



# How The Unique Traditional Dance Motions Of Lahbako Dance: Explorations Study Of Ethnomathematics As Innovative Learning

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## ARTICLE INFO

## ABSTRACT

One of the local cultures that is quite well known in Jember district, East Java, Indonesia is the Lahbako dance. However, this cultural wealth has not been deeply explored recently, regarding the ethnomathematical elements in it. Based on this phenomenon, this study aims to describe the ethnomathematical exploration of the traditional Lahbako dance motion at the Cemara Biru Dance Studio, Jember, Indonesia. This research is categorized as ethnographic research with a qualitative approach. The subjects of this study were nine experts who had an understanding of the Lahbako dance in the Jember Regency. Data collection techniques in this study were observation, interviews, and documentation. Data analysis in this study included data condensation, data display, and conclusion drawing/verification. The results of the study indicate that there are mathematical activities such as counting and determining location. In addition, in the Lahbako dance motion, there are also mathematical concepts, namely the form of two-dimension planes including rectangles, parallelograms, hexagons, triangles, and semi-circle; the concept of lines and angles; and geometric transformations that include translation and reflection. This concept has the implication that imitating dance movements can be innovative and interesting learning in the field of mathematics.

**Keywords:** Ethnomathematics, Lahbako Dance, Mathematical Activities, Mathematical Concepts.

## 1. Introduction

Indonesia is a country that has a variety of cultures with thousands of islands lined up from Sabang to Merauke (Firdaus et al., 2020)(Harmi et al., 2022)(Sukoco, 2015). Each region has its own characteristics and cultural heritage because the Indonesian people have various ethnic patterns, races, ethnicities, religions, beliefs, and so on. According to (Setiana, 2020), culture is the result of human activities that contain mathematical concepts, and exploring mathematical concepts in culture is very important. However, exploration of culture and certain fields has not been carried out such as ethnomathematical exploration. Ethnomathematical exploration is still very limited when compared to the abundant cultural diversity in Indonesia. Ethnomathematics is transdisciplinary, holistic, dynamic, and transcultural with a regional cultural approach (Rosa et al., 2016)(Ness & Lin, 2014).

Mathematics is a science that cannot be separated from life and its concepts are generated by logic, so mathematics has a very big influence in life. Not only school, consciously or unconsciously every human being will apply mathematics in every activity because mathematics is a universal knowledge to help someone in understanding all aspects of life (Esmonde et al., 2013)(Avelino & Ismail, 2022). Its implementation can be seen in various fields, one of which is in local culture. As for mathematics with a local cultural approach, this is known as ethnomathematics (Budiarto et al., 2019). In fact, according to (Andriani et al., 2022) local culture can make it easier for students to begin learning mathematics.

One of the Indonesian cultures that has not been explored further is the culture originally from East Java in Jember Regency, namely the Lahbako dance. Lahbako dance is a traditional dance that depicts the life of tobacco

farmers in Jember, East Java Indonesia. This dance is performed by several female dancers with motions that describe the activities of farmers in tobacco fields or plantations. One of the places that directly contribute to the Lahbako dance preservation is the Cemara Biru Dance Studio which has been established for about 20 years and has been passed down from generation to generation. The studio is a traditional dance studio that elevates traditional values. The existence of this wealth of cultural values requires a deeper ethnomathematical exploration of the Lahbako dance (Wilujeng et al., 2020).

Several studies on ethnomathematical exploration have been successfully carried out, such as (Suwarno et al., 2020). who successfully explored the ethnomathematics of Tobacco Farmer activities in Jember Indonesia. It was found that there was use of of non-standard units and arithmetic concepts including addition, multiplication, subtraction, and multiplication computations, in addition to geometric concepts such as triangle shapes, rectangles, 3D shapes, perpendicular lines, statistics, proportional and relational concepts. Furthermore, the research results of (Musa et al., 2012) regarding ethnomathematical exploration (Supriadi, 2019), it shows that there is a mathematical concept in *Rapa'i Geleng* dance in the form of a number pattern. (Dwidayati et al., 2019)(Zaenuri & Dwidayati, 2018) also successfully explored ethnomathematics in the northern coastal area of Java Island in the form of cultural and non-cultural buildings, traditional foods, batik motifs, and various forms of ethnomathematics in society related to mathematical concepts that can be integrated into mathematics learning(Chirinda et al., 2022). However, no one has found and succeeded in exploring the ethnomathematics of the Lahbako dance motions. The hope of this research has implications for the use of technology even though it is still in manual form but can be used to provide innovation to students so that it is important to learn more deeply(Cabrera-Solano et al., 2023).

Because of this phenomenon, the purpose of this study is to describe the ethnomathematical exploration of traditional Lahbako Dance motion at the Cemara Biru Dance Studio, Patrang Jember Indonesia. It is expected that through this research, the integration between mathematics and culture in Lahbako dance at the Cemara Biru Dance Studio in Patrang Jember Indonesia can be found so that later it can be used as a source of culture-based mathematics learning.

