

Ethnomathematics Exploration Study of the Four Ethnics Dance of South Sulawesi

Nurwati Djam'an^{1*}, Neni Mariana², Mangaratua Simanjorang³, and Sahlan Sidjara⁴ ¹Department of Mathematics, Universitas Negeri Makassar, Indonesia ²Department of Mathematics, Universitas Negeri Surabaya, Indonesia ³Department of Mathematics, Universitas Negeri Medan, Indonesia ⁴Department of Mathematics, Universitas Negeri Makassar, Indonesia <u>nurwati djaman@unm.ac.id</u>

Abstract. This study explores the ethnomathematics of a traditional dance of South Sulawesi. The dance was known as Four Ethnics Dance.It is one of the famous traditional dances from South Sulawesi that consisting of Four Ethnics which is Makassar, Bugis, Mandar, and Toraja Etnics. It is usually performed to welcome the guests in a formal and informal event. The research method was a case study in which we deeply analyzed the dance movement of the Four Ethnics Dance. The data were gathered by observing the performed dance and interviewing some dance experts. The data were analyzed qualitatively using descriptive methods. The analysis found that the concept of numerating, rhombus shape, circle, rotation, and gestures of the dancers in Four Ethnics Dance form three types of angles, i.e., acute angle 0 < x < 90, right angle x =90, and obtuse angle 90 < x < 180. The angles can be seen in a number of patterns of dance movements. Straight lines and the concept of multiplication are also demonstrated within the movement of the dancers.

Keywords: Ethnomathematics, Four Ethnic Dance, South Sulawesi.

1 Introduction

Education and culture are closely related to each other. This statement aligns with Dewey's idea that effective education comes primarily through social interactions and that the school setting should be considered a social institution (Flinders & Thornton, 2013). Considering the strong connection between culture and learning, educators should use culturally responsive pedagogy, including high expectations for all students, varied approaches to learning, and fostering community and family engagement (Ford, Stuart, Vakil, 2014).

Culture and mathematics, as two conceptualities of knowledge, have various similarities and dependencies. Culture is created when groups of people follow the same trend of assigning meaning and beliefs (Gilsdorf, 2012). Mathematics is knowledge from a culture that grows and develops to connect human needs (Knijnik, 1993). One of the similarities between the two conceptualities is their universal value.

Learning is influenced by many factors, which can be cognitive or affective. Hart (1989) defined attitude towards mathematics as a complex of individual negative or positive

[©] The Author(s) 2023

N. Djam'an et al. (eds.), Proceedings of the 5th International Conference on Statistics, Mathematics, Teaching, and Research 2023 (ICSMTR 2023), Advances in Computer Science Research 109, https://doi.org/10.2991/978-94-6463-332-0_18

emotions, beliefs towards mathematics, and behavior associated with mathematics. Different perceptions of mathematics in society and schools are the basis for researchers' interest in utilizing the relationship between culture and mathematics, which is unknowingly close to people's lives, by making culture an approach to make students interested in learning mathematics.

Ethnomathematics is a link between culture and mathematics. Ethnomathematical approaches to mathematics education and research seek to understand the roles of mathematics in different ethnic groups and nations (Djam'an, 2023). Ethnomathematics can be defined as a form of cultural integration into mathematics learning. Sharma and Orey (2017) added that ethnomathematics as an approach to mathematics learning aims to create meaningful learning.

1.1 Research Questions

What mathematical concepts are contained in the Four Ethnics Dance of South Sulawesi? This question would be the focus of the research that is discussed in this article.

2 Literature Review

2.1 Ethnomathematics

The concept of ethnomathematics is deeply rooted in the ideas and philosophies of Paulo Freire (D'Ambrosio, 2020). Etymologically, ethnomathematics is composed of *"ethno*," which refers to "cultural context," *"mathema*," which means "to explain, know, or understand," and "*tics*," which is related to "techno," which is also rooted in art and technique (Achor, Imoko, &; Uloko, 2009; Balamurugan, 2015; D'Ambrosio, 1985). In other words, "*ethno*" refers to group members in a cultural environment identified by cultural traditions, symbols, myths, and the specific means they use to reason and infer. "*Mathema*" means to explain and understand the world to transcend, manage, and overcome reality so that members of a cultural group can survive and thrive. Meanwhile, "*tics*" refers to techniques such as counting, sorting, classifying, measuring, weighing, solving, classifying, inferring, and modeling (Balamurugan, 2015).

