Geometry Transformation and Values on Lampung Batik Motifs

by Binti Anisaul

---

e- ISSN: 2442 - 4226

Check for updates

Geometry Transformation and Values on Lampung Batik Motifs

Noerhasmalina[1], Binti Anisaul Khasanah [2*]

[1] Department of Mathematics Education, Universitas Muhammadiyah Pringsewu, Lampung, Indonesia

[2] Department of Mathematics Education, Universitas Muhammadiyah Pringsewu, Lampung, Indonesia

[*] Correspondence: bintianisaul@umpri.ac.id

© The Author(s) 2022

Abstract

Culture is something this is carefully associated with regular lifestyles, such as withinside the discipline of education. Indonesia has numerous cultures, such as in Lampung Province. This cultural variety may be used to discover a few mathematical standards to convey arithmetic toward the fact and perceptions of its human beings. Therefore, this observes ambitions to discover mathematical standards, mainly the subject of geometric transformation in Lampung batik motifs. This study is a qualitative study with an ethnographic approach. The techniques used in this study are observation, literature review, and interviews with Lampung cultural and batik craftsmen, especially for Lampung motifs. Observations were made by observing batik activities and Lampung batik motifs as well as conducting interviews to find the mathematical and philosophical elements contained in them. The data were then completed and checked for correctness based on the results of the literature review. The outcomes of this observation imply that the idea of geometric transformation is utilized by the human beings of Lampung in making batik motifs which include the Siger batik motif, the tree of life motif, and the ship motif. The idea of geometric transformation used is reflection, dilation, and translation.

Keywords: Ethnomathematics; Geometric Transformation; Lampung Batik Motif; Philosophies.

1

Introduction

Indonesia is an archipelagic country that is rich in culture. In addition to its large quantity, Indonesia's diverse culture requires its people to continue to preserve and maintain its authenticity from time to time. The thing that can be done to preserve culture is by growing awareness and a sense of belonging and love for one's own culture, especially for the next generation of the nation (Nahak, 2019). However, it is undeniable that culture is something that is closely related to everyday life, including in the field of education, especially in the field of mathematics. In this case, the social characteristics and cultural context in the student's environment can improve students' ability to build their knowledge of mathematics (Sharma & Orey, 2017).

Ethnomathematics is a program that uses cultural media to explore mathematical phenomena which are then directed to the pedagogical realm (Choirudin et al., 2020). Ethnomathematics makes a major contribution to the preservation of the nation's culture in education, furthermore, learning mathematics that is applied by using ethnomathematics as part of the activities carried out at school makes students better understand the benefits and uses of mathematics in everyday life to increase learning motivation students', student activity during mathematics learning activities, as well as the value of learning outcomes, students, especially in mathematics subjects (Kencanawaty et al., 2020). The implementation of ethnomathematics can change the paradigm of children and society that mathematics has a relationship with daily activities and mathematics has a relationship with culture and can be learned in a fun way (Risdiyanti & Prahmana, 2018).

Understanding knowledge about culture is done through observation, comparison, classification, evaluation, quantification, measurement, calculation, representation, and inference in each region and culture, then ethnomathematics is the name given to all of the various knowledge systems that have emerged as a result of the discovery of mathematical concepts in this culture (Prahmana & D'Ambrosio, 2020). Revealing the ideas contained in certain cultural activities or certain social groups to develop a mathematics curriculum for, with, and by these groups, it can be done through ethnomathematical research so that mathematics can have different forms and develop according to the development of the user community (Prabawati, 2016). Ethnomathematics can also be used as a solution to bridge formal mathematical concepts with the cultural diversity that exists in society (Nur et al., 2021).

