



Ethnomathematics in Serampang XII Dance by Deli Malay Ethnic Group: An Exploration

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Abstract

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This study aimed to explore mathematical concepts in the local culture known as ethnomathematics. The culture examined in this study is the Serampang XII Dance performance, originating from the Deli Malay ethnic group in the province of North Sumatra. This qualitative descriptive research adopts an ethnographic approach, revealing and describing local cultural facts discovered in the field. It is revealed that the Serampang XII Dance performance incorporates various applications of mathematical concepts, including basic counting, geometric angle concepts, geometric transformation concepts, set concepts, relation concepts, and flat shape concepts. This research aims to provide answers to its main question, which is, "What mathematical concepts can be identified and further explored in the Serampang XII Dance performance?". In conclusion, Serampang XII Dance can be considered an ethnomathematical innovation that can be used as a foundation for a new mathematics teaching approach with the hope of transforming the perception of mathematics education from monotony to enjoyment.

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1. Introduction

Essentially, knowledge can be defined as the manifestation of thought processes combined with observations utilizing all human senses, ultimately leading to conclusions that are acknowledged as 'knowledge' (Vera & Hambali, 2021). It is argued that knowledge often arises from an individual's curiosity about a subject, which empowers them to gain understanding and the ability to apply what they have observed. To acquire knowledge, individuals typically immerse themselves in the field of education to gain knowledge, whether through formal, non-formal, or informal means (Fatoni, 2019). Otherwise, one example of formal education is schools.

To that extent, school is an institution that provides educational services to a learner, including guidance and learning activities involving the imparting and receiving of knowledge within specific subject areas corresponding to the field of study pursued (Parinsi et al., 2021). During education at school, a variety of knowledge is taught and developed by educators for students, ranging from exact sciences to non-exact sciences. Exact sciences are branches of knowledge that study tangible phenomena, are measurable, can be investigated through experimentation, and can be proven with definitive outcomes (Muryaningsih, 2021). In the case of, an instance of a discipline taught in the field of exact sciences is mathematics.

Mathematics is considered one of the branches of exact sciences, typically characterized as an absolute science with applications that are always related to life, activities, and thought patterns; and its presence continues to evolve (Abror, 2022). Mathematics is a subject that is now considered a necessary competency in every institution, especially within the realm of education, particularly in schools. The ideal mathematics is one that is taught effectively and is understandable. However, the reality is that there is still a substantial amount of data pointing to problems in the process of teaching mathematics. One of the causes of problems in mathematics learning includes using an inappropriate and poorly implementable teaching approach in

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the classroom, leading to misconceptions in mathematics learning, as mentioned in previous mathematics education research (Sari, 2019). To address this issue effectively, it is advisable for educators to first select an approach that can be considered more solution-oriented, ensuring that it is better targeted for implementation during the learning process, taking into account the competency levels of the class being taught.

To that extent, one of the alternative learning approaches that can be used is ethnography. Ethnography, essentially, is an educational approach that describes a discipline within the context of the culture of a particular society (Basuyoga Prabhawita, 2022). Through the use of the ethnographic approach, the focus of education shifts towards applying a specific field of knowledge in connection with a particular culture. An example of this application of learning integrated with ethnography is mathematical ethnography, commonly referred to as ethnomathematics.

Notably, ethnomathematics is a conceptual approach to teaching mathematics that is either developed or already exists within a particular culture (Mustika et al., 2022). The results of various studies in mathematics education at education units often show that ethnomathematics is considered a successful method in transforming the learning environment into a more enjoyable one. This approach helps prevent the learning material from appearing monotonous and makes it easier for students to understand. The concept of ethnomathematics learning can be categorized as an effort to preserve the culture of a region because this concept involves the study of mathematics while delving deeper into the culture that serves as the subject of ethnomathematics learning. The cultural diversity within a region can also facilitate educators in selecting a culture to be the focus of ethnomathematics education.

To that extent, North Sumatra is a province in Indonesia that is known for its diverse ethnic groups and cultures. One of an ethnic group in North Sumatra is the Deli Malay. The Deli Malay is an indigenous Malay group in North Sumatra, primarily found demographically in the city of Medan and the Deli Serdang regency (Manesah & Suryanto, 2022). Within the Deli Malay ethnic community, there is a traditional dance art known as the Deli Malay ethnic dance, which was crafted by a master artist by the name of Sauti (Hamdani, 2020). Sauti is credited with composing nine traditional Malay dance parts, with the Serampang XII Dance being a particularly notable creation among them.