Appelbaum (2023) states that ethnomathematics, and, in general, sociocultural approaches to mathematics education contribute to the integration of the history of mathematics and mathematics education. In line with the statement, cultural development describes mathematics as part of culture and how individual cultures depend on each of their parts holistically together (Spengler, 1956). Ethnomathematics helps contribute to the understanding of culture and mathematics. Pratiwi and Pujiastuti (2020) state that the existence of ethnomathematics is intended as a form of recognition of different ways of carrying out mathematics activities in community activities, such as grouping, calculating, measuring, designing tools or buildings, games, and many others, by considering the knowledge of mathematics developed in various sectors of society. This study focuses on opportunities for students to learn mathematics in ways they see as relevant to their identities and communities through ethnomathematics exploration of the Four EthnicsEthnic Dances of South Sulawesi. The dance is usually presented to welcome guest or inaugurate an event, as a sign of gratitude and honor for the guest or a leader.

2.2 Four Ethnics Dance

According to Sutton (1995), South Sulawesi has four main ethnic groups, namely: the Bugis (the majority, famous for shipbuilding and seafaring, often ranging far from home and settling overseas), the Makassarese (lowland traders, also famous for seafaring, though somewhat less likely to settle far from home), the Mandarese (traders and fishermen), and Torajans (highland rice cultivators). In South Sulawesi itself, several traditional dances are known to the wider community, including Pakarena dance from Gowa, which represents Makassar ethnicity: Pajoge dance from Bone: and Pajaga dance from Luwu, which represents Bugis ethnicity; Pattuddu dance, which represents Mandar ethnicity and Paggellu dance which represents Toraja ethnicity. These traditional dances are combined into a new dance, which is patterned with those traditions that represent the South Sulawesi region. The basic movements in this dance are taken from the basic movements in each dance that represent each of the Four Ethnicities, so this dance is often referred to or known as the Four Ethnics Dance of South Sulawesi. The elements of the Four Ethnics Dance, including folk songs, musical accompaniment, and traditional musical instruments, are characteristic of ethnic dances in South Sulawesi. In addition, makeup and clothing that represent each ethnicity. contribute to this dance, likewise with various basic movements in each ethnicity.

3 Method

3.1 Design and Research Setting

In order to answer the research question, this study used ethnographic research design. Ethnography itself is an approach in qualitative research developed from an anthropological methodology that analyzes the social activities and behavior of individuals of certain communities or community groups. The ethnographic approach in this study was used to explore and describe mathematical concepts contained in the Four Ethnics Dance of South Sulawesi.

3.2 Participant

This research is located at Siradjuddin Bantang Art Studio in Sungguminasa, Gowa district. The data sources selected in this study were obtained from South Sulawesi cultural figures and dance artists who understand the Four Ethnics Dance of South Sulawesi, which was then studied using ethnomathematics.

3.3 Data Collection

The data in this study was collected through observational and interviews with cultural figures and dance artists of South Sulawesi who know about the Four Ethnics Dance of South Sulawesi. The data collection technique is used to examine instruments that directly collect data with the help of supporting instruments in the form of observation sheets and interview guidelines.

1. Observation Sheet

The observation sheet is a non-test instrument in the form of a research activity framework developed as a value scale or a record of research findings. It is compiled as a list of observation checklists.

2. Interview Guidelines

The form of interview instruments is assembled as an interview guide.

3.4 Data Analysis

The observation was done by observing each movement of the dancers' gestures of Four Ethnics Dance. To enhance the validity and reliability, we used the complete video of Four Ethnics Dance at https://www.youtube.com/watch?v=WWNtdD-JIFo and took the step by step photos of each movement. We selected movements with a clear image of the geometric objects' construction. Then, we analyze it qualitatively using the descriptive method. To ensure the researchers' interpretation, we applied data triangulation by confirming the observation result from photos and video with the clarification from the experts of Four Ethnics Dance.

