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ETHNOMATHEMATICAL EXPLORATION OF TRADITIONAL MAKASSAR CAKES (PAWA CAKES)

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ABSTRACT
This study explores the ethnomathematical concepts embedded in the traditional process of making Pawa cake, a cultural heritage from Makassar, Indonesia. Employing a qualitative research method with an ethnographic approach, the study investigates both the geometric concepts and cultural values reflected in this culinary practice. Data were collected through observation, interviews with local cake makers, and visual documentation. The findings reveal that Pawa cake embodies various geometric elements, including circles, squares, cones, and spheres, which can serve as contextual resources for mathematics education. Beyond its mathematical significance, the making of Pawa also illustrates important cultural values such as cooperation, patience, and the preservation of tradition. The communal preparation of the cake, particularly during weddings and cultural ceremonies, highlights its role in strengthening social bonds and maintaining cultural identity. This study contributes to the integration of local wisdom in mathematics learning by offering a contextual and culturally relevant approach, particularly in geometry education.
Keywords: *cultural values; ethnomathematics; geometrypawa cake; traditional food*

ABSTRAK
Penelitian ini bertujuan mengeksplorasi konsep etnomatematika yang terkandung dalam proses pembuatan kue Pawa, salah satu warisan kuliner tradisional khas Makassar. Dengan menggunakan metode penelitian kualitatif dan pendekatan etnografi, penelitian ini menggali unsur geometri serta nilai budaya yang terwujud dalam aktivitas pembuatan kue tersebut. Data diperoleh melalui observasi, wawancara dengan pembuat kue, serta dokumentasi visual berupa foto dan video. Hasil penelitian menunjukkan bahwa kue Pawa merepresentasikan konsep-konsep geometri, antara lain lingkaran, persegi, kerucut, dan bola, yang berpotensi dijadikan sumber belajar kontekstual dalam pendidikan matematika. Selain aspek matematis, pembuatan kue Pawa juga memuat nilai-nilai budaya seperti gotong royong, kesabaran, serta pelestarian tradisi. Aktivitas memasak yang dilakukan secara kolektif, terutama dalam acara pernikahan dan kegiatan adat, menegaskan peran kue Pawa dalam memperkuat ikatan sosial dan menjaga identitas budaya masyarakat Makassar. Penelitian ini diharapkan dapat berkontribusi pada pengembangan pembelajaran matematika berbasis budaya, khususnya pada topik geometri.
Kata kunci*: etnomatematika; geometri; kue pawa; kue tradisional; nilai budaya,*

Introduction

Mathematics is often perceived as an abstract discipline, detached from everyday life contexts. This perception leads many students to struggle with understanding fundamental concepts, particularly in geometry, which requires

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strong visualization skills. Natsir (2023) found that students' basic abilities in geometry remain relatively low due to the limited connection between mathematical concepts and their real-life experiences. In this regard, ethnomathematics emerges as an innovative approach that integrates culture with mathematics, making learning more meaningful and relevant.

Ethnomathematics is an interdisciplinary field that has experienced significant growth within Indonesian education, particularly in mathematics instruction that incorporates local cultural values. A bibliometric analysis of research publications in Indonesia from 2017 to 2022 indicates a consistent annual increase in ethnomathematics studies, reflecting greater academic awareness of the importance of linking mathematics learning to cultural contexts (Fitriyah & Dasari, 2023). Ethnomathematics is conceptualized as a fundamental connection between mathematics and culture, emphasizing that mathematics itself is a cultural construct (Bishop, 1991; Mangudis et al., 2024). Moreover, previous studies have demonstrated that the application of ethnomathematics provides substantial benefits for students' academic development, including fostering creative thinking, strengthening geometry mastery, and enhancing algebraic skills (Supriyadi et al., 2022). Elements of Lampung's local culture can motivate students to love and preserve local culture (Sugiharti et al., 2025).

Recent studies have highlighted the significant potential of traditional foods as effective media for ethnomathematics-based learning. For instance, (Pathuddin et al., 2021) investigated Barongko cake from the Bugis culture and identified various geometric concepts such as circles and cylinders. Similarly, (Fayzahra et al., 2025) reported that traditional foods from Yogyakarta can serve as instructional tools for geometry, as they embody two-dimensional and three-dimensional shapes that are easily recognized by students. This finding is further supported (Iffah et al., 2025). whose systematic review concluded that food-based ethnomathematics not only enhances students' learning motivation but also contributes to the preservation of cultural values. Beyond Barongko and other traditional foods, additional research has emphasized the role of local cuisine in connecting mathematics learning with geometric and volumetric concepts. For example, (Azurah & Maysarah, 2024) explored Javanese traditional cakes such as klepon, wajik, and getuk, each of which represents different geometric forms from spheres and rhombuses to cube demonstrating that these simple shapes can be utilized as accessible resources for teaching geometry in schools. (Busrah & Pathuddin, 2021) developed a mathematical model utilizing traditional Bugis and Makassarese foods using the concept of solids of revolution to calculate volume. These findings demonstrate that traditional foods not only contain simple geometric shapes but can also serve as contextual media to explain more complex mathematical concepts, such as modeling the volume of solids of revolution. However, although research on traditional Javanese foods and volume modeling in Bugis and Makassarese foods has been conducted, to date there has been no study specifically examining Kue Pawa as an ethnomathematics object. In fact, Kue Pawa's distinctive round shape, filling technique, and presentation pattern hold great potential for exploration in relation to geometry and volume. Therefore, this research is important to fill this gap and add to the literature on ethnomathematics in the Makassar region.

