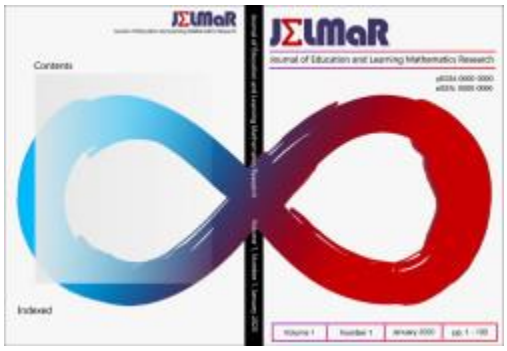

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Exploring Ethnomathematics On The Batik Patterns Of Jember In Mathematics Concept

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***Abstract**: This study aims to identify and describe mathematical concepts and describe the results of ethnomathematics exploration contained in Jember batik motifs. The type of research used in this study is qualitative research with an ethnographic approach. The research instruments used were observation, tests, and interviews with batik artisans. The results of this study indicate that the combination of coffee bean and tobacco leaf motifs has applied mathematical concepts of geometry. In the motif of coffee beans and tobacco leaves from the Nhora Pangetu hand-written batik production house, there are mathematical concepts of curves, points, circles, and the concept of dilation. The motif of coffee beans and tobacco leaves from the Gangsar Ngaidin batik production house contains mathematical concepts of reflection (mirroring), congruence, and flat shapes of circles, triangles, and rhombuses.*
***Keywords**: Ethnomathematics, Batik Jember, Math Concepts*

INTRODUCTION

Mathematics in Dutch is referred to as "wiskunde," which means exact science. Mathematics can generally be understood as a discipline related to the reasoning process (Utami & Ulfa, 2021). By exploring mathematical knowledge, one can improve thinking skills and face various challenges in everyday life. Some people's views state that mathematics often feels far from applications in real life, so many find it difficult to understand (Dimpudus et al., 2019). This finding is in line with the results of research (Fachrunnisa & Sari, 2023), which shows that most people consider mathematics only as a matter of calculation without paying attention to its relationship with everyday life or culture.

Mathematics in the school curriculum is often presented in a form that needs to be more formal and theoretical. As a result, students often find mathematics uninteresting, boring, and irrelevant to their daily lives. Therefore, a contextualized learning approach is needed, where teachers help students relate mathematical material to real situations and encourage them to apply this knowledge daily. Culturally-based learning is also essential, where mathematics materials are linked to local culture to make learning more exciting and meaningful for students (Ayuningtyas & Setiana, 2019). One type of mathematics learning approach that integrates cultural aspects and students' daily lives is ethnomathematics.

Ethnomathematics" is often defined as research on the relationship between mathematics (mathematics education) and the social and cultural backgrounds concerned, i.e., research that shows "how mathematics is produced, transferred, disseminated and specialized in diverse cultural systems" (Zhang & Zhang, 2010). Ethnomathematics is the use of mathematical concepts by a community of individuals from various cultural backgrounds (Setianti et al., 2022). Ethnomathematics refers to mathematics influenced or derived from culture (Mulyani et al., 2020). D'Ambrosio, a mathematician from Brazil, first introduced ethnomathematics in 1977. In the context of mathematics learning, ethnomathematics includes various fields that correspond to natural patterns or systems of abstract ideas governed by society. In ethnomathematics, mathematics is considered an

integral part of human culture and is applied in various aspects of life, including art, music, architecture, systematic knowledge, and daily routines (Wardah et al., 2023). It can be concluded that ethnomathematics is a research field that explores the relationship between mathematics and culture, starting from understanding the way of thinking and mathematical systems used by a community group.

One form of ethnomathematics we can find in the surrounding environment is batik. Batik in Indonesia has various types and motifs. Among the various batik motifs scattered in various regions in Indonesia, Jember batik stands out with its unique motifs. In general, Jember batik motifs are inspired by the natural resources in Jember Regency, such as tobacco, cocoa, coffee, bamboo, dragon fruit, birds, butterflies, rambutan pandan, Pasadena, and others. Batik motifs are not only a part of local culture found in the community. Batik motifs can also be associated with student math learning at school. The importance of learning mathematics encourages educators to provide suitable quality materials for students to trigger their interest in learning mathematics. This is considered one of the strategies to improve learning (Saldi et al., 2023). By utilizing batik motifs, we can develop mathematical questions that are rooted in local wisdom, enabling students to connect the concepts to everyday life situations (Putra Dwi & Laili, 2019).