In Indonesia, research on ethnomathematics has been widely carried out by academics including Exploration of Ethnomathematical Trusmi Cirebon Batik to Reveal the Values of Philosophy and Mathematical Concepts (Arwanto, 2017), Ethnomathematics on ancient wells in Kaliwadas Village, Cirebon and its relation to mathematics learning in schools (Noto et al., 2018), Ethnomathematics at temple Ratu Boko as a supporter of learning realistic mathematics (Rani, 2018), Ethnomathematics of Lampung Tapis Exploration as a Learning Resource to Protect Cultural Heritage (Dewi et al., 2019), Learning Geometry And Values From Patterns: Ethnomathematics on The Batik Patterns Of Yogyakarta, Indonesia (Prahmana & D'Ambrosio, 2020), Ethnomathematics on Cassava Leaf Painting Batik at

2

Daweea Batik Bondowoso Production House (Yudianto et al., 2020), Ethnomathematics on Tapis Fabrics and Lampung Traditional Houses (Loviana et al., 2020) and several others. Some of these studies have not discussed ethnomathematics in Lampung batik motifs and their philosophy.

Lampung, which is one of the provinces in Indonesia, has a unique cultural variety that can be studied in terms of mathematics, one of which is the typical Lampung batik motif. Several previous studies that have been described previously examined the ethnomathematics of various regional cultures, including Lampung, but in this case the researchers conducted an ethnomathematical study specifically on the geometric concept for each type of Lampung batik motif. Studies on the application of geometric transformations have been carried out by Fadila (2017), but these studies are still general for Lampung batik motifs. Meanwhile, in this study, the author examines the Lampung batik motif in particular and explores the geometric concepts contained in the motif.

Batik is a picture cloth that is specially made by writing a motif with wax on the cloth and then processing it through a certain process. Lampung Batik is the result of the development of Indonesian batik which takes motifs from the characteristics of traditional characters of Lampung, one of which is the Lampung tapis woven fabric. The batik craftsmen in Lampung chose decorative patterns on filter woven fabrics as a source of inspiration. Besides being unique to the people of Lampung, the decorative variety of tapis woven fabric is seen as more exotic because it looks like it was in the stone age era (Fadila, 2017). Therefore, in this article, the author explores the geometry of various Lampung batik motifs. However, due to the limitations of researchers and the diversity of typical Lampung batik motifs, the authors only limit their exploration to the Lampung siger batik motif, the ship batik motif, and the tree of life batik motif. Thus, it is hoped that this research can be a reference for further research to explore other Lampung batik motifs.

Methods

Ethnographic research is the method used in this study. This study examines the culture that exists in society, especially in the Lampung Batik motif. This research is included in ethnomathematical research because it aims to explore mathematical concepts and moral values contained in Lampung batik motifs. The data in this study were collected through field studies and interviews. The observation technique was carried out by researchers to find out data in the field regarding ethnomathematics in Lampung batik motifs. Researchers conducted observations by observing the activities of batik Lampung Batik motifs in Andanan batik Lampung and observing Lampung batik motifs to find the mathematical elements contained in them. In this study, the researchers conducted interviews with purposively selected sources, namely Mr. Humaidi, a humanist and retired employee of the Lampung Cultural Park, and Mr. Hidayatulloh, a typical Lampung batik craftsman as well as an entrepreneur who owns Andanan Batik Lampung. Mr. Humaidi is a native of the Lampung tribe who was raised in an environment and family that is very strong in maintaining Lampung culture. Since his youth, he has been involved in many cultural activities in Lampung, such as dance, music, and other Lampung cultural arts, including the tapis culture and Lampung batik. Since graduating from

high school, he started serving and was accepted as a civil servant at Taman Budaya Lampung Province. Through his place of work, he became a pioneer in preserving Lampung culture. While Mr. Hidayatulloh is a native of the Lampung tribe who was born and raised in an environment that is thick with Lampung culture. After graduating from the Strata 2 program in mathematics education, he began to explore Lampung batik through various training. In 2018 he pioneered the Lampung batik craft business under the name Andanan Batik Lampung. Apart from having a business in Lampung batik, Mr. Hidayatulloh has also been a resource person both locally and nationally, such as from the ministry of tourism and creative economy, the ministry of industry, and so on. Because Mr. Hidayatulloh has the expertise and is also an academic in the field of mathematics education, he also develops his batik products by applying mathematical knowledge to the batik cloth he produces. The type of interview used by the researcher is a semi-structured interview. Questions in semi-structured interviews are freer and more flexible in their implementation when compared to structured interviews. In conducting interviews, researchers still use interview guidelines but can be developed conditionally when conducting questions and answers. This is so that when conducting interviews, the open and non-rigid situation is created. Interviews were conducted with two sources, namely Mr. Humaidi and Mr. Hidayatulloh who were deemed able to provide in-depth information regarding Lampung batik motifs.

