lengths, diagonals, vertices, and angles.

3.2. Traditional Food

3.2.1. *Doko-doko Cangkuli* Cake

Doko-doko cangkuli is a Bugis specialty made from glutinous rice and filled with a coconut filling mixed with brown sugar (Pathuddin & Raehan, 2019). When modeled mathematically, this traditional food contains geometric elements, namely a pyramid. The geometrical model of this traditional food can be seen in Figure 6 below:

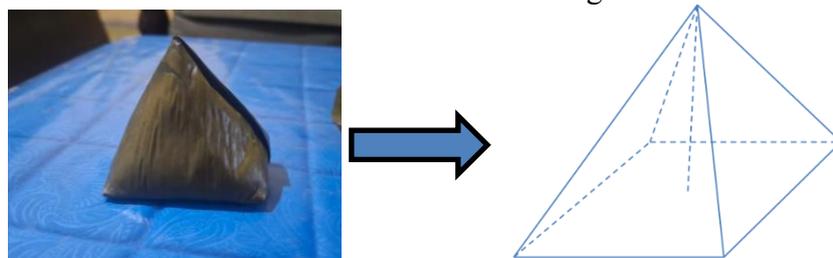


Figure 6. Geometric modeling of the *Doko-doko Cangkuli* cake

Based on the analysis in Figure 6, it is known that the Doko-Doko Cangkuli cake has a geometric shape, namely a rectangular pyramid. Its implementation in mathematics learning,

as found by researchers through interview results, is that teachers use this game in mathematics learning on the subject of space, sub-topic of pyramids, to describe the properties of pyramids, the area and volume of pyramids.

3.2.2. *Barongko* Cake

Barongko is a well-known Bugis specialty. It's made from mashed bananas, coconut milk, and eggs, then wrapped in banana leaves. This cake is often served at Bugis traditional events such as weddings (Pathuddin & Raehan, 2019). This traditional food, when modeled mathematically, contains geometric elements, namely a triangular prism. The geometrical model of this traditional food can be seen in Figure 7 below:

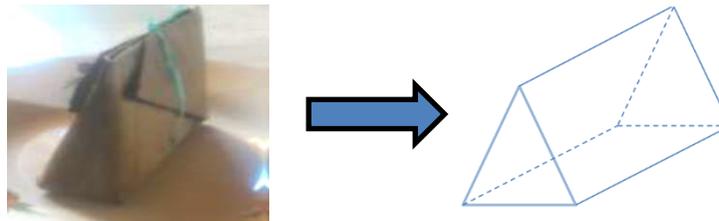


Figure 7. Geometric Modeling of *Barongko* Cake

Based on the analysis of Figure 7 above, it is known that the *Barongko* cake has a geometric concept, namely a triangular prism. Its implementation in mathematics learning, as found by researchers through interviews, is that teachers use this game in mathematics learning on the subject of space, sub-topic of triangular prisms, to describe the properties of triangular prisms, the area and volume of triangular prisms.

3.2.3. *Putri sallang* Cake

Putri Sallang Cake or known as *Katirisala* Cake is a traditional Bugis cake that is usually served at events or in the great traditions of the Bugis people, South Sulawesi. This cake is usually cut into cubes, although there are still many pieces or slices that are not cube-shaped with all the edges the same length and all the sides the same area, but most in the community through the findings of researchers that the community considers it like a cube. So if this traditional food is modeled in mathematical form it contains geometric elements, namely cubes. The geometric form of the traditional food modeling can be seen in Figure 8 below:

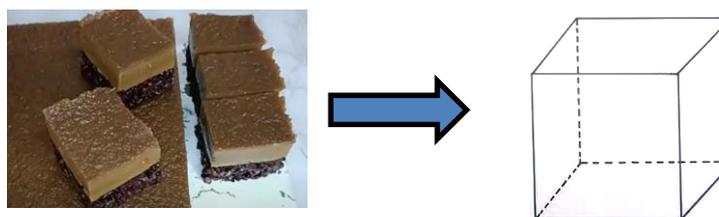


Figure 8. Geometric Modeling of *Putri sallang* Cake

Based on the analysis of Figure 8 above, it is known that the *Putri Sallang* cake has a geometric concept, namely the Cube. Its implementation in mathematics learning, as found by researchers through interviews, is that teachers use this game in mathematics learning on the topic of space, the sub-topic of cubes, to describe the properties of cubes, as well as the area and volume of cubes.

Traditional games and traditional foods of the Bugis tribe are a cultural entrenched in the community and closely related to students' daily activities. These games and foods contain geometric concepts, particularly those of plane and solid shapes. Therefore, these traditional games and foods can be developed as learning resources or media for students, especially elementary and secondary school students, to provide more concrete and contextual learning. This is in line with the opinion of (Andriani & Sari, 2024) who stated that local culture not only plays a role in mathematics learning but also plays a role in character development for students.

This is because elementary and secondary school students are directly exposed to the local culture around them.

In school learning, teachers can ask students to observe the tools needed in a game and identify the shapes of the tools needed in the game. Likewise with traditional Bugis food. The geometric concepts in traditional Bugis games discussed in this study are Mabbelle, Mangngasing, Mabendi bendi, Mappadekko, and Mappasajang. While traditional foods include Kue Doko Doko Cangkuli, Kue Barongko, and Kue Putri sallang. In traditional games, the concept of plane and solid shapes is found, as well as in traditional foods, the concept of plane and solid shapes is also found. Through these traditional games and traditional foods, students can be directed to identify the types of plane shapes used, in addition, students can also identify the properties of solid shapes. By using traditional games and traditional Bugis food as learning media, students are motivated in learning mathematics and more easily understand mathematical concepts, especially basic geometric concepts.

4. Conclusion

Traditional games such as *mabbelle*, *mangngasing*, *mabendi bendi*, *mappadekko*, and *mappasajang*, and traditional foods such as *doko doko cangkuli*, *barongko*, and *putri sallang* are one of the cultural heritages of the Indonesian archipelago found in Bone Regency, especially among the Bugis tribe. These traditional games and traditional foods are one of the cultures that are inherent in people's lives and are very close to students' daily activities. This makes the meaning can be studied as a source of learning and motivation to achieve a goal. Based on the results of ethnomathematics exploration on traditional games and traditional foods, mathematical concepts were found consisting of flat and solid shapes such as squares, rectangles, kites, circles, pyramids, primes, and cubes. These mathematical concepts have relevance to mathematical concepts at the elementary and secondary school levels in geometry material. Therefore, these traditional games and foods can be used as a medium for learning mathematics in schools, especially elementary and secondary schools, so that learning is more innovative and meaningful. It is hoped that this research can increase readers' understanding of ethnomathematics in local culture that may not be known to the general public. In addition, this study can serve as a source of evaluation in mathematics learning related to local culture in the area.

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