Based on preliminary observations that researchers have made in two batik production houses in the Jember area, namely the Nhora Pangestu and Gangsar Ngaidin hand-written batik production houses, various types of batik with various motifs have been developed by artisans. The types of batik motifs that the two batik artisans's houses have developed are the types of fusion motifs from several typical motifs of the Jember district, such as a combination of coffee beans and tobacco leaves, flower motifs and tobacco leaves, bird motifs and tobacco leaves, bamboo motifs and tobacco leaves, and many other types of fusion batik motifs that artisans have developed. Of the types of fusion motifs that exist, researchers are interested in the similarity of the fusion of the types of motifs used by both craftsmen, namely the motif of coffee beans and tobacco leaves.

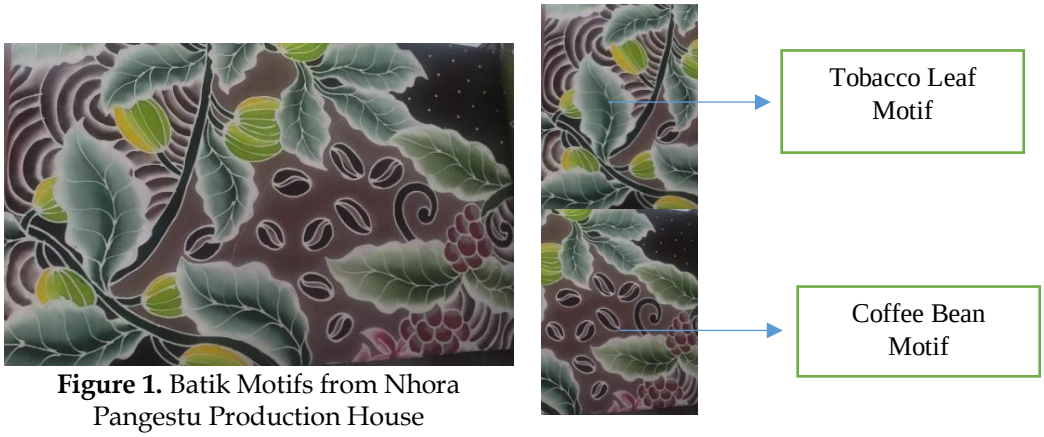

Figure 1. Batik Motifs from Nhora Pangestu Production House

Figure 2. Batik Motifs from Gangsar Ngaidin Production House

Based on the picture 2 motif of coffee beans and tobacco leaves, the researcher found that mathematical concepts are contained in it, such as the concept of geometry. With this discovery, this type of motif researchers use as an object of research to explore more deeply the mathematical concepts contained in batik motifs, especially the concept of geometry. The geometry concepts found in this batik motif can later be used as an exciting study about ethnomathematics-based contextual learning.

Previous researchers have conducted some studies on the exploration of ethnomathematics. Some of these studies include "Exploration of the Concept of Ethnomathematics Dilation in Jember Tobacco Batik" by (Noviani et al., 2021), "Exploration of Ethnomathematics in Lebak Batik Motifs in Terms of Philosophical Values and Mathematical Concepts" by (Mahuda, 2020), and "Exploration of Ethnomathematics in Tanjungpinang Riau Islands batik gonggong motifs" by (Sahilda & Izzati, 2020), and several other similar studies. The results of these studies show that in the various types of batik studied, there are mathematical elements such as obtuse angles, acute angles, circular planes, symmetrical concepts, concepts of similarity and congruence, as well as concepts in geometric transformations such as translation, reflection, rotation, and dilation. However, in these studies, no one has examined the geometry concepts of combining coffee bean and tobacco leaf motifs. Exploration of geometric concepts in batik motifs will provide a new understanding of mathematical concepts in culture. The results of this study can be used as a foundation for learning development. Thus, students Will learn more about and appreciate their culture and realize that mathematical concepts are related to everyday life.

