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Ethnomathematic Exploration Of Minangkabau *Batik Tanah "Liek"* (Clay Soil Batik)

Isnaniah[1*)], M. Imamuddin[2)]
[1,2)]Universitas Islam Negeri Sjech M. Djamil Djambek Bukittinggi

*Corresponding Author
Email: isna_imam@yahoo.com

Abstract

Ethnomathematics in mathematics learning is becoming a trend in Indonesia. Learning mathematics with ethnomathematics is nothing but introducing and learning mathematical concepts through local culture. This research belongs to qualitative research with an ethnographic approach. The purpose of this research is to explore the mathematical concepts found in batik tanah like (clay soil batik). Data in this study were collected by observation, documentation and interviews. Data analysis was carried out with the steps of data reduction, presentation, interpretation, and exposure. The result of this research is that in the motifs of batik tanah "liek" many geometry concepts are found such as: point, line, curved line, parallel line, triangle, rectangle, square, circle, angle, opposite angle, symmetry and kesebangunan. Different motifs have different geometry concepts. The findings of geometry concepts in batik tanah "liek" can be used as a learning resource in learning mathematics. Using learning resources that are in accordance with student culture can make learning meaningful and can increase love for local culture.

***Keywords**: Ethnomathematics, Exploration, Clay soil batik, Minangkabau*

INTRODUCTION

Ethnomatematics is a subject that studies or examines the relationship between mathematics and culture (Sianturi et al. 2022; Isnaniah & Imamuddin, 2022; Isnaniah et al. 2021; Pathuddin & Nawawi, 2021). Ethnomatematics is the study of certain patterns of mathematics that develop in people's life activities (Suprayo, et al. 2019; Hartinah et al. 2019). Ethnomathematics is closely related to the mathematical mindset and culture of the local community which can be integrated into the school curriculum (Lidinillah et al. 2022). Ethnomatematics can be used in an approach to learning mathematics in schools and is very promising for students in learning mathematical concepts and student culture (Peni & Baba, 2019). In short, ethnomathematics is a learning approach that can be used in learning mathematics in schools that involves local culture (local student culture).

Moreover, ethnomathematics can play a role in preserving local culture and being able to foster scientific progress (Permata et al. 2021; Nuryadi et al. 2020). Learning by involving local culture (ethnomathematics) is very important in learning mathematics (Putra & Mahmudah, 2021). Learning mathematics using ethnomathematics really helps students understand mathematical concepts (Widada et al. 2018; Zayyadi, 2017). For this reason, learning using ethnomathematics can be used as an option to be utilized in learning mathematics at school so that learning mathematics becomes beneficial for the local culture (Manoy & Purbaningrum, 2021; Ilyyana & Rocmad, 2018). Ethnomathematics is not only a hereditary inheritance but can be used as a means of learning mathematics (Isnaniah et al. 2021).

In learning mathematics, there have been many previous researchers who studied ethnomathematics in Indonesia. There are those who explore mathematical concepts, use ethnomathematics as a learning resource, the role of ethnomathematics in learning

mathematics, and others. Such as, a research conducted by Isnaniah et al (2021) which explored mathematical concepts in *Tenun Pandai Sikek* Minangkabau, Zayyadi (2017) explored mathematical concepts in *Madura batik*, Rahmawati & Muchlian (2019) and Irianti et al (2022) explored or studied mathematical concepts on the *Rumah Gadang*, and Risdiyanti and Prahmana (2017) explored Javanese culture. Therefore, as for those who use ethnomathematics in learning mathematics as practiced by Isnaniah & Imamuddin (2022) develop mathematical literacy questions with the Minangkabau cultural context, and Fitriza (2020) used math LKPD with Minangkabau cultural insight in learning mathematics. Prahmana & D'Ambrosio, (2020) learning geometry and moral values in the Yogyakarta *batik*-making process.