The Serampang XII Dance is a traditional Deli Malay dance piece that portrays the love story of a young couple, progressing from the initial stages of romance to the more serious commitment of marriage (Syauqii, 2021). As it happens, the Serampang XII Dance has been included in the art and culture curriculum under the dance and art chapter and has been taught in almost every school in the North Sumatra province. This widespread inclusion has made the Serampang XII Dance quite familiar and well-recognized. Notably, The most prominent feature of this dance is its usual configuration of a male and a female dancer as a pair, although it is occasionally presented in a group context while still adhering to the paired concept.

Owing to, this research aims to provide answers to its main question, which is, "what mathematical concepts can be identified and further explored in the Serampang XII Dance performance?". The findings of this study are set to act as a catalyst for innovation in ethnomathematics, enabling the creation of novel approaches to mathematics education. Ultimately, this research aims to transform the perception of mathematics education from being monotonous to enjoyable and to provide cultural education as a means of raising awareness for cultural preservation.

2. Methods

This research utilized a descriptive qualitative method, which consists of various sets of field data to provide descriptive data presentations in the study (Soearso & Prakoso, 2021). Additionally, the approach employed was the ethnographic. Ethnographic approach refers to a qualitative approach that delves into the culture of a specific group or individual within a particular region (Alghifari et al., 2022). Furthermore, the applied approach aims to combine the relationship between culture and mathematical elements (Nova & Putra, 2022). Following the established guidelines for ethnomathematics research (Hasibuan & Br Ginting, 2021), the aim is to uncover new conceptual ideas for applying mathematical principles within a cultural context.

This study focus around the Serampang XII Dance crafted by Sauti, with Ms. Nurhaszianty Putri, S.Psi, serving as the main source of information, given her expertise in this particular dance form. The research

was conducted at the residence of the Pulau Putri Dance Studio, which is a member of the Dance Committee of the Labuhanbatu Arts Council. This institution is one of the organizations dedicated to preserving the nine traditional Deli Malay dances in North Sumatra, to which the Serampang XII Dance belongs. In addition to, the research instrument involves the researcher who conducts observations, gathers, and collects research data.

Likewise, the data collection techniques employed in this research involve activities such as observation, interviews, and documentation (Sugiyono, 2013). Interview data is obtained through interviews with Ms. Nurhaszianty Putri, S.Psi, who serves as the informant for the Serampang XII Dance. Subsequently, documentation of the Serampang XII Dance was carried out by capturing several images from YouTube. Referring to the established ethnomathematics research guidelines (Sawita & Br Ginting, 2022), the most suitable data analysis technique for this research is the Spradley model, which involves analyzing the cultural domain, taxonomy, components, and themes as part of the research analysis steps.

3. Results & Discussions

Following the ethnomathematics identification in Sauti's Serampang XII Dance, several mathematical concepts found in the dance are set theory, counting, and geometric transformations.

3.1. Set

The A set is a concrete grouping that can encompass either an object or an entity (Rizqi et al., 2021). In the Serampang XII dance, the concept of a set has been identified.