Based on the description above, the researcher wants to explore the relationship between the results of ethnomathematics exploration on Jember hand-written batik motifs and mathematical concepts, especially geometry concepts, contained in the combination of coffee bean and tobacco leaf motifs. Therefore, this research will be titled "Exploration of Ethnomathematics in Jember Written Batik Motifs Viewed from Mathematical Concepts." This study aims to identify mathematical concepts and explain the results of ethnomathematics exploration contained in Jember's hand-written batik motifs.

METHOD

This research uses a qualitative method with an ethnographic approach. Ethnography describes, explains, and analyzes cultural aspects of a community or ethnic group. Ethnography is a part of Anthropology that thoroughly describes the culture of a community, tribe, or nation based on field research.

The main instrument in this research is the researcher himself, where the role of the researcher cannot be replaced. The subject of this research is a variety of batik motifs obtained from 2 batik artisans, namely from the Nhora Pangestu Batik Tulis Production House located in Tirtoasri Hamlet, Andongsari Village, Ambulu District and Gangsar Ngaidin Batik Production House located on Jl. KH Wachid Hasyim, Cantikan, Kauman, Kepatihan, Kaliwates District. The subject selection technique in this research is purposive sampling, where the sample is taken from data sources that know the information relevant to the researcher's needs. Data collection methods include observation, interview, and documentation.

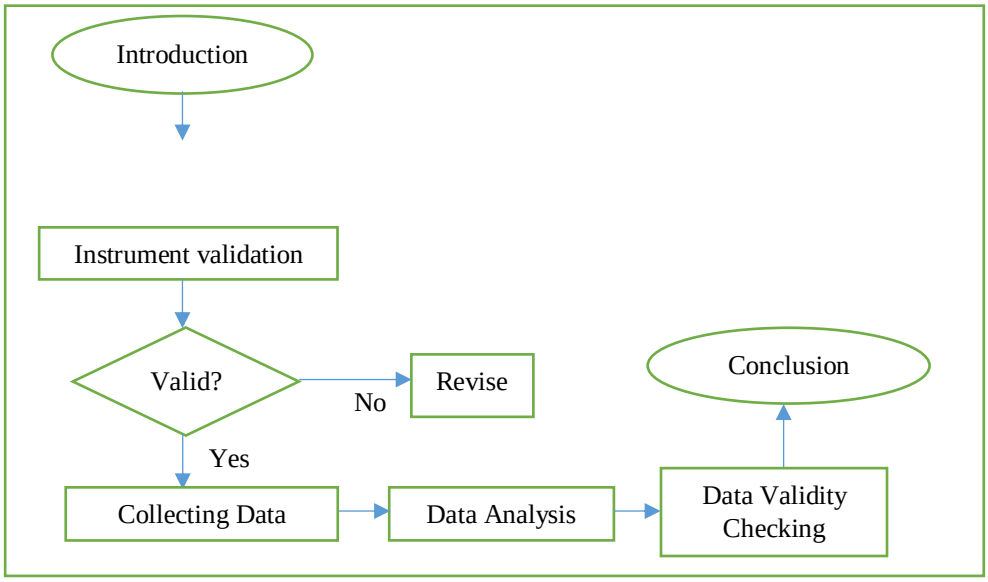

Figure 3. Research Procedure

Data validity checking carried out in this study uses source triangulation. Source triangulation is carried out to test the credibility of data by checking data that has been obtained from various sources, namely from observations, interviews, and documentation.

