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Utilization of Traditional Games in Maros Regency as an Ethnomathematics-Based Mathematics Learning Media

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ABSTRACT

Ethnomathematics is a mathematical concept integrated in a culture. Identifying and analyzing the use of traditional games in Maros Regency is essential to uncover their ethnomathematical concepts, which can enhance mathematics learning through culturally relevant and engaging methods. This approach not only preserves local heritage but also fosters students' critical thinking and problem-solving skills by connecting abstract mathematical principles with real-life experiences. This study aims to identify and analyze the use of traditional games in Maros Regency as a medium for ethnomathematics-based mathematics learning. This study employs not only a Systematic Literature Review (SLR) approach but also an ethnographic study to explore the integration of traditional games in Maros Regency as an ethnomathematics-based mathematics learning medium. Data collection techniques were carried out through documentation, interviews and literature searches from various databases, such as Google Scholar, Scopus, and Research Gate. The articles used in the study were 10 articles from 2020 to 2024. Data analysis was conducted by compiling a data matrix to identify key themes, comparing findings from various studies, and synthesizing research results. The results of this study indicate that the ethnomathematics approach through traditional games can be an effective alternative to improve the quality of mathematics learning in schools. Using games can increase student motivation and engagement in math learning. The findings of this study imply that integrating traditional games into mathematics education through an ethnomathematics approach can serve as an effective pedagogical strategy to enhance student engagement, motivation, and conceptual understanding while preserving cultural heritage.

Keywords: Ethnomathematics, traditional games, mathematics learning, Maros Regency

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Introduction

Ethnomathematics is a mathematical concept that exists in a culture. Mathematics with cultural nuances makes a major contribution to mathematics learning (Pratiwi & Pujiastuti, 2020). While according to (Faqih et al., 2021), ethnomathematics is an educational approach that creates a connection between mathematical concepts and culture. Ethnomathematics can be seen through various traditional games, such as Beklang (Bola Bekel), Congklak, Dende-dende (Engklek), and Kelereng, which teach mathematical concepts in a cultural context. Beklang and Congklak involve counting seeds and beans, respectively, which helps children grasp numerical concepts and develop strategic thinking (Aini et al., 2022; Narciso et al., 2024). Similarly, games like Congklak and marbles encourage logical reasoning and planning,

essential skills for mathematical problem-solving (Lantarón et al., 2019; Nurrahmah et al., 2020). Moreover, indigenous games, including those mentioned, connect students to their cultural roots, enhancing the learning experience by making mathematical concepts more relatable (Mosimege, 2020). The enjoyment derived from these games increases student motivation, transforming the perception of mathematics from a tedious subject into an engaging and enjoyable activity (Nurrahmah et al., 2020).

Playing is a way for children to explore the world and learn. Playing enhances cognitive skills, allowing children to engage in problem-solving and creative thinking (Da Silva et al., 2024; Filho et al., 2024). Activities like role-playing and games stimulate imagination and reflection, fostering autonomy and independent decision-making (Da Silva et al., 2024). Additionally, children learn to navigate social interactions, developing teamwork and communication skills through collaborative play (Filho et al., 2024). Beyond cognitive and social benefits, playing serves as a unique language for children, enabling them to express emotions and build meaningful relationships (Filho et al., 2024). Engaging in physical play not only promotes motor skills and physical health but also helps children manage emotional challenges (Da Silva et al., 2024; Denny & Mendes, 2024). Moreover, playful activities create a safe environment for children to confront fears and insecurities, contributing to their emotional resilience (Da Silva et al., 2024). Cultural game activities in Maros District also help children's physical and mental development. Games that are still often practiced physically train agility, balance, and creative thinking in solving problems, such as in the traditional games beklang (bola bekel), congklak, dende-dende (engklek), and marbles. Children playing together teaches local cultural values such as gotong royong and mutual respect, which are an important part of the life of the Maros Regency community. Understanding the importance of play in this local cultural context helps to ensure that children can grow well, are physically and mentally balanced, and have strong social skills.

Various previous studies have proven that traditional games have benefits in helping the development of math skills in children (Siregar & Lestari, 2018). Among them are the research "Exploration of Ethnomathematics in the Traditional Game of Bekles", "Exploration of Ethnomathematics in Traditional Games in Femnasi Village", "Ethnomathematics in the Traditional Game of Engklek", "Exploration of Ethnomathematics in the Traditional Game of Marbles", and others like that (Hendriawan & Faridah, 2022; Nurrahmah et al., 2020; Pratiwi & Pujiastuti, 2020; Taus et al., 2022). Traditional games are very suitable for use as a learning medium, especially for children who still understand math concretely. Ethnomathematics in this game can be a bridge to change children's realistic way of thinking into a more abstract understanding of concepts (Hendriawan & Faridah, 2022). Some traditional games in Maros Regency such as bola bekel, congklak, engklek, and marbles have many benefits.