## 2. Materials and Methods

The method used in this study was a qualitative approach as its type was ethnographic research shown in Figure 1. Research subject selection used purposive as its technique. The subjects of this study were nine experts. First, it was the owner the Cemara Biru Dance Studio, Patrang, Jember, East Java, Indonesia who explained the motions and meanings of the philosophy of the *Lahbako* dance motions. The second expert was one of the Jember Regency Tourism and Culture Offices in the field of culture that provides more valid information from the government. The third expert was a senior dance artist in Jember, Indonesia. The fourth expert was the six dancers of the *Lahbako* dance who show directly how to motion the *Lahbako* dance. The location of the research was carried out at the Cemara Biru Dance Studio, Patrang, Jember, East Java, Indonesia. Observation, interviews, and documentation were used as data collection techniques. The observation method used was the passive participation observation method. The interview was conducted through a semi-structured interview technique to find problems openly. While the forms of documentation in this study include photos, pictures, and videos of every motion of the *Lahbako* dance.

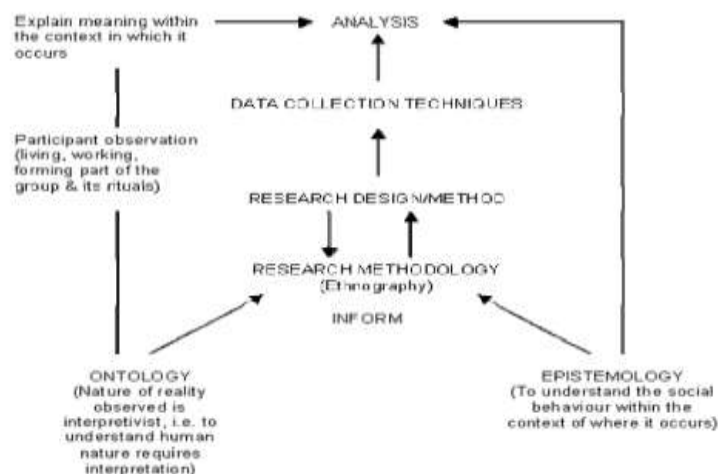
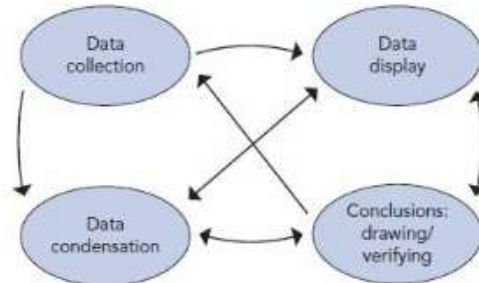


Figure 1: Ethnographic research method (Kane, 2021)

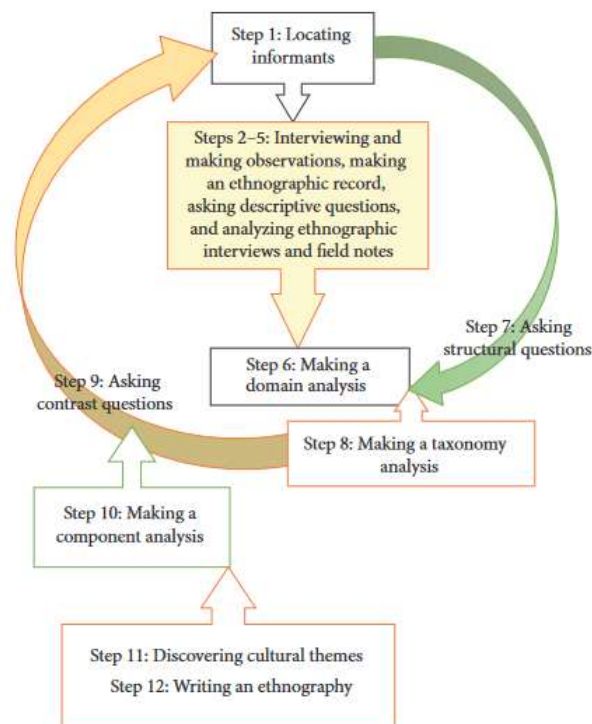
The data analysis of this research was guided by (Miles & Huberman, 1994)(Miles & Huberman, 2014) using data condensation, data display, and conclusion drawing and verification. In the data condensation stage, several procedures were carried out including: (1) data selection, (2) data focusing, (3) data simplification, (4) data abstraction, and (5) data transformation. The data display stage, in generally, a display is an organized.

Through this stage, there is a compressed assembly of information processes so that it is possible to draw conclusions and take action. After collecting data related to the ethnomathematics of the *Lahbako* dance motions, the researchers then grouped the results of observations and interviews to be presented and discussed in more detail. At the conclusion drawing and verification stage, after presenting the data, the researcher concludes the ethnomathematics exploration of the *Lahbako* dance motions based on the information submitted by the respondents and has gone through various stages for data analysis. Schematically the data analysis process using the Miles interactive data analysis model can be seen in Figure 2.