RESULT AND DISCUSSION

The results showed that ethnomathematics are found in Jember batik motifs. Ethnomathematics in Jember batik motifs are reflected in the pattern of motifs on the batik cloth. Some Jember batik motifs can be used to introduce mathematical concepts. According to information from batik artisans, Jember batik motifs have many variations. However, this article only discusses some batik motifs considered to have mathematical concepts. Based on the researcher's observation, in the combination of batik motifs of coffee beans and tobacco leaves, mathematical concepts such as geometry were found to be applied by batik artisans in the production houses of Nhora Pangestu and Gangsar Ngaidin. Furthermore, the mathematical concepts of geometry found in the images of coffee bean and tobacco leaf motifs are described in the following figure:

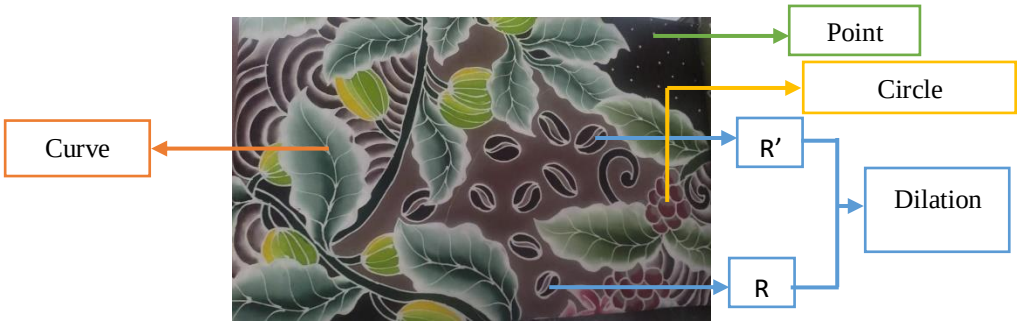

Figure 4. Coffee Bean and Tobacco Leaf Motifs of Nhora Pangestu's Batik

Based on the picture above, the batik motif of coffee beans and tobacco leaves from the Nhora Pangestu hand-written batik production house has mathematical geometry concepts, including curves, points, circles, and the concept of dilation. The concept of dilation seen in the picture is the process of changing the size of batik motifs to be larger or smaller and then putting them together to create a more aesthetic batik motif. The concept of dilation that can be observed in the picture is mainly seen in the coffee bean motif R, which, if enlarged, will become R'.

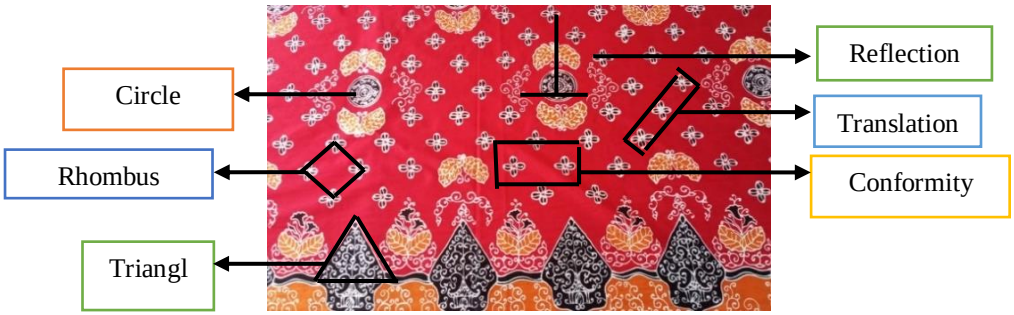

Figure 5. Coffee Bean and Tobacco Leaf Motifs of Gangsar Ngaidin Batik

Furthermore, in Figure 5, the motifs of coffee beans and tobacco leaves from the Gangsar Ngaidin batik production house found mathematical concepts such as reflection (mirroring) on tobacco leaves and translation and congruence on coffee bean motifs. In addition, there are also geometry concepts of flat shapes of circles, triangles, and rhombuses.

Based on the results of the research that has been carried out, it is evident that among the many batik motifs from Jember, which are studied focusing on two batik motifs, namely coffee bean and tobacco leaf motifs, geometric mathematical concepts were found. The mathematical concepts found in these batik motifs are, of course, one of the essential parts of being able to start making ethnomathematics as an alternative to optimizing preserving culture into Mathematics learning. The simplest form is to apply a specific learning model assisted by ethnomathematics with one of the goals of improving mathematics learning achievement. (Aprilyani & Hakim, 2020) Stated that the application of ARIAS learning assisted by ethnomathematics significantly affected students' mathematical problem-solving skills. That way, it is likely that students can achieve much better math learning achievement.