In the light of previous lines, learning mathematics with ethnomathematics has become a trend in Indonesia. Learning mathematics by using ethnomathematics as a learning resource requires special skills in understanding existing concepts. For this reason, it is necessary to analyze in depth when the mathematical concepts contained in the culture make it easier to use in learning. Exploring mathematical concepts contained in culture is an important part of knowing ethno-mathematics which is still rarely disclosed. Previous researchers have carried out many explorations of mathematical concepts in community culture, such as a research conducted by Zayyadi (2017) exploring mathematical concepts in Madurese *batik*, exploring mathematical concepts in *Tenun Pandai Sikek* of Minangkabau (Isnaniah, et al. 2021). The difference between this research and previous research is the object being explored, such as research conducted by Isnaniah et al (2021) the subject is *tenun songket* Minangkabau, Zayyadi (2017) the subject is Madurese *batik*. Furthermore, a research conducted by Fitriza et al (2020), the subject is *Rumah Gadang* and *tenun* used in worksheets for learning mathematics. Whereas in this study the subject was Minangkabau clay batik. *Tanak liek batik* is the result of the culture of the Minangkabau people who have not been exposed to mathematical concepts and have not been used as a source of learning. According to this point, it is necessary and very important to expose the mathematical concepts that exist in Minangkabau *Batik Tanah Liek*. By knowing the mathematical concepts found in *Batik Tanah Liek* Minangkabau, it makes easier for educators to use it as a learning resource in learning mathematics. The position of this research is none other than to enrich studies related to ethnomathematics and to preserve local culture.

RESEARCH METHODS

This study uses qualitative research with an ethnographic approach where an ethnography is used to describe, explain and analyze cultural elements of a society or ethnic group. The subject of this study was *Batik Tanah "liek"* (soil batik) of Minangkabau. *Batik Tanah "liek"* (soil batik) is one of the cultural results of the Minangkabau people besides the popular songket weaving. Besides, researchers used informants to obtain in-depth information. The informants used in this study were historians/culturalists from the UIN Bukittinggi, namely lecturers in the Minangkabau Natural Culture course. The instrument used in this research is the researcher himself; the researcher acts as the main instrument that cannot be represented by other people. Researchers played a direct role as data collectors. Data was collected through library data, interviews, observation, and documentation.

Furthermore, data analysis techniques were carried out by doing data reduction, data presentation, data interpretation, and data presentation. The steps are as follows: Data reduction is a step to convert recorded data or images into written form and select the necessary and unnecessary data. Furthermore, the presentation of data, the presentation of data includes compiling data and organizing data from the information that has been collected so that it can

be well organized and meaningful, the data presented was data from the results of data reduction. After the data is presented based on the results of data reduction, the next step was the process of interpreting the data through data analysis. Finally, all the results of data analysis were be presented which are representative of the results of the answers to the research questions of the study.

RESULT AND DISCUSSION

D'Ambrosio (2001) explains about mathematics contained in the culture of society (Ethnomatematics). D'Ambrosio explained that there are mathematical concepts practiced in everyday life. Among them, the concept of geometry appearing in the cultural arts of batik, weaving *(tenun)* and traditional games. In brief, ethnomathematics in this study is a community activity carried out continuously for a long time so that it becomes a local culture in which there are mathematical concepts. Another study on ethnomathematics is the exploration and analysis of geometric concepts on wall decorations in Lesotho and other areas around South Africa (Gerdes, 1999). *Sotho* women often adorn their walls with symmetrical ornaments. The result of this work is called *Litema*. These ornaments, called Litema, form mutually symmetrical shapes. Thus, ethomathematics is develop according to the cultural development of its users. The more bigger the local culture, the more advanced are the mathematical concepts in that area.

Moreover, concepts are abstract ideas that can be used to classify an object. This is in line with what was conveyed by Skemp (1990) that a concept is an abstract idea that can be used to group or classify a set of objects. Therefore, concepts are formed from a number of experiences that have something in common. Thus, to form a concept requires a number of experiences that have something in common.