**Figure 2. Components of data analysis (Miles & Huberman, 2014)**

This study applied several techniques to check data validity included extending observations, conducting more thorough and continuous observations, and triangulation which included technical triangulation and source triangulation. There were several stages conducted in this study by Spradley model shown in Figure 3. The first stage was the planning stage, which included preparing research plan, determining research field, managing permits, selecting informants, and preparing research equipment. The second stage, namely the implementation stage of the research, included: determining informants, conducting interviews with informants, making ethnographic notes, asking descriptive questions, analyzing ethnographic interviews, making domain analysis, asking structural questions, conducting taxonomy analysis, asking contrast question, making a component analysis, discovering cultural themes, and writing ethnography. The third stage was the completion stage included analyzing the data and compiling reports.



**Figure 3. The research stage of the Spradley model (Spradley, 2016)**

### 3. Results and Discussion

Based on the results of interviews, a complete information was successfully obtained about the history and elements of mathematics in Lahbako Dance. *Lahbako* dance is a typical dance from Jember Regency, East Java, Indonesia which was created to appreciate tobacco farmers, whose most of whom are women. Based on the exploration results, it was found that 19 motions of *Lahbako* dance contain ethnomathematics elements. The

first motion is *Trisig* motion, this motion in the *Lahbako* dance implies that the tobacco farmer who will start working and leaving to the tobacco plantation. In *Trisig* motion, mathematical activity is found, namely counting activity. In this motion, there are rules for counting according to the accompaniment of the song and the area of the stage. Dancers can use a count of  $1 \times 8$  or  $2 \times 8$ .

The second motion is *Walking* motion shown in Figure 4 (a), the motion of *Walking* in this *Lahbako* dance means that farmers are walking slowly to go to the fields or tobacco plantations. The motion of the left hand holding the shoulder means that the farmer is carrying an empty basket for harvested tobacco. In the *Walking* motion found mathematical activities including counting activities, determining the location, and the mathematical concept of 2D plane on the floor pattern (Figure 4 (b)).



**Figure 4.** (a) Walking motion and (b) Hexagon floor pattern of Walking motion

The third motion is the motion of *Walking to the right and left* which is shown in Figure 5, this motion is almost the same as the *Trisig* motion but the difference lies in little step to the right and to the left. This motion means that farmers are looking to the right and left of the tobacco that is ready to be harvested in their fields or plantations. In this motion, it was found that mathematical activities include counting activities which can be seen from the rules for counting motions of  $1 \times 8$  or  $2 \times 8$ , activities to determine the location indicated by the dancer's motions when determining the position to the midpoint, and the mathematical concept of 2D plane as seen from the floor pattern as shown in Figure 4 (b).



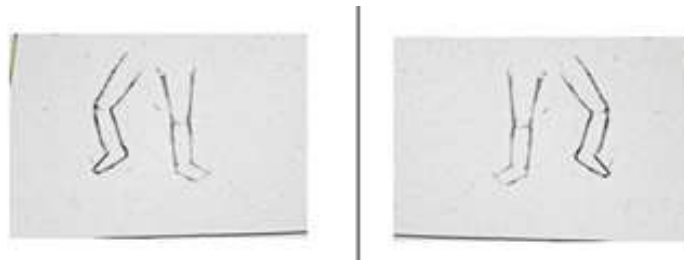
**Figure 5.** Left and right Walking motion

The fourth motion is *Picking* motion, the *Picking* motion is an upright posture, which hand motions are carried out like people picking tobacco. This motion is divided into 2, namely the *Forward Picking* motion and *Back Picking* motion. For *Front Picking* motion, mathematical activities are found including counting activities of  $1 \times 8$  or  $2 \times 8$ , while activities to determine the location indicated when the dancer must determine his position at the midpoint, the mathematical concept of 2D plane and translation, as shown in Figure 6 (a), (b), and (c). Meanwhile the *Back Picking* motion shown in Figure 6 (d). Not so different with the previous one, the *Back Picking* motion is done in the opposite direction to the *Front Picking* motion. Although this motion is almost the same as before, there are some differences; the motion of the hand starting from the cross to the left side. This *Back Picking* motion is done two times, and then ends with the same *Mbopong* motion as before. In the *Back Picking* motion, the same mathematical activity was found as in the *Front Picking* motion.



**Figure 6.** (a) Parallelogram floor pattern in Front Picking motion, (b) Translation of front Picking motion, (c) Front Picking motion, and (d) Back Picking motion

The fifth motion is *Nglangkahi Galengan* shown in Figure 7, this motion has the meaning that the farmer steps on the *Galengan* while they are in the fields or tobacco plantations. In this motion, it was found that mathematical activities include counting activities of  $1 \times 8$  or  $2 \times 8$ , activities of determining the location of the dancer's position at the center point as seen from the benchmark, the mathematical concept of 2D plane (as in Figure 6 (a)), and reflection.



**Figure 7.** Reflection of *Nglangkahi Galengan* foot motion

The sixth motion is *Mbuka' Bopongan* shown in Figure 8, this motion is a continuation of the *Mbopong* motion which is done by opening both hands to the right and left. This motion has the meaning of farmers' activities when opening piles of tobacco that have been brought before. In *Mbuka' Bopongan* motion, mathematical activities were found including counting activities with a count of  $1 \times 8$  or  $2 \times 8$ , activities to determine the location of the dancer's position at the midpoint which is usually seen from the front benchmark, and the mathematical concept of two-dimension plane on the floor pattern (as in Figure 6 (a)).