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Despite the fact that traditional pawa cakes are already well-known in the Makassar region, researchers have expressed interest in the culture surrounding them based on the numerous study references that have been done in the past. On the other hand, not much is currently known about mathematics education and culture in relation to this traditional dessert. Traditional pawa cakes are smooth to the touch and have a flavor that isn't overly sweet. The traditional pawa cake from Makassar is round and includes a variety of fillings, such as coconut filling and brown sugar (also known as karake). Other varieties are filled with peanuts, granulated sugar, and brown sugar.

Another name for pawa cake is a traditional Makassar, South Sulawesi cake. Despite being comparable to the Mamuju variety, Makassarese pawa cake has certain distinctive features of its own. Like bakpia, this cake is typically round, tiny, and filled with sweet mung beans. The crust is composed of a thin, crispy flour dough. Pawa cake is frequently offered as a daily snack, at different cultural gatherings, or as a customary Makassar memento. This cake is a favorite among many because of the savory crust and the sweet taste of the soft mung beans.

Numerous investigations into ethnomathematics in traditional cuisine have been carried out, including those by (Irfah, 2024), (Elsty & Nahdlah, 2020), (N.K.S et al., 2023), (Wardah et al., 2025), (Fitriani & Putra, 2022), (Awalia et al., 2025) dan (Werdiningsih, 2022). Looking at all the existing research, no research has been found that specifically discusses the exploration of ethnomathematics in the traditional cake "kue pawa", especially on the elements of cultural values and geometric concepts contained in the traditional cake "kue pawa".

The aim of this study is to investigate the ethnomathematics idea found in the preparation of pawa cake, a traditional Makassarese dish that is still enjoyed, particularly by Makassar City residents. With the use of this research, the traditional cake's philosophy, values, and techniques of preparation can be preserved and will eventually become ingrained in the local culture.

Research Methods

This research employs a qualitative design with an ethnographic approach to investigate how the community in Jeneponto Regency incorporates geometric concepts into the process of making *bannang-bannang* and how these mathematical ideas are interpreted within their culinary practices and cultural traditions. Through this study, diverse cultural aspects of the local society can be explored and better understood. Data were obtained from multiple sources, including direct observations during the preparation of Pawa cakes, in-depth interviews with cake makers, and visual documentation in the form of photographs, video recordings, and other audiovisual materials.

The investigation of ethnomathematics in traditional Makassar cakes (pawa cakes) is included in this paper. The methods employed to get the data were: 1. observation, carried out to see firsthand how the pawa cake-making procedure is carried out, 2). interviews with pawa cake manufacturers and vendors, who serve as the study's sources, 3). Photographs of pawa cakes and the equipment needed to make traditional Makassar pawa cakes serve as documentation.

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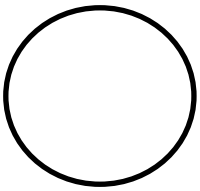
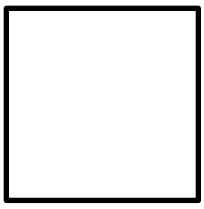
Results and Discussion

Pawa cake is a traditional delicacy from Makassar that traces its origins to Chinese culinary traditions, particularly the *bakpao* (steamed bun). As a historic port city, Makassar has long served as a meeting point for diverse cultures, including strong influences from the Chinese community. Through this cultural exchange, the *bakpao* was adapted into what is now known as Pawa cake, with modifications in flavor and form to suit local preferences. Typically filled with sweetened mashed mung beans, Pawa offers a distinctive taste that sets it apart from the original *bakpao*. This culinary adaptation not only reflects cultural acculturation but also represents an integral element of Makassar's gastronomic identity, deeply embedded in its historical and cultural heritage.

The Concept of Geometry in Making Pawa Cake

There are several geometric concepts contained in the method of making pawa cake. There are 2 flat shapes and 2 spatial shapes as in the following Table 1:

Table 1.