The bekel ball game is one of the traditional games that has an important role to be studied further, especially in learning mathematics on whole number counting operations (Badariah et al., 2022). The bekel ball game can be played by two or more people which helps train children's dexterity and thinking skills in taking bekel seeds quickly and precisely. The rules of this game vary in every region in Indonesia, as well as in the Maros Regency area and can be changed according to the agreement of the players. Tools used include a ball and 6-10 seeds, usually using pebbles or other materials agreed upon by the players.

The traditional game of congklak is one of the games that contains elements of math learning. One aspect of mathematics that can be learned through the game of congklak is the material about opportunities (Marsyanda & Havizul, 2023). The method used in the congklak game focuses on the situation where the player's last seed falls into an empty hole, which will cause the turn to play to the opposing player. To calculate the probability of a player's congklak seed falling into an empty hole, we can use the concept of calculating the probability of an event. The tools used can directly use the game equipment, can also be played on the ground by drawing patterns to form a congklak board and using pebbles as seeds. A congklak board that has 16 holes is usually filled with 7 pebble seeds in 14 holes on the board.

Traditional games have many mathematical elements in them. For example, the game engklek can be utilized as a learning medium. Each region has a different name for the game, such as in . Based on research, the traditional game of engklek contains various mathematical materials, such as geometry, chance, and other aspects (Khoerunnissa et al., 2023). The game of engklek has simple rules and is usually played on flat surfaces such as soil or asphalt drawn with a pattern of plots. This game can be played by a group of children, both boys and girls. Each player needs a gaco or stone that is thrown into one of the patches, then they jump over the patches, using one foot or two feet in a particular patch.

The game of marbles is a traditional game that is very popular in rural areas. Like the game of marbles that is still practiced by a group of boys in Maros Regency. According to (Suhendri & Ningsih, 2023), the game of marbles contains various mathematical concepts, such as the concept of building space seen in the shape of marbles, the concept of flat geometry and trigonometry related to the game area, as well as the concept of chance and integer counting operations applied in the game process. The rules of the marbles game are very simple. Players draw a playing field on a flat and level ground, with a shape that can be a triangle, square, or circle, as desired.

Various traditional games that are still often played by children, such as research in the area of Pallantikang Village, Maros Baru Subdistrict, Maros Regency, such as the game of bola bekel, congklak, engklek, and marbles remain a fun entertainment in the area. Some of the games have elements of math learning, but children usually do not use them as a means of learning outside the classroom, but only for

entertainment. Therefore, teachers can utilize these traditional games as learning media to help and improve the mathematics learning process.

Methods

The method applied in this research is ethnography, in which researchers make observations through documentation, interviews, and literature studies related to the traditional games of bola bekel, congklak, engklek, and marbles. The ethnographic approach focuses on exploring the cultural importance of these games, highlighting their contribution to community identity and educational practices (Deda et al., 2024). This research is qualitative in nature, which aims to describe how to play the game and the benefits obtained from the game, including the relationship between the game and mathematics. The type of approach used in this research is a qualitative approach using the Systematic Literature Review (SLR) method (Afsari et al., 2021). Systematic Literature Review allows to analyze and provide good information on the topic of realistic mathematics approach to mathematical creative thinking skills. This method can be done in depth, efficiently, and with minimal costs, and data collection can be done on a large scale (Agustin & Kharisudin, 2023). This qualitative approach helps researchers explore the educational benefits of traditional games, which can be used to improve students' ability to master mathematical concepts, while encouraging their active and creative involvement in the learning process.

This study employs an ethnographic method, which involves immersive fieldwork to understand the cultural and mathematical significance of traditional games in Pallantikang Village, Maros Baru Sub-district, Maros Regency, South Sulawesi. The research process includes direct engagement with the local community through in-depth interviews, participant observation, and documentation. The interview process was conducted alongside the documentation of traditional games, focusing on a group of children actively playing these games on October 24, 2024. Additionally, an adult participant who had frequently played traditional games such as bola bekel, congklak, engklek, and marbles during childhood and resided in the area provided valuable insights into the game structures, rules, and cultural relevance. Ethnographic data collection involved recording gameplay, taking field notes, and capturing narratives about how these games are played and passed down through generations. Once data collection was complete, qualitative analysis was performed by systematically organizing, interpreting, and identifying ethnomathematical elements embedded in the games, ensuring an in-depth understanding of their role in mathematics learning and cultural preservation.