**Figure 8.** *Mbuka' Bopongan* motion

The seventh motion is *Ndeleh Mbako* shown in Figure 9. In *Ndeleh Mbako* motion, the posture and body position are almost the same as the *Mbuka' Bopongan* motion. The difference is in the hand motions performed with both hands open, the fingers facing down, and the position of one foot in front of the other. *Ndeleh Mbako* has the meaning of putting the harvested tobacco into the warehouse slowly so that the tobacco remains neat and the leaves are not broken or damaged. In this motion, the same mathematical activity was found in the *Mbuka' Bopongan* motion.



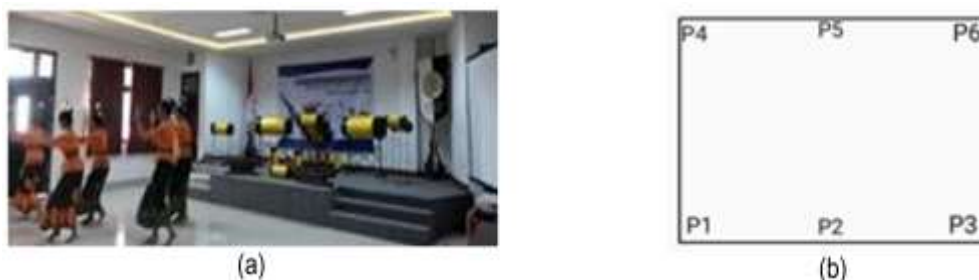
**Figure 9.** *Ndeleh Mbako* motion

The eight motion is the *Molak-Malik* motion shown in Figure 10, this motion which describes the motion of tobacco farmers who are carrying out the process of selecting and sorting tobacco. In this dance motion also found the same mathematical activity as the *Ndeleh Mbako* motion.



**Figure 10.** *Molak-Malik* motion

The ninth motion is *Flower* motion. The *Flower* motion symbolizes the flowers produced by the tobacco plant. This motion is done with the position of both hands are in straight elbows position and stay in front of the dancers' face until it crosses the border of the head, while all fingers are open. The position of left foot in *Gejug* is behind the right foot and then do some small steps. Next, both hands are turned so that they stick together between the backs of the hands, their positions are below, precisely in front of the stomach while bending our body. In this motion, it was found that mathematical activities included counting activities, activities to determine the location of the dancer's position at the midpoint, and the mathematical concept of 2D plane on a rectangular floor pattern. Here's a picture of the motion of *Flowers* along with the floor pattern shown in Figure 11 (a) and (b).



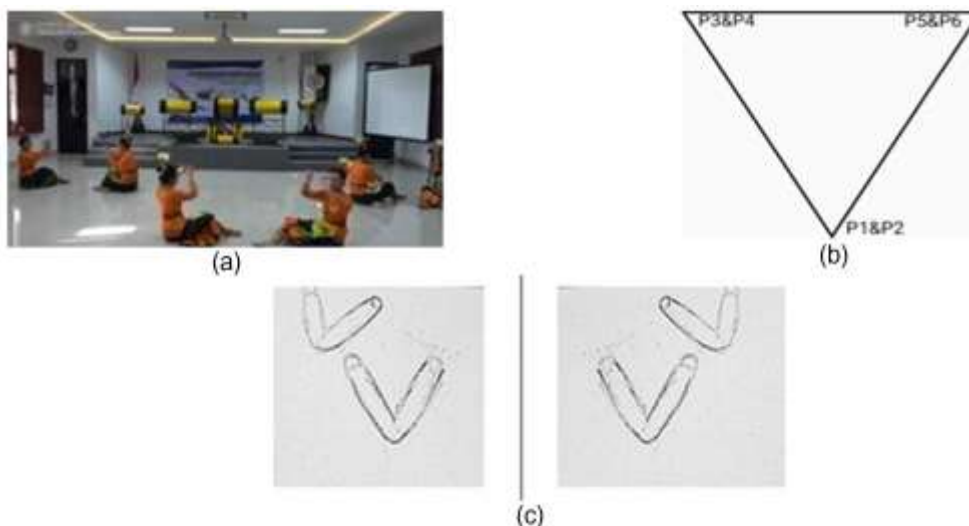
**Figure 11.** (a) *Flower* motion and (b) Rectangular pattern of *Flower* motion

The tenth motion is *Leaf* motion shown in Figure 12. The motion of the *Leaf* is a continuation of the motion of the *Flower*, where the position of the hands stretches out with the wrists bent down. The posture of the body is facing towards the right and then to the left. Next, lift one of the legs and stomp it out next to the other foot for two beats. These motions symbolize the act of cleaning the feet from the dirt. Just like in the motion of the *Flower*, mathematics activity is also found in the motion.