In additionIn order to complete the findings of these interviews and observations, the researcher also carried out a review of the relevant literature on Lampung batik. Photos, videos, and field notes document all data. Furthermore, source triangulation methods were used to look at the data to see if there was a connection between mathematical concepts and values in Lampung batik motifs. The triangulation technique was carried out by comparing the data obtained from the results of field observations, interviews, and the results of a literature review on mathematical concepts and values in Lampung batik motifs. The last step is to describe the data to investigate each study finding.

This research is limited to informants who have the same background, in this case, are native Lampung people, use the same language, namely Lampung language, have the same administrative area, namely being in Pesawaran Regency, Lampung Province, and experienced the same historical experience, namely history when living, grow and develop in Lampung. There are seven main descriptions produced in ethnographic research, namely language, technological system, economic system, social organization, knowledge system, art, and religion (Koentjaraningrat, 2015). In this study, the knowledge system is the primary focus of the research. This is due to the fact that researchers must observe and investigate the community's knowledge and art system in order to discover the fundamental knowledge used in the process of making batik motifs and the cultural values incorporated into the art of batik motifs.

In the process of this research, the researcher uses an ethnographic research design adopted from the research design designed by Prahmana & D'Ambrosio (2020) which can be seen in Table 1 below:

Table 1. Ethnographic Research Design

General Questions	Initial Answers	Starting Point	Specific Activity
Where to start looking?	The Lampung people are responsible for the production of batik motifs, which incorporate mathematical techniques.	Culture	Interviewing members of the Lampung community who are familiar with Lampung culture or who make batik motifs in Lampung
How to look?	Analyzing the Quantitative, Relational, and Spatial (QRS) aspects of Lampung residents' mathematics-related batik motif making practices.	Alternative thinking and knowledge system	Find out what QRS concepts the Lampung people use to make batik motifs in activities that are related to math practice
What it is?	Evidence (The outcomes of the previous process's alternative thinking)	Philosophy of mathematics	Identifying QRS characteristics in the mathematics-related activity of making batik motifs in Lampung society. It demonstrates that the process of creating batik motifs for the Lampung people does have a mathematical aspect, as evidenced by the components of knowledge and art systems that are utilized in everyday life.
What does it mean?	Valued important for culture and important value patterns for mathematics	Anthropologist	Describe the relationship between the two systems of mathematical knowledge and culture. Describe mathematical conceptions that exist in the activity of making batik motifs for the people of Lampung.