The purpose of this research is to recognize and identify the elements of ethnomathematics that exist in traditional games in Maros Regency, then used as a method applied in the mathematics learning process. The data analysis technique in this study was carried out by compiling a data matrix to find the main themes, comparing the results of various studies, and synthesizing the findings. The data collected

was analyzed in depth to identify patterns, evaluate differences and similarities, and explore the meaning of any relevant findings. This approach allowed the researcher to draw a comprehensive conclusion about the utilization of traditional games as a medium for ethnomathematics-based mathematics learning.

Results and Discussion

The research findings, based on the ethnographic method, reveal that traditional games in Maros Regency, such as bola bekel (beklang), congklak, engklek (dende-dende), and marbles, hold significant ethnomathematical values. Through direct observation and interviews with local community members, including adults who had childhood experience with these games, it was found that each game incorporates essential mathematical concepts. For example, bola bekel involves quick calculations, counting, and coordination skills; congklak enhances counting, strategic planning, and spatial reasoning; engklek teaches geometric patterns, balance, and symmetry; and marbles incorporates the concept of chance and probability.

The ethnographic study also highlighted how these games are passed down through generations and their role in fostering social interaction, communication, and teamwork among children. Additionally, the study revealed that these games, deeply rooted in the local culture, offer an engaging and context-rich way of teaching mathematics. The integration of traditional games into the classroom not only makes mathematics more relatable and enjoyable for students but also strengthens their connection to local cultural heritage. The findings underscore the potential of these games as effective tools for ethnomathematics-based learning, enhancing students' mathematical understanding while preserving cultural traditions.

The research revealed that traditional games in Maros Regency, such as bola bekel, congklak, engklek, and marbles, have significant potential as ethnomathematics-based mathematics learning media. Preliminary findings show that the bekel ball game contains elements of the concept of whole numbers, addition operations, modulo, spherical spaces, and probability. Through this game, students can understand math concepts more concretely while preserving local culture, which in turn improves their understanding of the subject matter. Take a look at figure 1 below.

Figure 1. *Children Playing Bekel or Beklang Ball*

The game of bekel ball or beklang is played using a small ball and bekel seeds. Players throw the ball into the air, then pick up the bekel seeds from the floor before the ball is recaptured. The retrieval of the bekel seeds is done gradually, one by one, until all the seeds are collected. The bekles game involves the concept of whole numbers when counting the number of bekel seeds taken by the player. The addition operation is seen when players add up the total seeds collected in each turn. The concept of modulo or residual quotient appears in determining the order of players' turns and the results of the game. In addition, the ball used in the game helps introduce the concept of space, especially the shape of the ball, as well as probability when estimating the chances of winning or losing.

The game of congklak shows that it involves various mathematical concepts, such as flat shapes (rectangle and square) and spatial shapes (hemisphere), as well as transformation in the form of reflection. The game also includes arithmetic operations, such as addition, subtraction, multiplication and division, as well as number patterns. This confirms that congklak is effective as a math learning medium that introduces students to various concepts in a fun and culturally relevant way. Consider figure 2 below.

Figure 2. *Children Playing Congklak*

The game of congklak involves two players using a congklak board with 14 small holes and 2 parent holes. Each player fills the holes on his side with congklak seeds. The game starts when a player

takes seeds from one of the holes and distributes them one by one to the next holes in a clockwise direction. The game of congklak contains various math concepts. The game board shows flat shapes such as rectangles and squares, while the holes are hemispherical shapes that reflect the concept of space. Calculation operations, including addition, subtraction, multiplication and division, occur as players count seeds and strategize. Number patterns are seen in the filling and emptying of the holes. Transformation concepts, especially reflection, are seen in the arrangement of holes facing each other on the board.

The game of engklek shows important ethnomathematical elements. The game involves mathematical elements such as the shape of the plots, which are rectangles and circles, and triangular or square gacos or stones. The rules of the game include mathematical logic and the concept of chance, especially in determining players' turns using the hompimpa game. This finding shows that engklek incorporates basic math concepts and chance, making it an interesting and educational math learning medium for children. Take a look at Figure 3 below.