The similarity of experience in a society produces a new concepts. Such as the experience of the Minangkabaunese in producing the work of the local community, one of which is *Batik Tanah Liek* (clay soil batik). *Batik Tanah Liek* is a typical Minangkabau batik. It uses *liek* soil as a dye in addition to *jengkol* shell, *rambutan* shell and *gambier*. The cloth is first soaked for a week with *liek* soil, then washed and given other natural dyes derived from plants. The base color, which tends to be beige or light brown, is obtained from the result of soaking the cloth in a clay liquid solution.

The use of *Batik Tanah Liek* motifs can be used to introduce mathematical concepts (geometry) to students in learning mathematics. The geometrical concepts found in *Batik Tanah Liek* are shown in the figures below.

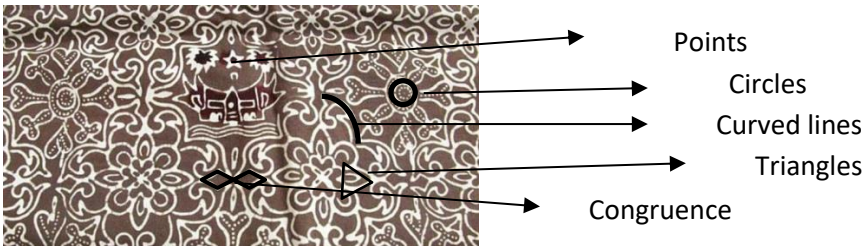

Figure 1.

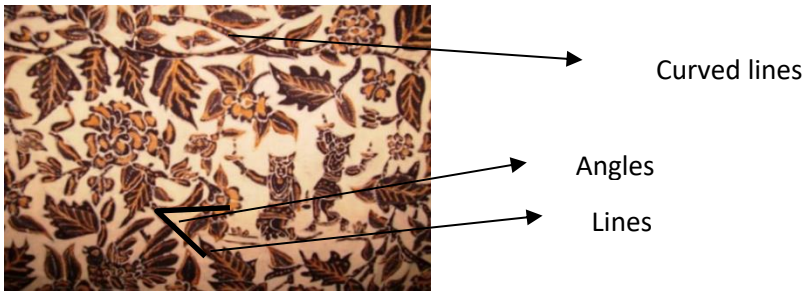

Figure 2.

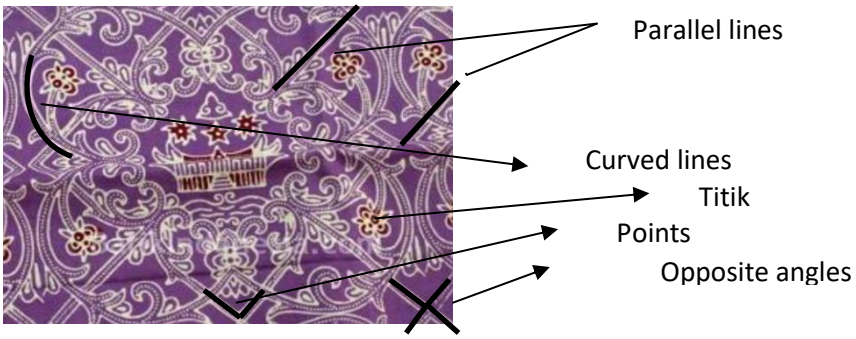

Figure 3.

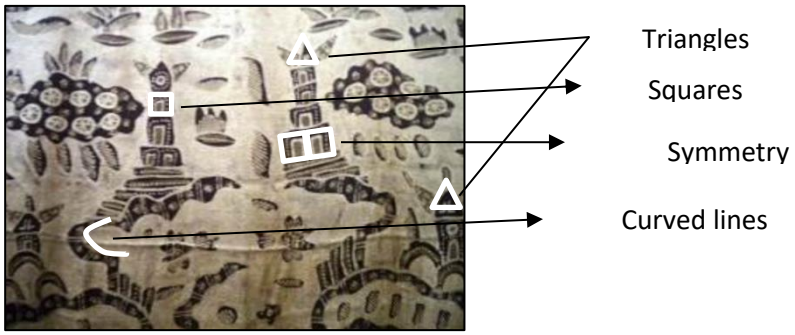

Figure 4.