Results

Besides Lampung tapis, Lampung also has a distinctive cloth that is also famous, namely Lampung batik. Although both come from Lampung and are made of cloth, Lampung batik is different from Lampung tapis. Tapis Lampung uses gold thread and is embroidered, while Lampung batik is written with this batik candle is called "Malam". Besides being used to attend official events, the people of Lampung also use this batik cloth for casual events or it has even become a patterned cloth used in daily life according to its fashion design (Hidayatulloh, 2021; Humaidi, 2021). In 2021, based on circular letter number: 045.2/3672/07/2021 regarding the adjustment of the use of official clothing for state civil servants in the Lampung Province environment, it is stated that Fridays are set to wear the Lampung Batik Daily Service Clothes (PDH) (Gubernur Lampung, 2021). This makes Lampung batik official clothing and mandatory clothing in the local government environment, including the educational environment. In addition, Lampung batik has also become a mandatory uniform for students in schools in the province of Lampung (Hidayatulloh, 2021; Humaidi, 2021). This can be seen in Figure 1 below:
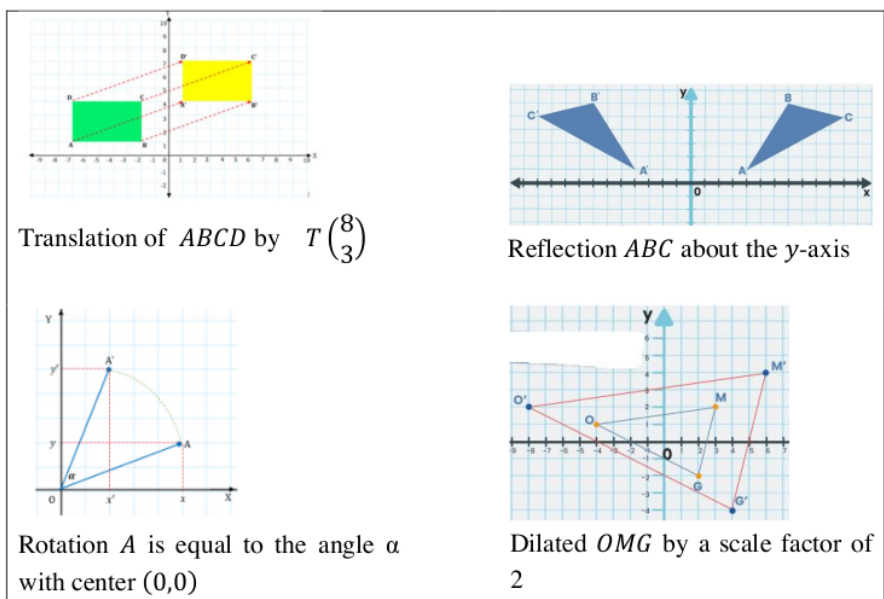

Figure 1. Lampung Batik as School and Service Uniforms as Well as Lampung People's Fashion

Lampung batik was brought by the Javanese people who lived in Lampung for a long time because batik came from the Java area. The origins of the birth of batik in Indonesia are related to the development of the kingdoms of Majapahit, Solo, and Yogyakarta (Trixie, 2020). The process of migration of the Javanese to Lampung officially began in 1905 in the colonization program and continued until the government of the Republic of Indonesia the frame of the transmigration program (Budianto, 2020). Furthermore, the Javanese people adapted the existing culture in Lampung so that more and more batik cloth appeared with typical Lampung motifs called Lampung batik. Lampung batik began to develop in the 1970s which was pioneered by Andrean Sangaji (a Lampung culturalist).

Lampung is famous for having an island with a million Siger. In addition to the siger, there is also a Lampung elephant which is a characteristic of the Lampung area. Thus, the people of Lampung developed siger and elephant images on filter cloth and batik. In addition, the most famous Lampung batik motifs are the boat/ship motif and the tree of life or the tree of life. These two motifs are very distinctive for Lampung culture and are Lampung's trademarks in the eyes of the international community because they are found in several museums in Australia, Hawaii, and America (Fitinline, 2013). Due to the diverse

characteristics of Lampung culture, Lampung batik also has various motifs including the Siger motif, ship, tree of life, elephant, butterfly, sembagi, gamelan, pramadya style, and others. Some of the oldest motifs include the ship motif and the tree of life, while one of the most famous Lampung regional icons is the Lampung siger. Thus, considering the limitations of the author, the authors limit the study of exploratory geometric transformations to three motifs, namely the siger motif, the boat/ship motif, and the tree of life motif.

Geometric transformation is a part of the geometry that discusses changes, both changes in location and presentation based on images and matrices (Iswahyudi, 2003). The making of Lampung batik cannot be separated from the role of the science of geometric transformation which has been taught in schools. Simple things of transformation such as translation, reflection, rotation, and dilation can be applied to make batik, especially the Lampung batik motif (Fadila, 2017). Translation is a transformation that moves points on a plane with a certain direction and distance; reflection is a transformation that moves each point on the plane by using the properties of the image by a mirror; rotation is a transformation that moves points by rotating them by an an angle α to a certain point; and dilation is a transformation that change the distance of the points by a certain multiplier to a certain point. This can be seen in Figure 2 below:

Translation of $ABCD$ by $T\begin{pmatrix}8\\3\end{pmatrix}$

Reflection ABC about the y-axis

Rotation A is equal to the angle α with center $(0,0)$

Dilated OMG by a scale factor of 2

Figure 2. Transformation Geometry Concept

Value and Geometry Transformation in Lampung Siger Batik

Motifs Lampung siger batik motifs are very popular in Lampung society. This batik motif reflects the hallmark of Lampung, namely siger. Everyone who wears this batik motif is very proud because the beautiful batik is siger from Lampung (Novitasari, 2020). Siger is a crown for the bride of Lampung which has a bilaterally symmetrical shape, displaying to the left and

right. The siger has a specific number of specific indentations that characterize the region of origin of the siger. Siger is the Saibatin custom who lives in coastal areas has seven curves which mean seven adoq (traditional titles in the Saibatin community), namely suttan/dalom/pangeran (kepaksian/marga), raja jukuan/depati, inner, radin, minak, kimas, and mas/itton. Whereas in the Pepadun custom, the siger has nine indentations which symbolize the existence of nine clans (abung siwo megou) (Deslima, 2021). The siger symbol for Lampung women and its application to Lampung batik motifs can be seen in Figure 3 below:

Figure 3. Siger and Lampung Siger Batik Motifs

The siger motif in Lampung batik symbolizes the strength behind the softness (feminism) of a woman. There is hard work, independence, persistence, and so on behind the softness of a woman. Although the people of Lampung adhere to the patrilineal or patrilineal lineage. However, the vigor of a woman is important, which at the same time inspires and drives the progress of her life partner (Humaidi, 2021; Deslima, 2021).

Besides batik motifs that have a philosophy, the Lampung siger batik motif also uses the concept of geometric transformation in the form of reflection and translation as shown in Figure 4.

Reflection   Translation and Dilation
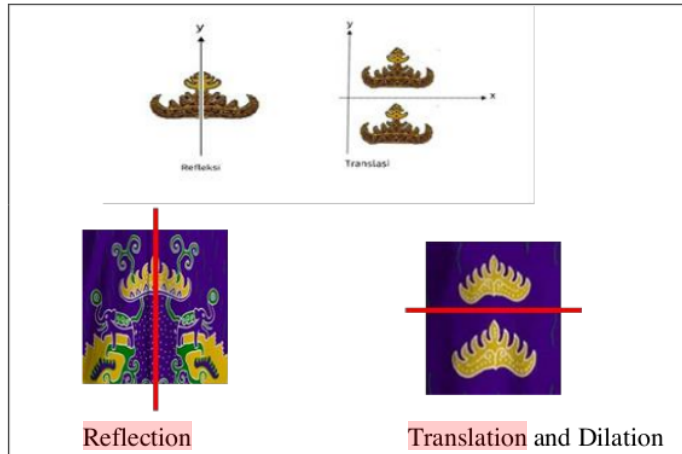
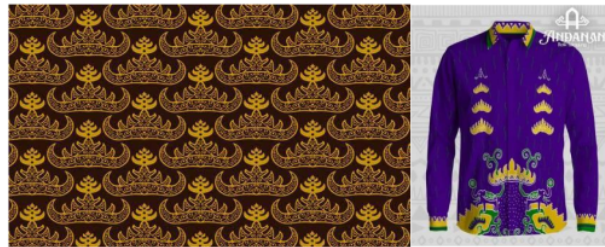**Figure 4**. Geometry Transformation of Lampung Siger Batik Motifs

Figure 5. The Motif of Batik Siger Lampung

Values and Geometry Transformations in Kapal Batik

Motifs This ship (Kapal) batik motif symbolizes the Lampung area which is bordered by water areas. This motif describes the characteristics of Lampung (Novitasari, 2020). The Ship motif contains a deep philosophy, which symbolizes harmony, balance, and interrelationships between human life and the natural surroundings (Humaidi, 2021). As shown in the following excerpt from the interview with Mr. Humaidi:

R : What do you think is the philosophy of this ship's batik motif, sir?