Figure 3. *Children Playing Cricket or Dende-Dende*

Engklek is played by drawing squares on the ground in a certain pattern. Players throw a small stone (gaco) into the box, then jump with one or two feet over the boxes, except for the box where the gaco is. The game of cricket embraces the concept of geometry through the shape of the playing squares, such as rectangles and circles. Triangular or square gacos introduce players to flat shapes. Mathematical logic is applied in the rules of the game, such as when a player is declared “dead” if they step on a line or box containing a gaco. The element of chance appears in determining the player's turn through the game of hompimpa, which can be described mathematically with the concept of permutation.

The game of marbles reveals mathematical elements, such as geometry (circles and triangles) and the concept of distance measured by hand inches to determine the position of the marbles. The activity of flicking the marbles helps develop children's fine motor skills, focus and patience. In addition to teaching math, this game also instills character values such as togetherness and cooperation. The results of this

study show that the marbles game can be an interesting and effective learning medium to improve students' understanding of mathematics. Take a look at Figure 4 below.

Figure 4. *Children Playing Marbles*

The game is played in a circular arena drawn on the ground or asphalt. Players take turns flicking marbles to hit the opponent's marbles or reach certain targets in the arena. A player is declared a winner if he or she manages to get the opponent's marbles out of the circle. The game of marbles involves the concept of geometry, such as the circle that becomes the arena of the game and the ball shape of the marbles themselves. When players position the marbles by hand, they also apply the concepts of distance and measurement. The activity of flicking the marbles involves calculating angles and forces, which can train children's fine motor skills. In addition, the game teaches the concept of probability through strategy and the chances of success when flicking the marbles.

The results showed that traditional games such as bola bekel or beklang, congklak, engklek or dende-dende, and marbles have great potential as interesting and relevant mathematics learning media. In addition, the results of the literature review show 10 articles that discuss games related to ethnomathematics, covering various mathematical concepts such as geometry, counting operations, and chance. The articles come from various sources and different types of journals. The data from this research is presented in the following table 1.

Tabel 1. *Research Findings on Traditional Games as Ethnomathematics-Based Learning Tools*

No.	Author and Year of Publication	Title	Journal Name	Research Results
1	(Badariah et al., 2022)	Utilisation of Traditional Ball Bekel Game in Improving Student Motivation and Learning Outcomes	Journal on Teacher Education	The results showed that the traditional bekel ball game proved to be effective as a learning tool for whole number calculation operations. The use of this media succeeded in increasing students' enthusiasm and learning achievement.
2	(Taus et al., 2022)	Exploration of Ethnomathematics in the Traditional Game of Congklak in Femnasi Village	MES: Journal of Mathematics Education and Science	This study identified various mathematical concepts contained in the game of Congklak, such as flat shapes (rectangle and square) and counting operations (addition and subtraction). Through observations and interviews, it was found that children can understand these concepts better while playing
3	(Maulida, 2020)	Ethnomathematics-Based Mathematics Learning Through The Traditional Game of Engklek	LEMMA : Letters of Mathematics Education	The results of this study obtained a description of the engklek game which contains mathematical elements, namely geometry, comparison, and chance
4	(Uskono et al., 2023)	Exploration of ethnomathematics in traditional kaneker games in Bitefa Village	Primatika: Journal of Mathematics Education	This research shows that the game of marbles is full of mathematical concepts. The shape of the marbles in the form of a ball is an example of a spatial shape, while the playing field in the form of a circle and triangle is an example of a flat shape. The rules of playing marbles, such as determining position, involve the concept of distance. Furthermore, the aiming technique (kuti) in this game requires calculations similar to algebraic operations to achieve accuracy
5	(Suhendri & Ningsih, 2023)	Exploration of Ethnomathematics in the Traditional Game of Marbles in Bahagia Village, Babelan, Bekasi	Derivat Journal: Journal of Mathematics and Mathematics Education	The study concluded that the game of marbles is rich in mathematical concepts. The shape of the marbles themselves represent the concept of geometric shapes, while the playground involves the concepts of flat shapes and trigonometry. In addition, the game includes the concepts of chance and integer operations.
6	(Mahardika et al., 2023)	Ethnomathematics-Based Mathematics Learning Through The Traditional Game of Engklek	Widyajaya: Journal of Primary School Teacher Education	The results of this study indicate that there is a significant difference in the effect of students' interest in learning mathematics in the treatment group before and after being given the ASSURE Model treatment oriented to the traditional Selodoran game based on local wisdom in class IV SDN 1 Banyuasri.
7	(Harefa, 2024)	Mathematics Education Based on Local Wisdom: Learning Strategies Through Hombo Batu	Afore : Journal of Mathematics Education	The study highlights that traditional games like Hombo Batu can be utilized in Maros Regency as ethnomathematics-based learning media, enriching mathematics education by connecting concepts to local culture,