1. Diverse dance forms. The various dance styles in the Serampang XII performance can be linked to the concept of mathematical sets. One type of set that can be found is the subset. These subsets can then be listed in the form of;
 $K(\text{diverse dance}) = \{\text{Introductory dance variety (first encounter), journey dances variety (love seeping), spinning dances variety (concealing love), crazy dances variety (going wild), conditional dances variety (with various signs of love), bouncing dances variety (conditional responses), one-footed dances (left-right) variety (speculating), three-step dances leaping forward/backward variety (disbelief), leaping dances variety (response), coming-approaching dance variety (courting and proposing), diverse/mixed dances variety (accompanying the bride and groom), handkerchief dances variety (love meetings)}\}.$
 Then, $K(n) = 12$.
2. Number of Dancers. Since this dance is fundamentally performed in pairs, the number of dancers in the Serampang XII dance performance can be related to the mathematical concept of a set. The type of set that can be found is a subset. Then these subsets can be listed in the form of ; $L(\text{number of dancer}) = \{\text{Male Dancers, Female Dancers}\}.$ Then, $L(n) = 2$.
3. Female Dancers' Costumes. Upon closer examination, the costumes of the female dancers in the Serampang XII dance performance can be related to the mathematical concept of a set. The type of set that can be found is a subset. Then these subsets can be listed in the form of; $M(\text{female dancers' costumes}) = \{\text{malay traditional clothing, malay skirt, waist sash, cloth belt, rose hair ornament, traditional earrings, traditional necklace}\}.$ Then, $M(n) = 7$.
4. Male Dancers' Costumes. Upon a closer examination, male dancers' costumes can be related to the mathematical concept of sets in the performance of the Serampang XII Dance. The type of set that can be identified is the set of subsets. Then, the set can be represented as follows: $N(\text{male dancer's costumes}) = \{\text{malay teluk belanga clothing, malay pants, songket cloth, belt, malay hat}\}$ Then, $N(n) = 5$.
5. Dancer' properties. The props used by the dancers in the Serampang XII Dance performance can be associated with the mathematical concept of sets. The type of set that can be identified is the set of subsets. Then, the set can be represented as follows: $O(\text{dance props}) = \{\text{a man's handkerchief, a woman's handkerchief}\}.$ Therefore, $O(n) = 2$.
6. Musical instruments for the dance. The musical instruments used to accompany the performance of the Serampang XII Dance can be related to the mathematical concept of sets. The type of set that can be identified is the set of subsets. Then, the set can be represented as follows: $P(\text{musical instruments}) = \{\text{malay drum, malay tambourine, accordion, keyboardist}\}.$ Therefore, $P(n) = 4$.

3.2. Arithmetic

Counting activities encompass all everyday life activities related to estimating, calculating, and measuring logically in a specific context, expressed in mathematical terms or symbols (Silowati, 2021). In the Serampang XII Dance, the concept of counting can be identified.

1. Variety 1

Variety 1 is referred to as the initial dance variety or commonly known as the first encounter. This variety consists of 1 motion motif. There are a total of $2(1 \times 8)$ counts, which amounts to 16 counts.

2. Variety 2

Variety 2 is known as the walking dance variety. It comprises 2 motion motifs. There are a total of (4×8) counts, which amounts to 32 counts.

3. Variety 3

Variety 3 is known as the spinning dance variety or commonly referred to as the rotating motion. This variety consists of 3 motion motifs. There are a total of $4(1 \times 8)$ counts, which amounts to 32 counts.

4. Variety 4

Variety 4 is referred to as the "*gila kepayang*" or commonly known as "*mabuk kepayang*" dance variety. It consists of one motion variety but is repeated four times in four different directions. There are a total of $4(1 \times 8)$ counts, which amounts to 32 counts.

5. Variety 5

Variety 5 is known as the nature walk dance or commonly referred to as "*langkah tujuh* (seven steps)." This variety consists of 3 motion motifs. There are a total of $4(1 \times 8)$ counts, which amounts to 32 counts.

6. Variety 6

Variety 6 is known as the "*goncat-goncat*" dance variety or commonly referred to as a response to signals. This variety consists of 2 motion motifs. There are a total of $4(1 \times 8)$ counts, which amounts to 32 counts.

7. Variety 7

Variety 7 is known as the "*sebelah kaki* (a half leg)" dance variety or commonly referred to as "*menduga* (presume)." This variety consists of 2 motion motifs. There are a total of $4(1 \times 8)$ counts, which amounts to 32 counts.

8. Variety 8

Variety 8 is known as the "*langkah tiga 3 melonjak* (3 steps jumping)" dance variety. It consists of 2 motion motifs. There are a total of $4(1 \times 8)$ counts, which amounts to 32 counts.

9. Variety 9

Variety 9 is known as the "*melonjak* (jumping)" dance variety or commonly referred to as the "response" variety. It consists of 2 motion motifs. There are a total of $4(1 \times 8)$ counts, which amounts to 32 counts..

10. Variety 10

Variety 10 is known as the "*datang mendatangi/menjemput* (approaching and receiving)" dance variety. It consists of 3 motion motifs. There is a total of $8(1 \times 8)$ counts, which amounts to 64 counts.

11. Variety 11

Variety 11 is known as the "*rupa-rupa jalan* (kinds of way)" dance variety. It consists of 4 motion motifs. There are a total of $4(1 \times 8)$ counts, which amounts to 32 counts.