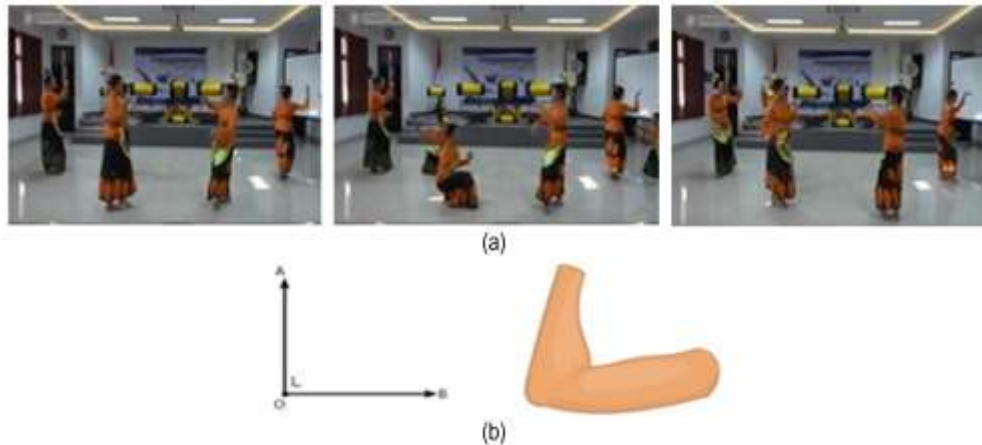
**Figure 12.** Leaf motion

The eleventh motion is *Ngukur* motion shown in Figure 13 (a). The *Ngukur* motion describes the position of measuring tobacco leaves using tools. The motion itself is done carefully in a sitting position to prevent tobacco leaves from being damaged and torn. Mathematics activity is found in the form of counting  $1 \times 8$  or  $2 \times 8$ , and in the activity of determining the location of the middle point dancer which is usually seen from the front benchmark, utilizing a 2D plane concept in the form of a triangle, and its reflection as shown in Figure 13 (b) and (c).



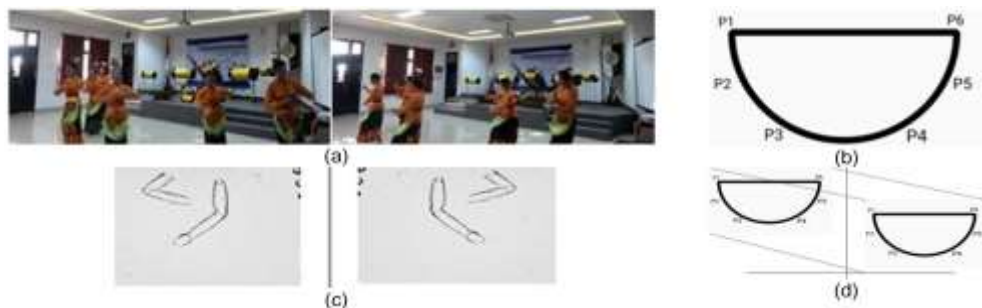
**Figure 13.** (a) *Ngukur* motion, (b) Floor pattern in *Ngukur* motion, and (c) Reflection of hand motion on *Ngukur* motion

The twelfth motion is *Nata 1* shown in Figure 14 (a). The *Nata 1* of *Lahbako* dance is a motion that expresses the meaning of tobacco workers' activities arranging tobacco leaves that have gone through a measurement process. The motion carried out in *Nata 1* motion is by placing both hands in front of the chest forming right triangle, with the right hand is above the left hand, palms facing each other, and then being turned back along with the footwork. The stance of the foot is aligned and then moves *Kengser* to the right. *Kengser* motion is a motion with both soles of the feet treading on the floor and then moving in the desired direction. In *Nata 1*, mathematics activity is found to in the form of counting  $1 \times 8$  or  $2 \times 8$ , and in the activity of determining the location of the middle point dancer, which is usually seen from the front benchmark, utilizing a 2D plane concept in the form of a triangle, and right angles shown in Figure 14 (b).



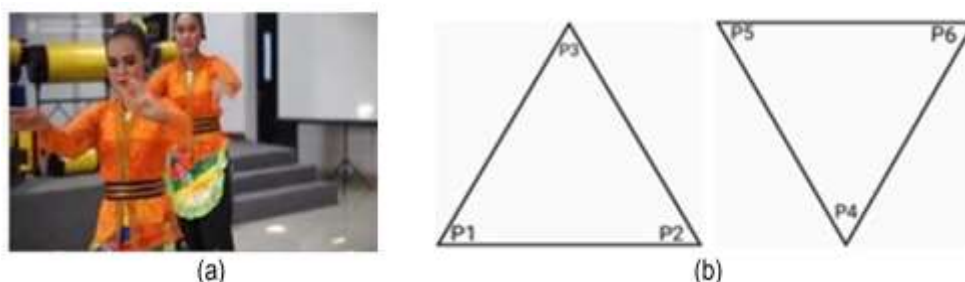
**Figure 14.** (a) *Nata 1* motion and (b) Angles formed by the hand motion

The thirteenth motion is *Nyujen* motions shown in Figure 15 (a). The *Nyujen* motions in the *Lahbako* dance are performed alternately with the right and left hands according to the displacement of the foot. This motion also contains mathematics activity in the form of counting with a count of  $1 \times 8$  or  $2 \times 8$ , determining the position of the dancer at the middle point, forming 2D plane concept which are semicircle, reflection, and translation shown in Figure 15 (b), (c), and (d).