4 Results

4.1 Results of Quantitative Analysis

Counting

Numeracy in the Four Ethnics Dance are shown when the initial movement enters the stage. The right foot goes forward and then alternates with the left foot. This movement is done by walking rhythmically while circling the stage where the performance is performed. While walking, there is an element of counting natural numbers, it is spent 3 x 8 counts.



Figure 1. Analysis of counting in the initial movement of the dance

Bishop (1998) mentions six universal activities of mathematics as counting, locating, measuring, designing, playing, and explaining. Counting in this dance movement is a consideration of how many movements the dancers have. Through this dance, students can practice/see movement and counting in different ways that allows them to visually and physically experience space. Moreover, students can express movement on a number line.

Rhombus shape

The shape of the rhombus is indicated at the moment when the dancer takes the initial position. In this section, dancers will dance accompanied by the Anging Mammiri song, a typical Makassar song. The position between dancers 1, 2, 3, and 4 will form a diagonal rhombus and face forward. In this position, the dancer will dance while holding a fan that opens sideways in the right hand, the left hand holding the skirt/sarong, and twisting movements **360**°.



Figure 2. Analysis of rhombus shape in the position of dancers

In the ethnic part of Makassar, the folk song that usually accompanies the dance is *Anging Mammiri* or *Paccobana Lino*. The clothes and accessories used by dancers representing Makassar ethnicity, including *baju bodo* clothes or *la'bu clothes*, lipa' sa'be *(silk sarongs), flower headbands*, bangkara' (*earrings), geno* (necklaces), *lola'* (bracelets), *simatayya/sima'*, and *sulepe* (*belts*). Variety of movements in the Makassar ethnicity is patterned on the Pakarena dance movement, which has the characteristics of female dancers holding fans with gentle movements but seems magical, while the rhythm played by fast-tempo accompaniment music contrasts with the dancer's movements that are very soft and vibrant. The circular movement, like clockwork in Pakarena dance, symbolizes the cycle of human life. In the class, students learn how to identify shapes and their symmetry while learning the social meaning of the dance.

Half Circle &; A Circle

The circle is shown when the dancer changes position to move to the Bugis variety accompanied by the song *Bulu Alau'na Tempe*. When moving to change position, the dancer will rotate in place while rotating the fan by a semicircle or 180° . In this variety, the dancer's movements are dominated by twisting movements 360° .



Figure 3. Analysis of the circle during the Bugis ethnic dance

In the Bugis ethnicity, the folk song that usually accompanies the dance is *Bulu Alau'na Tempe* or *Indo' Logo*. The clothes and accessories used by dancers representing the Bugis ethnicity include bodo clothes, *lipa' sa'be* (silk sarong), *geno* (necklace), *bangkara'* (earrings), and *simpolong flowers* (hair flowers). The variety of movements in the Bugis ethnicity is patterned on Pajoge dance movements with a characteristic finger movement called *mangingking*, where the thumb and middle fingers meet. In addition, the movement pattern is also faster but still gentle, firm, and more coquettish, as a depiction of the flexibility of Bugis women, who are known to be friendly in their daily lives.

160 N. Djam'an et al.

Rotation

Rotation is shown when dancers take turns occupying the position of another dancer while holding a fan that is swung from behind the back to the front of the chest and meets in the middle of the circle. The right foot is in front of the left and rotates while tiptoeing.



Figure 4. Analysis of the rotation on the movement dance This dance provides the opportunity for the students to learn how to describe movement as a series of rotations.

Three types of angles (The obtuse angle, acute angle, and right angle)

The obtuse angle is indicated when the dancer is in an oblique position. The dancer bends down on both tiptoe legs, swings the fan to the right side, and lifts the fan over his forehead so that an obtuse angle of more than is formed and 90° continued by standing while turning the body.