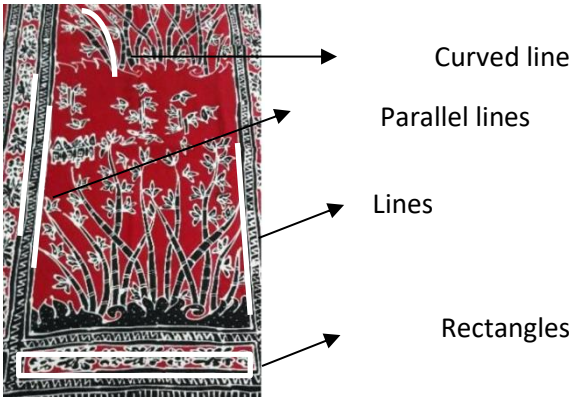

Figure 5.

Based on the results of the analysis and mapping of mathematical concepts *(geometry concepts)* contained in the Tanah Liek batik as a whole are presented in Table 1 below.

Table 1. Geometry concepts found in *Batik Tanah Liek*

No	Konsep Geometri	Keterangan
1	- Points - Curved lines - Triangles - Circles - Congruence	Figure 1
2	- Lines - Curved lines - Angles	Figure 2
3	- Points - Curved lines - Parallel lines - Angles - Opposite angles	Figure 3
4	- Curved lines - Triangles - Squares - Symmetry	Figure 4
5	- Lines - Curved lines - Parallel lines - Rectangles	Figure 5

Based on the use of mathematical concepts in several *Batik Tanah Liek*, it can have an impact as a learning tool as a learning resource in this case. Geometry concepts such as points, lines, triangles, circles, symmetry and others can be directly observed and felt directly and are real in student culture found in Batik Tanah Liek in this case. Learning directly to concrete objects can make it easier for students to understand the geometric concepts studied. Learning by using concrete learning resources such as learning media can make it easier for students to learn concepts, (Imamuddin et al. 2020). Therefore, learning mathematical concepts using concrete objects will help students learn rather than learn abstract concepts.

In line with the previous ideas, therefore, learning by using student culture can help students learn contextually according to the development of students' thinking and the characteristics of the mathematical concepts being studied. Learning by using *Batik Tanah Liek* media as a learning resource can make students happy. This is because students learn directly from their own culture so that learning becomes more meaningful. This is in accordance with what was conveyed by Zayyadi (2017) that learning by using local culture is more meaningful for students. In addition, learning by using student culture fosters a sense of love for culture which in the end this love will be able to preserve local culture. Students are closer to their culture, and are able to see and understand the interrelationships between culture and mathematics, (Radiusman, & Juniati, 2022). Meaningful learning through the learning resources of *Batik Tanah Liek* makes students quickly understand and understand the mathematical concepts being studied and be able to develop students' positive character.

CONCLUSION

Based on the results of the study, ethno-mathematics in Minangkabau culture has its own characteristics as found in "land-liek batik". Many geometrical concepts are found in the motifs of *"Batik Tanah Liek"* such as: points, lines, curved lines, parallel lines, triangles, rectangles, squares, circles, angles, opposite angles, symmetry and congruence. Different motifs have different geometric concepts. The findings of geometric concepts in *Batik Tanah Liek* can be used as a source of learning in learning mathematics. Using learning resources that are appropriate to the local culture of students can make learning meaningful and can increase a sense of love for their own culture.

Based on these findings, it is suggested to prospective teachers and mathematics teachers, especially the Minangkabau community, to use this *Batik Tanah Liek* as a learning resource. For example, it is used in developing Student Worksheets (LKPD) or Mathematics Learning Modules or in developing other mathematics teaching materials.

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