No.	Picture	Geometry Concept	Explanation
1.			Hasil Pengamatan pada bentuk kue pawa setelah dikukus terdapat bentuk bangun datar yaitu lingkaran, Rumus untuk mencari luas dan keliling lingkaran ialah: • Luas : πr^2 • Keliling : $2\pi r$
2.			Pada loyang yang digunakan pada kue pawa terdapat bangun datar yang membentuk persegi, Adapun rumus untuk mencari luas dan keliling dari persegi ialah: • $L = s\,x\,s$ • $K = 4\,x\,s$
3.			Setelah dilakukan observasi pada alat kukus yang digunakan untuk mengukus kue

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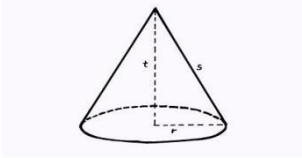
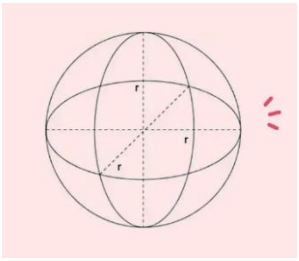
			pawa, terdapat bangun ruang kerucut pada penutupnya, Adapun rumus untuk mencari volume kerucut, luas permukaan dan luas selimut kerucut ialah: • $V = \frac{1}{3}\pi r^2 h$ • $LP = \pi r(r+s)$ • $LS = \pi rs$
4.			Saat melakukan obserevasi diketahui bahwa sebelum kue pawa dikukus adonan kue pada awalnya membentuk bangun ruang bola, Adapun rumus untuk mencari volume, luas permukaan dan keliling lingkaran pada bola ialah: ➢ $V = \frac{4}{3}\pi r^3$ ➢ $L = 4\pi r^2$ ➢ $K = 2\pi r$

Beginning with the equipment used in the manufacturing process, which incorporate the geometric concept of flat and space shapes, the table above illustrates the geometric concept in pawa cake.

The findings of this research are consistent with prior studies that highlighted the role of traditional foods as effective resources for mathematics learning. For instance, (Sutra, 2023) identified geometric representations in Bugis Apang cakes, particularly triangular and rhombic forms, which parallel the circular and spherical characteristics found in Pawa cakes. In addition, (Octaviani & Mariana, 2023) demonstrated that Lapis Legit can be utilized to teach the concept of cuboid volume, whereas the present study illustrates how the spherical form of Pawa cake can be associated with the calculation of a sphere's or a hemisphere's volume.

Previous research has identified a range of geometric concepts in traditional foods, including two-dimensional and three-dimensional forms such as circles, squares, cones, and spheres, which are also evident in Pawa cakes. Ethnomathematics studies focusing on traditional culinary practices have been widely conducted. For example, (Suripah, 2024) examined the geometric values embedded in Riau Malay culinary traditions using a qualitative ethnographic approach and reported the presence of points, lines, angles, triangles, circles, rectangles, and other geometric figures. Similarly, (Dalimunthe et al., 2022)

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explored the relationship between culture and mathematics through an ethnographic study of traditional Asahan cakes, identifying both planar and spatial geometric concepts. In addition, (Isnaningrum, 2023) investigated traditional cakes from the Magelang region and highlighted concepts of proportion, plane geometry, and spatial geometry patterns, demonstrating their potential as learning resources for mathematics. These findings are consistent with earlier studies such as those by (Busrah & Pathuddin, 2021)(Nursyahidah & Albab, 2021), which also emphasize the strong link between traditional culinary heritage and ethnomathematical practices.

This study, which draws on a number of earlier investigations, addresses a number of significant topics, including the application of an ethnographic research approach to the investigation of ethnomathematics in relation to traditional culinary arts. For instance, research carried out by (Suripah, 2024), (Dalimunthe et al., 2022)(Isnaningrum, 2023), (Busrah & Pathuddin, 2021)(Nursyahidah & Albab, 2021) (Setiadi, 2025) (Wulandari et al., 2024) (Nafisa, 2024) because it explores the concept of geometric proportions in making traditional cakes.

One distinction in this study is that it offers a fresh viewpoint that hasn't been extensively examined in earlier research by examining the cultural values included in the traditional cakes under examination in addition to existing geometric notions.

Conclusion and Suggestion

This study demonstrates that the process of preparing Pawa cake, a traditional Makassarese pastry, involves multiple geometric concepts such as circles, squares, cones, and spheres that can be meaningfully incorporated into culture-based mathematics instruction. Beyond its mathematical relevance, the making of Pawa cake also reflects important cultural values, including cooperation, patience, and the preservation of heritage. Commonly served during traditional ceremonies, enjoyed as a daily snack, or presented as a signature souvenir of Makassar, the cake combines the sweetness of soft mung beans with a savory outer layer, making it a popular treat among the community.

It is therefore recommended that future generations give greater attention to the mathematical and cultural elements embodied in Pawa cake. Likewise, schools are encouraged to implement culture oriented approaches in mathematics education, thereby enhancing both students' motivation and their conceptual understanding of mathematics.

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