**Figure 15.** (a) *Nyujen* motion, (b) Floor pattern formed in *Nyujen* motion, (c) Reflections on *Nyujen* motion, and (d) Translation on *Nyujen* motion

The fourteenth motion is *Glanthang* motion. *Glanthang's* motions is performed with the legs position aligned. In this motion, mathematics activities are found to include the activity of calculating  $1 \times 8$  or  $2 \times 8$ , the activity of determining the position of the dancer at the midpoint of the location, the mathematical concept of 2D plane in the form of a triangle that appears in the floor pattern. Here's a picture of the dance motion and floor pattern of the *Glanthang* motion is shown in Figure 16 (a) and (b).



**Figure 16.** (a) *Glanthatang* motion and (b) Floor patterns in *Glanthatang* motion

The fifteenth motion is *Ngelus* motion, this motion performed in a sitting position. This motion is commonly done by tobacco workers in tobacco warehouses. The mathematics concepts found in this motion are the same as in *Glanthang* motion. Here's a picture of the dance motion of The *Ngelus* motion is shown in Figure 17.



Figure 17. *Ngelus* motion

The sixteenth motion is *Nata 2* motion shown in Figure 18 (a). The *Nata 2* motion is carried out in standing position with the legs parallel to each other. The position of the hands is in front of the abdomen, hand motions are carried out by alternately opening the hands and then closing them. In this motion, it is found that the activity and concept of mathematics are the same as in *Nyujen's* motion, but there are differences in the reflection shown from the difference in motion, the following can be seen in the Figure 18. (b).

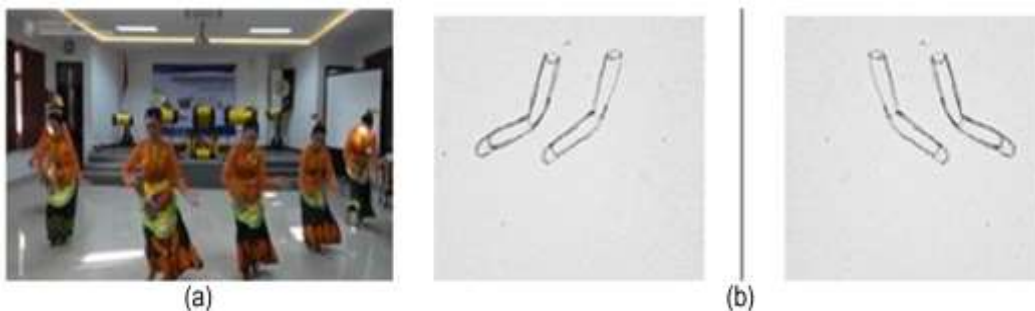


Figure 18. (a) *Nata 2* motion and (b) Reflections on *Nata 2* motion

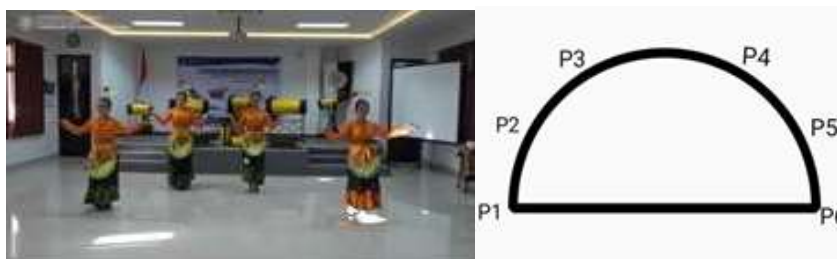
The seventeenth motion is *Nggogroki Regetan* motion shown in Figure 19 (a). The *Nggogroki Regetan* motion is a motion of walking in a place with a fixed foot stance. Like other motions, this motion contains mathematics in the activity of calculating dance motions and determining locations, the difference lies in the floor pattern used is a straight line shown in Figure 19 (b), which all dancer divided into two groups and facing each other.



Figure 19. (a) *Nggogroki Regetan* motion and (b) Floor pattern formed on *Nggogroki Regetan* motion

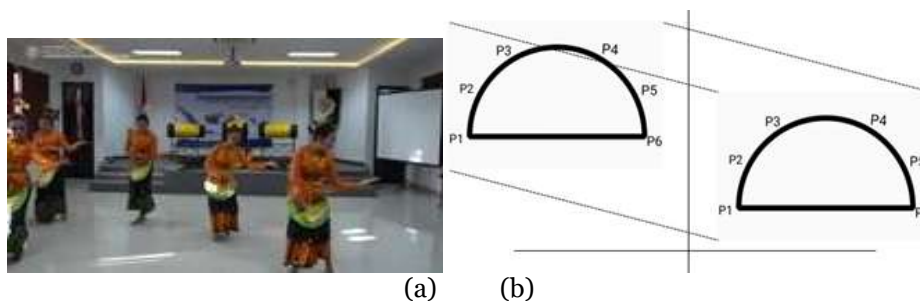
The eighteenth motion is *Keset* motion as shown in Figure 20 (a). This motion has the meaning of cleaning the feet and mopping the floor of the shed after work. In this motion, it is found that the activity and concept of mathematics are the same as in *Nyujen's* motion, but there are differences in the reflection shown from the difference in motion, but the difference lies in the floor pattern that forms a semicircle as shown in figure 20 (b).