Figure 5. Analysis of obtuse angles

Acute angle in this dance is shown in the movement of the Mandar variety accompanied by the *song Tenggang-tengganglopi*, which is a typical Mandar song. The dancer turns their back to the stage, then rotates $\frac{3}{4}$ in a circle, then pauses by turning the fan until she has their back to the right hand, and the left hand is in front of the forehead, which then forms an angle less than or a pointed angle **90**°.



Figure 6. Analysis of acute and right angle

In Mandar ethnicity, the folk song that usually accompanies the dance is *Tenggang Tenggang Lopi*. The clothes and accessories used by dancers representing the Mandar ethnicity, including *Rawang Boko* (traditional Mandar costume), *lipa' sa'be* (silk sarong), jasmine flower, *edit, dali* (earrings), *tombi jijir* (necklace), and *gallang balle* (bracelet). The variety of movements in the Mandar ethnicity is patterned on Pattuddu dance movements, with characteristic finger movements where the thumb and index finger meet. The variety of movements in this ethnicity is taken from the social life of the Mandar community, such as weaving and sailing using *tande boats*.

Straight Line

The straight line in this dance is shown when the dancer turns back to switch to a variety of Toraja dances accompanied by the song *Sangmaneku to Manglaa*. The dancer then takes their respective positions with the movement of both hands bent forward of the chest with the fingertips inward. The position of the hand forms a right angle or angle of **90**°.



Figure 7. Analysis of straight line in Trojan Dance movement

In Torajan ethnicity, folk songs, such as *Tomeppare*, *Sarira Parerung*, or *To Mangla*, usually accompany the dance. The clothes and accessories used by dancers representing Toraja ethnicity, including *pokko* clothes, typical Toraja earrings, *mastura* (necklace), *komba' Boko* (*bracelet*), sokkong bayu (*clothes ornament*), *ambero* (belt), and cow headdress. The variety of movements in the Toraja ethnicity is patterned on Pagellu dance movements with characteristics of broken movements, looks stiff, and is done firmly on the wrist called *ra'pa*. In addition, in the variety of Toraja ethnicity, which is the last variety in the Four Ethnics Dance of South Sulawesi, the dancer's body gestures seem to change drastically. The dancer's body position looks more forward-inclined.

Multiplication

This dance is performed with 4-8 kinds of movements with a count of 8 times each movement in one song. To get the total number of movements performed by the dancers, the types of movements are multiplied by the count of each movement. Four multiplied by eight then obtained the result of 32 counts, or eight multiplied by 8 obtained the result of 64 counts for one song.



Figure 8. The concept of multiplication on the dance movement

The Anging Mamiri song accompanying the Padengan dance contains *pappaseng* (messages). Bulu' Alauna Tempe is a regional song from the Bugis tribe. This song accompanies the Pajoge' dance from Bugis, which tells the story of the beauty of Lake Tempe in Wajo, South Sulawesi. But it also contains meaning about the leader's character. The song Tenggang-Tenggang Lopi tells the customs of the Mandar people, who are known as accomplished sailors. Pagellu Dance is the closing dance of the 4 Ethnic Dances. This dance is accompanied by the song To Mangla, which tells the life of a shepherd.

Furthermore, the cultural values also reflected in the dance movements of the Four Ethnics dance include entertainment values and cohesiveness/togetherness values (The manifestation can be seen when the musical instruments accompanying the dance are being played by several people who are given the task and responsibility); Compactness in playing musical instruments in this dance is really prioritized so that the accompanying dance can really look interesting and run smoothly), religious values; personality values; and educational values. In addition, mentality is part of forming a character for the dancers; when a character is not formed, it means the dancer fail to embody the art that they carry.

Conclusion and Recommendations

From the discussion, it can be concluded that the mathematical concepts that can be found in the Four Ethnics dances, namely counting, rhombus shape, circle, rotation, the obtuse angle, acute angle, and right angle, straight line, and multiplication. These interesting facts can be employed as a recommendation to teach mathematics that integrates dance and introduces mathematics topics while learning culture to the students at the school. Hence, the students can learn mathematics from their culture and environment, which will help increase their mathematical appreciation in daily life.