12. Variety 12

Variety 12 is known as the "*sapu tangan* (handkerchief)" dance variety or commonly referred to as the "meeting of love." It consists of 4 motion motifs. There are a total of $4(1 \times 8)$ counts, which amounts to 32 counts.

When we add up the counts from all the different motion motifs, it results $(16 + 32 + 32 + 32 + 32 + 32 + 32 + 32 + 32 + 64 + 32 + 32 = 400)$ counts for the entire range of motions in the Serampang XII Dance.

3.3. Geometric Transformations

Geometric transformations involve changes in the position, shape, or size of a geometric object (Sari, 2019). In the Serampang XII Dance, various types of geometric transformation concepts have been identified, including rotation, reflection, and translation.

3.3.1. Rotation

Rotation is defined as the act of changing the orientation of an object by spinning it around a specified center (Putri et al., 2023). The explanations of the rotation concept discovered in the Serampang XII Dance is provided below.

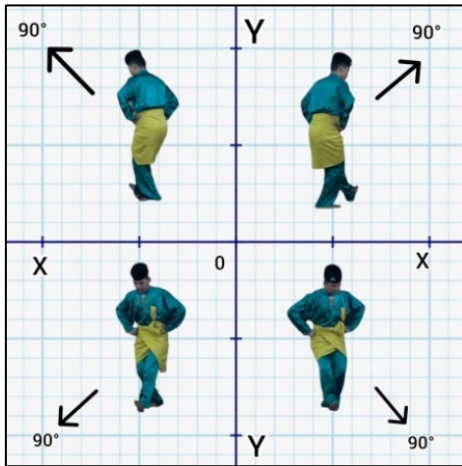


Figure 1. Part of Variety 1

The image above is a part of Variety 1 in the Serampang XII Dance. Variety 1 is known as the introductory variety, symbolizing the first encounter between a young man and a young woman. In the image, it is evident that the pattern in the Serampang XII Dance involves rotational transformations of the body position, with a 90° rotation applied, repeated four times.

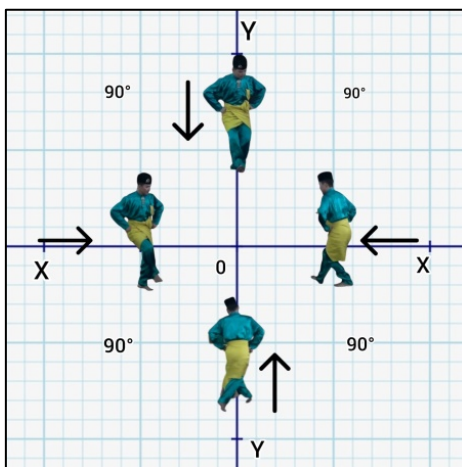


Figure 2. Part of Variety 9

The image above is a part of Variety 9, motif 1, in the Serampang XII Dance. Variety 9 is known as the "melonjak" dance variety, symbolizing the engagement procession between both parties of a couple. In the image, it is evident that the pattern in the Serampang XII Dance involves rotational transformations of the body position, with a 90° rotation applied, repeated four times.

3.3.2. Translation

Translation is the movement of every point on a shape or plane in a straight line, maintaining the same distance and direction (Sutopo & Ratu, 2021). Below, the descriptions of the translation concept identified in the Serampang XII Dance is explained.

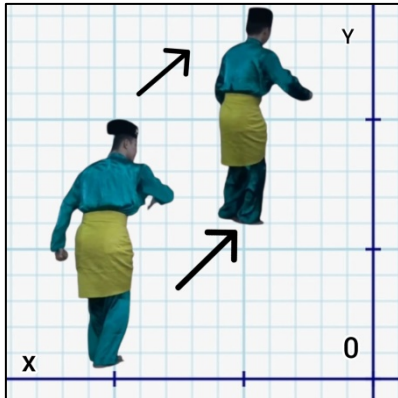


Figure 3. Part of Variety 3, Motif 1

The image above is a part of Variety 3, motif 1. Variety 3 is known as the spinning variety, symbolizing the confusion between the young man and the young woman after their encounter. In the image, it is evident that the pattern in the Serampang XII Dance applies the concept of translation in geometric transformation, characterized by the movement of the floor pattern in a different position while maintaining the same distance, size, and direction.