**Figure 20.** (a) *Keset* motion, and (b) Semicircular floor pattern formed in *Keset* motion

The nineteenth motion is the motion of *Ngangkat Mbako* as shown in Figure 21 (a), this motion is done with the same hand stance as the *Keset* motion but different in footwork. The legs that are done in the *Ngangkat Mbako*'s motion are small walks with a little step meanwhile, this motion describes the workers who lift tobacco for the delivery process to the next process. Ethnomathematics is found that the activity and concept of mathematics are the same as in *Nyujen*'s motion. But the difference lies in the floor pattern that forms a semicircle is the same as in semicircular floor pattern formed in *Keset* motion as shown in Figure 20 (b). In addition, in the motion of *Ngangkat Mbako* there is a translation process which is shown by the motion of shifting the position of the foot shifting to the right without changing the formation. An overview of the translational forms of the *Ngangkat Mbako*'s motion is shown in the figure 21 (b).



**Figure 21.** (a) *Ngangkat Mbako*'s motion, and (b) Translational images on *Ngangkat Mbako*'s motion

Based on the *Lahbako* dance motions, ethnomathematics elements were found contained in each motion of *Lahbako* dance, namely mathematical activities and mathematical concepts that can be seen in Table 1 and 2.

**Table 1.** Mathematical activities in *Lahbako* dance motion

No.	Ethnomathematics	Mathematical Activities	Dance Motions
1.	Counting	Multiplication count of $1 \times 8$ or $2 \times 8$	<i>Trisig, Front and Back Picking, Walking, Right and Left Walking, Ngelangkahi Galengan, Mbuka' Bopongan, Ndeleh Mbako, Molak-Malik, Flower, Leaf, Ngukur, Nata 1, Nyujen, Glanhang, Ngelus, Nata 2, Nggogroki Regetan, Keset, and Ngangkat Mbako</i>
2.	Determining location	Determining the position of the midpoint so that the position of one dancer with another dancer is balanced	<i>Trisig, Walking, Right and Left Walking, Front and Back Picking, Ngelangkahi Galengan, Mbuka' Bopongan, Ndeleh Mbako, Molak-Malik, Flower, Leaf, Ngukur, Nata 1, Nyujen, Glanhang, Ngelus, Nata 2, Nggogroki Regetan, Keset, and Ngangkat Mbako</i>

Based on the Table 1, dance motions are found that interpret ethnomathematics both in its activities and concepts. Of all the dance motions contained in the *Lahbako* Dance, it is confirmed that it has a counting activity of  $1 \times 8$  or  $2 \times 8$  adjusting to the accompaniment of the song and the area of the stage. Several ethnomathematical explorations in other cultures also show counting activities, such as the dance performance of *Makan Sirih* at the Deli Malay Tribe of North Sumatra Indonesia, tobacco farming activities at Jember, Indonesia, and *Reyog Ponorogo* Indonesia (Paristiwati et al., 2022)(Hasibuan & Br Ginting, 2021)(Sugianto et al., 2019)(Suwarno et al., 2020).

Another mathematics activity is to determine the location interpreted in some of the *Lahbako* dance motions.

Determining the location of the dance is usually indicated by the motions of the dancer when determining his position. The activity of determining the location is also found in the ethnomathematics of catching fish in the Musi River, Indonesia (Malalina et al., 2020) As explained by (Rosa et al., 2016)(D'Ambrosio, 1985) that ethnomathematics uses broad mathematical concepts and is related to various mathematical activities, one of which is determining the location.

**Table 2.** Mathematical concepts in *Lahbako* dance motion

No.	Ethnomathematics	Mathematical Concepts	Dance Motions
1.	2D concept	Hexagon	<i>Trisig</i> , <i>Walking</i> , and <i>Walking to the Right and Left</i>
		Parallelogram	<i>Picking (front and back)</i> , <i>Nglangkahi Galengan</i> , and <i>Mbuka' Bopongan</i>
		Rectangle	<i>Flower</i>
		Triangle	<i>Ngukur</i> , <i>Nata 1</i> , <i>Glanthang</i> , and <i>Ngelus</i>
		Semicircle	<i>Nyujuen</i> , <i>Nata 2</i> , <i>Keset</i> , and <i>Ngangkat Mbako</i>
2.	The concept of lines and angles	Straight lines	<i>Nggogroki Regetan</i>
		Right angle	<i>Nata 1</i>
3.	Geometry transformations	Translation	<i>Front and Back Picking</i> , <i>Nyujuen</i> , <i>Nata 2</i> , and <i>Ngangkat Mbako</i>
		Reflection	<i>Nglangkahi Galengan</i> , <i>Ngukur</i> , <i>Nyujuen</i> , <i>Nata 2</i> , <i>Keset</i> , and <i>Ngangkat Mbako</i>