Acknowledgement

The authors thank the Ministry of Research, Technology, and Higher Education (Ristekdikti) for the research funding for funding this project (Contract No. 139/E5/PG.02.00.PL/2023; 2790/UN36.11/LP2M/2023), participating universities and participants for their support and collaboration.

References

1. Flinders, D., & Thornton, S. (2013). The curriculum studies reader. (4th Ed.). New York: Routledge.

- 2. Ford, B.A., Stuart, D.H., & Vakil, S. (2014). Culturally responsive teaching in the 21st century inclusive classroom. The Journal of the International Association of Special Education, 15(2), 56-62.
- 3. Gilsdorf, T. E. (2012). Introduction to cultural mathematics: With case studies in the Otomies and Incas. John Wiley & Sons. https://doi.org/10.1002/9781118194164
- 4. Knijnik, G. (1993). Ethno-Mathematical Approach in Mathematical Education: a Matter of Political Power. For the Learning of Mathematics, 13(2), 23–25.
- Hart, L. (1989). Describing the Affective Domain: Saying What We Mean.In Mc Leod& Adams (Eds.) Affect and Mathematical Problem Solving (pp.37-45). New York: Springer Verlag.
- Djam'an, N., Mariana, N., Simanjorang, M.M. (2023). Trends in Mathematics Education Research in Indonesia. In: Atweh, B., Fan, L., Vistro-Yu, C.P. (eds) Asian Research in Mathematics Education. Mathematics Education – An Asian Perspective. Springer, Singapore. <u>https://doi.org/10.1007/978-981-99-0643-7_8</u>
- Sharma, T., & Orey, D.C. (2017). Meaningful Mathematics Through the Use of Cultural Artifacts BT -Ethnomathematics and its Diverse Approaches for Mathematics Education. In M. Rosa, L.Shirley, M.E. Gavarrete, & W.V Alangui (Eds.). Cham: Springer International Publishing.https://doi.org/10.1007/978-3-319-59220-6 7
- 8. D'Ambrósio and G. Knijnik, "Ethnomathematics," Encycl. Math. Educ., pp. 283–288, 2020.
- 9. Achor, E.E., Imoko, B.I., & Uloko, E.S. (2009). Effect of Ethnomathematics Teaching Approach on Senior Secondary Students' Achievement and Retention in Locus.
- Balamurugan, M. (2015). Ethnomathematics; an Approach for Learning Mathematics from Multicultural Perspectives. School of Education, Pondicherry University, Puducherry-605014, India.
- 11. D'Ambrosio U (1985) Ethnomathematics and its place in the history and pedagogy of mathematics. Learn Math 5(1):44–48
- Appelbaum, P., Stathopoulou, C. (2023). History of Ethnomathematics: Recent Developments. In: Romero Sanchez, S., Serradó Bayés, A., Appelbaum, P., Aldon, G. (eds) The Role of the History of Mathematics in the Teaching/Learning Process. Advances in Mathematics Education. Springer, Cham. <u>https://doi.org/10.1007/978-3-031-29900-1_8</u>
- 13. Spengler, O. (1956). Meaning of numbers. In J. Newman (Ed.), The world of mathematics (pp. 2315–2347). Simon and Schuster, ed. Newman.
- 14. Pratiwi, J. W., & Pujiastuti, H. (2020). Eksplorasi Etnomatematika pada Permainan Tradisional Kelereng. *Jurnal Pendidikan Matematika Raflesia*, 5(2), 1–12. https://ejournal.unib.ac.id/index.php/jpmr/article/view/11405
- Sutton, R. A. (1995). Performing Arts and Cultural Politics in South Sulawesi. *Bijdragen Tot de Taal-, Land- En Volkenkunde*, 151(4), 672–699. <u>http://www.jstor.org/stable/27864709</u>
- 16. Bishop, A. J. (1994). Cultural conflicts in mathematics education: developing a research agenda. For the Learning of Mathematics 14 (2), 15-18.

164 N. Djam'an et al.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (http://creativecommons.org/licenses/by-nc/4.0/), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

(00)	•	\$
	BY	NC