				enhancing engagement, and developing social skills while fostering cultural identity.
8	(Halimah et al., 2024)	Ethnomathematics in the Traditional Game of Congklak in Srengseng Sawah Village	Bilangan : Scientific Journal of Mathematics, Earth and Space	Based on the research analysis and discussion of the history and philosophy of the traditional game of congklak, mathematical concepts in the game of congklak such as the concept of flat shapes, namely semicircles, circles, rectangles and spatial shapes, namely half a ball; the concept of transformation in this case reflection / mirroring; the concept of arithmetic operations including addition, subtraction, multiplication and division.
9	(Nurazizah, 2023)	Ethnomathematics: Increasing Interest and Understanding of Maths through the Game of Congklak	Scientific Journal of Mathematics Education Al Qalasadi	The research highlights the potential of traditional games, like congklak, as ethnomathematics-based learning media, emphasizing their role in enhancing mathematical understanding and interest by integrating cultural elements for effective mathematics education
10	(Zayyadi et al., 2023)	Ethnomathematics Exploration Through Traditional Madurese Games in Elementary School Mathematics Learning	Mathema Journal	The results of this research are ethnomathematical principles in traditional Madurese games, which can be seen in the preparation before playing, the way of playing and the rules of the game. Mathematical concepts included in the game engklek (bhisek): the concepts of addition and subtraction, numbers, lines and angles, flat shapes and comparison; in the game hide and seek (rem-ngerreman): the concepts of addition and subtraction and numbers; and in the game bekel ball (bal bleken): the concepts of addition and subtraction, number patterns, multiplication and division and comparison.

The table 1 above shows the results of a wide range of research literature examining the role of traditional games as ethnomathematics-based learning tools. These studies indicate that traditional games not only improve students' understanding of mathematics, but also provide a cultural context that enriches their learning experience. Thus, ethnomathematics has proven to be an effective approach in mathematics education.

Research revealed that the bekles game has ethnomathematical values, including the concept of numbers from 1 to 10, modulus, ball shape, and probability (Hendriawan & Faridah, 2022). The authors recommend the use of bekles as a learning medium in mathematics and physics subjects, especially those related to vertical motion and free fall. By utilizing this game, students can learn mathematical concepts in a fun and relevant way.

Research shows that the game of congklak is not only entertaining, but also teaches mathematical concepts, such as geometry and logic (Taus et al., 2022). The game can be used to deepen students'

understanding of mathematics, while respecting cultural values. By integrating this traditional game in the curriculum, teachers can increase students' motivation and participation in the math learning process.

The study revealed that the game of engklek teaches various math concepts, including flat shapes and symmetry. The author argues that cricket is a very effective learning medium, as children can learn through direct experience and social interaction while playing. In addition, the game can also be used to introduce mathematical concepts outside the classroom environment, making it more relevant and interesting for students (Iskandar, 2021).

According to (Permana, 2019; Rakhmawati, 2016) this game can teach various basic math concepts, such as how to count, measure, and understand chance. Children learn to count the number of marbles they have and calculate the score of the games they play. During play, they are active in counting and recognizing patterns, which contributes to the development of logical thinking skills and strategies. In addition, marbles games are generally played in groups, so children can learn to cooperate and socialize, and appreciate the principle of healthy competition. By utilizing this game, students can learn outside the formal classroom environment, making learning more relevant and fun, which in turn can increase their interest in mathematics.

Conclusion

This research concludes that traditional games in Maros district, such as bola bekel (beklang), congklak, engklek (dende-dende), and marbles, are effective tools for ethnomathematics-based mathematics learning, as they incorporate key mathematical concepts like counting, measurement, chance, and geometry. These games not only make learning more enjoyable and contextually relevant for students, but also promote cultural preservation through an ethnomathematics approach. The significant implication of this study is that integrating these games into the curriculum can enhance student engagement, increase participation, and improve their understanding of mathematical concepts, while simultaneously fostering social, emotional, and cognitive development. Thus, traditional games offer a meaningful and interactive way to connect students with both mathematics and their cultural heritage.

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