H : Well, ma'am, the Lampung area is mostly water, so there are a lot of people who make a living as fishermen. In this way, this ship became one of the characteristics of the people of Lampung. This ship also has a philosophy, Ms. If you see that the ship is balanced, it symbolizes the harmony between its citizens and indicates that humans and nature are interrelated.

Besides batik motifs that have the philosophy, the ship batik motif also uses the concept of geometric transformation in the form of reflection, translation, and dilation as shown in Figure 6.
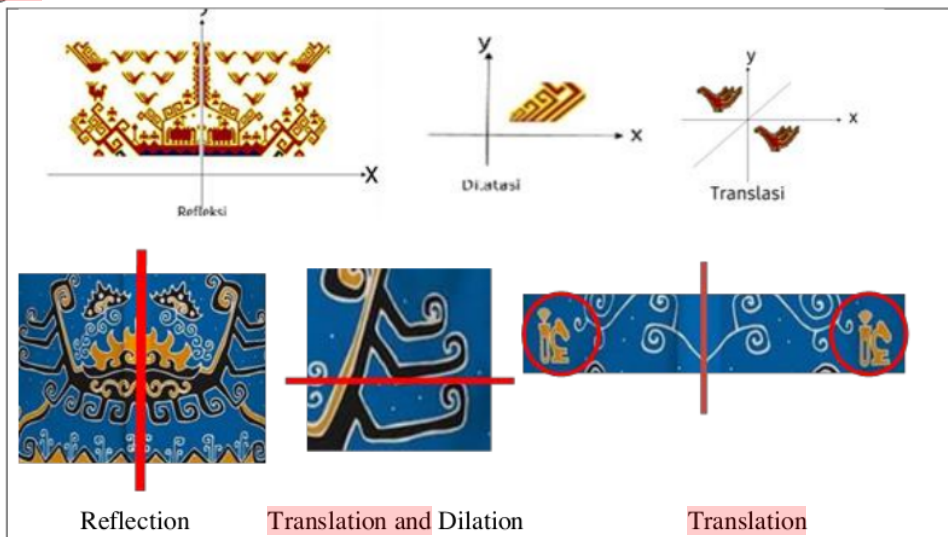

Reflection   Translation and Dilation   Translation

Figure 6. Geometric Transformation of a Ship/kapal in Batik Motifs

Figure 7. Batik Motif of Ship (Kapal)

The Value and Geometry Transformation of the Tree of Life (Pohon Hayat)

The tree of life batik motif has a deep philosophy for the people of Lampung. The tree depicted here is a symbol of life with the curtains of life. Usually, this cloth is used for subordinates by women as a complement to clothing (Novitasari, 2020). The tree of life motif symbolizes unity and God Almighty as the creator of the universe (Humaidi, 2021). In addition, the tree of life also symbolizes a person's ability to place himself in a people who can determine his life path (Isbandiyah & Supriyanto, 2019). The batik motif also employs the idea of geometric transformation in the form of reflection, in addition to having a philosophy, as shown in Figure 8.
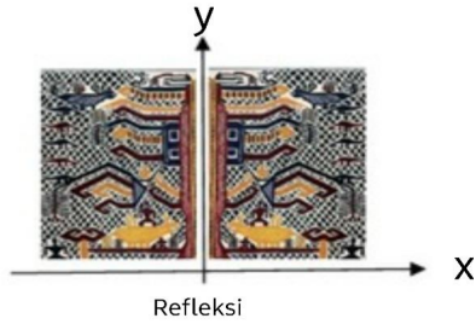
Figure 8. Geometry Transformation of the tree of life (Pohon Hayat) Batik Motif

Figure 9. Batik Motif of tree of life (Pohon Hayat)