Based on the previous explanation, here is the utilization of mathematical concepts contained in several motifs of Jember Batik tulis, especially in the motif of the combination of coffee beans and tobacco leaves:

1. Studying various motifs of Jember's hand-drawn batik, especially the combination of coffee beans and tobacco leaves such as circles, triangles, and rhombuses, can help strengthen students' understanding. This approach is more effective than directly understanding these shapes because students tend to understand them abstractly without being related to real contexts. These geometric shapes can be applied daily, especially in Jember batik tulis. In addition, the concepts of congruence, points, curved lines, and geometric transformations such as dilation, translation, and reflection can also be found in the motifs of Jember batik tulis.
2. Thus, learning mathematics in the classroom will become more meaningful because students will feel familiar with the material. After all, it is already known and found in their cultural environment. In addition, mathematics learning should be adapted to the characteristics of the concept, the level of thinking development of students, and the relevance of the material in everyday life. Mathematics learning should also follow

common pedagogical principles, which start from concrete experience to abstract understanding, from simple to complex, and from accessible to difficult. This approach is based on the Ausebel Theory, which states that related information will facilitate understanding similar concepts in subsequent learning. Therefore, it is essential to pay attention to the specificity of the concept, the level of development, and the relevance of the material in learning mathematics.

The information in the two batik motif images of a combination of coffee beans and tobacco leaves from both batik production houses in the Jember area contains mathematical concepts. From the research results that have been presented above, there are at least some concepts that can be taken into a series of geometry learning. The mathematical concepts contained in the two batik motifs include the concept of points, curved lines, flat shapes of circles, triangles, rhombuses, congruence, and geometric transformations (dilation, translation, and reflection).

The application of mathematical concepts identified in the research results showed similarities with findings in other studies. For example, research by (Zayyadi et al., 2017) revealed the presence of geometric elements in Madurese batik. Similarly, research by (Karimah et al., 2019) found the concept of geometry transformation, such as translation and reflection, in Gajah Oling batik motif design. Research by (Harahap and Mujib, 2022) also found mathematical concepts of geometry and geometric transformations in Medan batik. With the discovery of several mathematical concepts in batik motifs in previous studies, ethnomathematics is very good when used to develop the quality of mathematics learning in the classroom. Through ethnomathematics, students and teachers work together to carry out a comprehensive series of mathematics learning. (Zulaekhoh & Hakim, 2021) Stated that ethnomathematics in learning Mathematics is closely related and has a positive impact on students to understand, especially culture is a real thing and lives hand in hand with society, so ethnomathematics is a good and innovative bridge for teachers to provide comprehensive material in learning Mathematics.

CONCLUSION

Based on the results and discussion above, it can be concluded that in the combination of Jember handmade batik motifs, namely coffee bean and tobacco leaf motifs, there are concepts of mathematics concepts, including the concept of points, curved lines, flat circles, triangles, rhombuses, congruence and geometric transformations (dilation, translation, and reflection). Based on the research findings, the researcher recommends utilizing this natural wealth by adapting the ethnomathematics contained in Jember batik motifs in classroom learning. One suggestion is to introduce Jember's distinctive culture, especially Jember batik, to the learning process. Understanding their regional culture is expected to increase students' interest in learning mathematics. Furthermore, further research is expected to examine the development of regional culture-based learning models or the application of learning processes that integrate regional culture.

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REFERENCES

Aprilyani, N., & Hakim, A. R. (2020). The Effect of Assurance, Relevance, Interest, Assessment, Satisfaction Learning Assisted by Ethnomathematics on Problem Solving Ability. JNPM (National Journal of Mathematics Education), 4(1), 61. https://doi.org/10.33603/jnpm.v4i1.2549

Ayuningtyas, A. D., & Setiana, D. S. (2019). Development of Mathematics Teaching Materials Based on Ethnomathematics of Yogyakarta Palace. AKSIOMA: Journal of Mathematics Education Study Program, 8(1), 11-19. https://doi.org/10.24127/ajpm.v8i1.1630

Dimpudus, A., Carolina, A., & Ding, H. (2019). Exploration of Ethnomathematics in Dayak Culture as a Mathematics Learning Resource at SMP Negri 1 Linggang Bigung West Kutai.