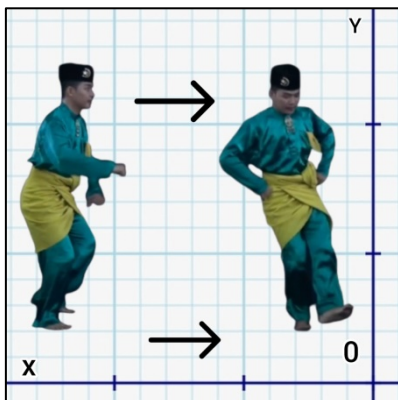


Figure 4. Part of Variety 7, Motif 1

The image above is a part of Variety 7, motif 1. Variety 7 is known as "*sebelah kaki* (one footed)," symbolizing the feelings of suspicion and doubt regarding each other's emotions until the truth is revealed. In the image, it is evident that the pattern in the Serampang XII Dance applies the concept of translation in geometric transformation, characterized by the movement of the floor pattern to a different position while maintaining the same distance, size, and direction.

3.3.3. Reflection

Reflection is the transformation of a plane or shape with the condition that the distance of movement on the plane or shape must have the same value between the starting point and the mirror as between the points of movement on the reflection (Hanipah et al., 2022). The explanations of the reflection concept found in the Serampang XII Dance are presented below.

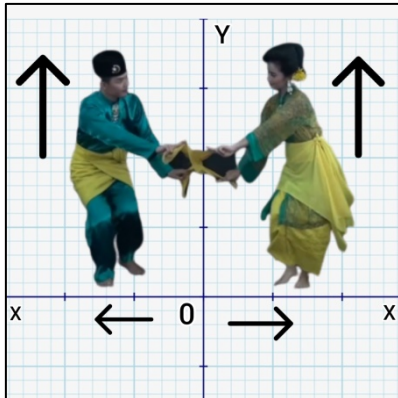


Figure 5. Part of the Floor Pattern in Variety 12

The image above is a part of the floor pattern for the movements in Variety 12 of the Serampang XII Dance. This variety represents the steps leading to the conclusion of the love story between the couple. In the image, it is evident that the floor pattern of the Serampang XII Dance applies the concept of reflection in geometric transformation, characterized by the mirroring of every point on the floor pattern, including the initial form of the pattern as well as its reflection.

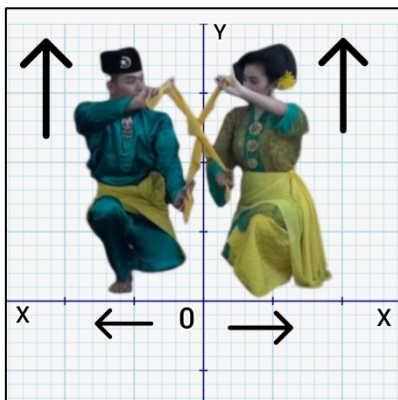


Figure 6. Final Pose in Variety 12

The image above represents a part of the floor pattern for the final pose in Variety 12 of the Serampang XII Dance. Variety 12 signifies the conclusion of the love story between the couple, symbolizing their marriage with the crossed handkerchief, which represents that a married couple cannot be separated until death and fate intervene. In the image, it is evident that the floor pattern of the Serampang XII Dance applies the concept of reflection in geometric transformation, characterized by the mirroring of every point on the floor pattern, including the initial form of the pattern as well as its reflection.

This Serampang XII dance can be used as a learning approach to various mathematical materials, for example, by raising mathematical problems related to this dance according to the material to be conveyed. Apart from that, it can also motivate and bring students closer to the culture of learning mathematics.

4. Conclusion

The research on ethnomathematics exploration in the performance of the Serampang XII Dance of the Malay Deli ethnicity in North Sumatra has revealed the presence of mathematical concepts in the dance, specifically in the form of set theory, arithmetic activities, and geometric transformations. The research on the Serampang XII Dance of the Malay Deli ethnicity is expected to serve as a fresh source of inspiration for innovative mathematics teaching methods. This is with the ultimate goal of increasing students' interest

in mathematics, particularly within the Sumatra Utara region. Furthermore, the ethnomathematics learning approach aims to facilitate students in learning mathematics while simultaneously introducing them to the local culture through the presented art form. Additionally, this study aims to serve as an inspiration for other researchers to delve deeper into the realm of ethnomathematics, particularly when considering other works by Maestro Sauti S within the domain of Malay dance as potential research subjects.

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