10

Discussion

The findings of the investigation into the application of mathematical concepts to the production of Lampung batik motifs demonstrate that the inhabitants of Lampung have made use of the idea of geometric transformation. The concept of this geometric transformation has been self-taught and creative ideas have emerged in making Lampung batik motifs based on their experience in the batik process (Hidayatulloh, 2021). This indirectly shows the application of mathematics in a culture that is often known as ethnomathematics. Even the results of ethnomathematic exploration have been used to teach mathematics in Indonesian schools. As with several results of the development of teaching materials and learning tools that have been carried out by several researchers that can be used in mathematics learning, including-based geometry transformation teaching materials *discovery learning* through an ethnomathematical approach (Fitriyah et al., 2018), the development of geometric transformation worksheets with the Lampung filter motif. (Khasanah & Fadila, 2018), the development of teaching materials characterized by the ethnomathematics of the Komering tribe in elementary school students (Nelawati et al., 2018) ethnomathematics in the traditional engklek game and its tools as teaching materials (Aprilia et al., 2019), the development of worksheets Timor woven ethnomathematics-based student work on number pattern material (Disnawati & Nahak, 2019), development of ethnomathematical-based teaching materials for one-variable linear equations and inequalities (Lakapu et al., 2020), and development of ethnomathematical-based teaching materials on geometric transformation materials (Nurmaya et al., 2021). This demonstrates that ethnomathematics-based mathematics instruction can alter students' perceptions of the connection between mathematics and their own culture and real-world experiences, thereby reducing mathematics anxiety (Prahmana & D'Ambrosio, 2020). Some of these research have been successful in incorporating ethnomathematical investigation into the design of mathematics instruction, which has been demonstrated to increase student comprehension and make them feel that the mathematics they study has more significance.

In addition, the results of this study also show that every Lampung batik motif has moral values that can be reflected in everyday life regarding symbols of strength, balance, and unity (Humaidi, 2021). In addition to the use of Lampung tapis, the Lampung batik motif itself also marks the characteristics of the Lampung region, so that people can use Lampung batik as a symbol of their regional identity (Hidayatulloh, 2021; Humaidi, 2021). The use of Lampung batik as a uniform in the world of education can also be used as a concrete medium in introducing the application of mathematical concepts in everyday life (Hidayatulloh, 2021).

Thus there is no doubt that mathematics is closely related to culture. In this case, ethnomathematics can be used as an effort to introduce culture to the younger generation and maintain its sustainability. The results of this study are expected to be a contribution for further research to develop ethnomathematics-based mathematics learning tools, especially geometric transformation materials in Lampung batik motifs.

Conclusion

Ethnomathematics makes a major contribution to the preservation of the nation's culture in education. Ethnomathematics can be used as a means of preserving culture through learning and can even be an element in the mathematics education curriculum in Indonesia. The inhabitants of Lampung frequently use the idea of geometric transformation to create batik motifs like the siger batik pattern, the tree of life motif, and the boat/ship motif. The concepts of geometric transformation used are reflection/reflection, dilation/scaling, and translation/shift. In addition, Batik Lampung also has a history, philosophy, and moral values contained in each motif. These principles, such as the importance of God Almighty, unity, harmony, balance, and the strength of women's femininity, can be seen in daily life. This ethnomathematical study of the culture of the Lampung batik motif can be used as a starting point in introducing culture to students in Lampung and throughout Indonesia through learning mathematics.

Conflicts of Interest

There are no conflicts of interest in the publication of this work, according to the authors. Furthermore, the authors have addressed all instances of plagiarism, misconduct, data fabrication and/or falsification, multiple publication and/or submission, and redundancy in great detail.

Author Contributions

Author One: Data collection and data analysis; **Author Two:** Writing, Data collection and data analysis.

References

Geometry Transformation and Values on Lampung Batik Motifs

9 Internet Source   <1 %

10 Submitted to Syiah Kuala University
Student Paper   <1 %

11 repository.radenintan.ac.id
Internet Source   <1 %

12 ejournal.unsri.ac.id
Internet Source   <1 %

13 "The Effect of SSCS Learning Model on Reflective Thinking Skills and Problem Solving Ability", European Journal of Educational Research, 2020
Publication   <1 %

14 mdpi-res.com
Internet Source   <1 %

Exclude quotes	Off		Exclude matches	Off
Exclude bibliography	On			