Fachrunnisa, Y. N., & Sari, C. K. (2023). Exploration of Geometric Transformation Concept in Batik Melati of Kebon Village, Bayat. AKSIOMA: Journal of Mathematics Education Study Program, 12(1), 294-304. https://doi.org/10.24127/ajpm.v12i1.5961

Harahap, L., & Mujib, A. (2022). Exploration of Ethnomathematics in Medan Batik Motifs. Journal Ability: Journal of Education and Social Analysis, 3(2), 61-72..

Karimah, S., Sugarti, T., Yudianto, E., Setiawan, T. B., & Trapsilasiwi, D. (2019). Interesting Findings from the Exploration of Ethnomathematics in Gajah Oling Batik Based on Geometric Concepts. Saintifika Department of PMIPA FKIP, University of Jember, 21(1), 52-59.

Mahuda, I. (2020). Exploration of Ethnomathematics in Lebak Batik Motifs in Terms of Philosophical Values and Mathematical Concepts. Lebesgue Journal: Scientific Journal of Mathematics Education, Mathematics and Statistics, 1 (1). https://doi.org/10.46306/lb.v1i1

Mulyani, E., Natalliasari, I., Siliwangi, J., 24, N., Tasikmalaya, J., & Barat, I. (2020). Exploration of Ethnomathematics of Batik Sukapura. Musharafa: Journal of Mathematics Education, 9(1). http://journal.institutpendidikan.ac.id/index.php/mosharafa

Noviani, D., Amalia, D., & Djamali, M. F. (2021). Exploration of Ethnomathematics Dilation Concept in Jember Tobacco Batik. Prismatics: Journal of Mathematics Education and Research, 4(1)..

Putra Dwi, E., & Laili, N. (2019). Implementation of Discovery Learning Model with Local Wisdom Based Problem to Improve Mathematics Learning Outcomes. Gammath Journal, 4(1).

Sahilda, Y., & Izzati, N. (2020). Exploration of Ethnomathematics of Batik Motif Gonggong Tanjung Pinang Riau Islands. Al Khawarizmi: Journal of Mathematics Education and Learning, 4(1).

Saldi, J., Lutfiyah, & Anas, A. (2023). Development of Geometry Teaching Materials in the Lato-Lato Game.

Setianti, S., Gatra Hanafiani, L., Devianti, V., Wahyuni, S., Kusuma, J. W., & Khan, F. (2022). Jurnal Internasional Penelitian Multidisiplin Dan Literatur Motif Tirtayasa, Kepandean Dan Kawangsan Pada Batik Banten Dalam Teori Matematika. Jurnal

Internasional Penelitian Multidisiplin dan Literatur IJOMRAL, 1(3), 241-360. https://doi.org/10.53067/ijomral.v1i3

Utami, Y. P., & Ulfa, M. (2021). Mathematics Education Students' Understanding of Online Lectures on the Philosophy and History of Mathematics. In MATHEMA JOURNAL E-ISSN (Vol. 3, Issue 2).

Wardah, N., Panglipur, N., & Putra, I. D. (2023). Ethnomathematics of Lahbako Dance Movement In The Perspective Of Mathematical Literacy Of Geometry Concept. *Journal of Education and Learning Mathematics Research (JELMaR)*, *4*(2), 144. https://doi.org/10.37303/jelmar.v4i2.118

Zayyadi, M., Jalan, A., Panglegur, R., & Pamekasan, K. M. (2017). Exploration of Ethnomathematics in Madura Batik.

Zhang, W., & Zhang, Q. (2010). Ethnomathematics and its Integration in Mathematics Curriculum. Journal of Mathematics Education © Education for All, 3(1), 151-157. https://journalofmathed.scholasticahq.com/article/90460.pdf

Zulaekhoh, D., & Hakim, A. R. (2021). Analysis of Ethnomathematics Studies on Mathematics Learning Referring to Javanese Culture. JPT: Journal of Thematic Education, 2(2), 216-226. https://siducat.org/index.php/jpt/article/view/289