In the Table 2, mathematical concepts are also found in almost every dance motion in *Lahbako* dance. The first mathematical concepts is 2D concept consisting of hexagon, parallelogram, rectangle, triangle, and semicircle. In hexagonal 2D concept, which is formed on The *Trisig* motion floor pattern and the motion of Walking to right and left. Hexagon shapes are also found in the crafts of *Koli Leaf Weaving* and *Batik Solo* (Faiziyah et al., 2021)(Laurens et al., 2021). The parallelogram was found in the 2nd floor pattern in The *Picking* motion (front and back), *Nglangkahi Galengan* motion, and *Mbuka' Bopongan* motion. In previous research, the concept of 2D plane was also found in the form of parallelograms on *Gajah Mada Batik motif Sekar Jagad* Tulungagung Indonesia and *Geblek Renteng Batik* (Afifah et al., 2020)(Fatkhurohman et al., 2021).

Rectangular shape is visible in the floor pattern in the motion of the *Flower*. In addition, this form is found in other ethnomathematical explorations such as the *Chinese Wall*, *Biak-Papua* traditional houses and musical instruments, *Kandara* musical instruments, and fishing in the Musi River (Zaenuri & Dwidayati, 2018)(Zaenuri & Dwidayati, 2018)(Fredy et al., 2020)(Malalina et al., 2020)(Sroyer et al., 2018)(Tlonaen & Deda, 2021). (Tlonaen & Deda, 2021) explained this concept can implemented in mathematics learning such as in the discussion of two-dimensional shape. The concept of 2D triangles was found in the motion of *Ngukur*, the motion of *Nata 1*, the motion of *Glanthang*, and the motion of *Ngelus*. In the ethnomathematical exploration of Batik Solo, (Faiziyah et al., 2021) also succeeded in finding the shape of a triangle. So, the triangle shape is not only found in the ethnomathematics of traditional dance but can also be found in other cultural forms. The semicircular shape shown in the floor pattern in *Nyujuen* motion, *Nata 2* motion, *Keset* motion, and *Ngangkat Mbako* motion. This is also found in the form of the *Sumur Gumuling* Tamansari and traditional *Wayang* performance in Surakarta (Narulita et al., 2019)(Nur Alvian et al., 2021).

The second mathematical concepts is the concept of lines and angles consisting straight lines and right angle. For the concept of a straight line in *Lahbako* dance, it is found in the motions of the *Nggogroki Regetan* which is formed from the floor pattern of the dancers. In line, (Maryati & Prahmana, 2018)(Maryati & Prahmana, 2018) discovered the concept of lines in the *Kebaya Kartini*. (Syarmadi & Izzati, 2020) also managed to find this concept in traditional games. While the concept of angle in the position of the hand motion of the *Lahbako* dance dancer is in the form of a right angle in *Nata 1* motion. The concept of angles is also found in ethnomathematical explorations of other cultures, such as the *Batik Ceplok*, *Kebaya Kartini*, and traditional house *Ume Kbbubu* (Maryati & Prahmana, 2018)(Pramudita & Rosnawati, 2019)(Tlonaen & Deda, 2021).

The third form of ethnomathematics is the discovery of geometric transformations in *Lahbako* dance, namely translation and reflection. Translation is found in four dance motions, namely in *Picking* motion, *Ngangkat Mbako* motion, *Nata 2* motion, and *Nyujuen* motion. As for the reflection on *Lahbako* dance, it lies in *Nglangkahi Galengan* motion, *Ngukur* motion, *Nyujuen* motion, *Nata 2* motion, *Keset* motion, and *Ngangkat Mbako* motion. The concept of transformation (translation and reflection) is also found in the ethnomathematics of *Anyaman Bambu* motifs (Maryati & Prahmana, 2018).

Based on the exploration of ethnomathematics, it is interpreted that the implementation of mathematics can be applied in community culture that can be found in everyday life. The results of this exploration can be used as a learning resource for students and directly introduce local culture to students (Syarmadi & Izzati, 2020). As reported by (Wiryanto et al., 2022). that ethnomathematics can help learning mathematics. In line with

(Wiryanto et al., 2022), (Shahbari & Daher, 2020) reported that through ethnomathematics-based learning, students were successful in constructing the concepts of congruence and congruent triangles.

#### 4. Conclusion

Based on the findings and discussions, it was concluded that from the results of ethnomathematics exploration in Lahbako dance, it was found that ethnomathematics elements include mathematical activities in the form of counting and determining locations, and mathematical concepts in the form of; 2D planes including hexagons, parallelograms, rectangles, triangles, and semicircles; right angles and straight lines; and geometric transformations include translation and reflection. The used by subsequent researchers with a different research focus. In addition, it can be implied in cultural-based mathematics learning with different topics, in addition to increasing student understanding. Through ethnomathematics, student can also be motivated to preserve local culture in Indonesia.

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