

**Learning Transformation Geometry and Values from Batik Patterns: Ethnomathematics on  
Sukapura Tasikmalaya Batik Patterns, West Java, Indonesia**

Comment [ANV1]: Judul seharusnya...

Comment [ANV2]: Sudah dilakukan revisi terkait dengan perubahan judul yang tidak perlu mencantumkan tempat

**ABSTRACT**

Culture is the result of human creation and work which is ultimately preserved from generation to generation. The current study of mathematics shows that a person's cultural activities can be seen in mathematics itself. Through this research, it is hoped that there will be a mathematical review of making Sukapura Tasikmalaya Batik motifs. This research uses ethnographic research. Data obtained through observation, interviews and field notes collected by researchers. The respondents interviewed were batik makers from Tasikmalaya and cultural figures from Sunda. The research results show that the Sukapura Tasikmalaya batik motif is in accordance with the concept of geometric transformation. Apart from having concepts related to mathematical geometry, every batik motif has philosophical value which is a mandate from the motif maker which has been passed down from generation to generation to the current generation. This philosophical value is a positive value that is a guide for the people living in the land of Sukapura Tasikmalaya.

**Keywords:** batik motifs, Sukapura culture, geometric transformation, local values.

**INTRODUCTION**

**The problem of learning mathematics cannot be separated from how teachers are able to activate students in learning so that they are able to increase student activity in learning which is ultimately able to improve abilities in mathematics. Apart from that, there needs to be a correlation between mathematics learning and the context experienced by students so that mathematics becomes meaningful learning. The contextual learning indicates the learning activities are experienced as part of life (Samo et al., 2018). On the other hand, the cultural aspect is important so that students are able to inherit the culture that exists in their**

## respective regions and are able to preserve that culture even through learning mathematics.

Learning that includes cultural elements in learning was developed by (D'Ambrosio, 2007) known as ethnomathematics. Ethnomathematics is basically mathematics that is implemented in certain cultures, from ordinary people to working groups. Therefore, the meaning of ethnomathematics can be broader if it is connected to this understanding. However, with the existence of research on culture in mathematics, the definition that has developed regarding ethnomathematics is that ethnomathematics is mathematics that is practiced by certain cultural groups, such as those carried out by community groups or tribes or even professional community groups.

Table 1 Ethnomathematics Desain Research

No	Desain	Background	Detail

Comment [ANV3]: Table terbuka

*Ethnomathematics is a meeting point between pedagogical anthropology which seeks to help and understand diverse mathematical ideas from the cultural practices of a community to be studied academically so that they are useful in learning. Therefore, the mathematics learning curriculum must be culturally charged so that it can provide experience to students, apart from gaining knowledge about mathematics itself, it can also harmonize knowledge with the cultural practices around it. This is confirmed by opinion (D'Ambrosio & Rosa, 2017) which states that the aim of ethnomathematics is that there is another way of understanding mathematics by considering the knowledge that exists in certain groups of society and by considering the activities of people in certain groups related to grouping, calculating, measuring and designing building patterns for that group of people. The development of ethnomathematics in learning is supported by none other than research (Barton, 1996; Herawaty et al., 2019; Muhtadi et al., 2017; Supiyati et al., 2019) which concludes that mathematical knowledge in a culture plays an important role in life and preserving the culture itself, meaning that ethnomathematics can be a tool in constructing the culture that develops in that society. Care needs to be taken in constructing these activities into formal knowledge in mathematics, this is so that there are no misunderstandings that occur in formal knowledge.*

Comment [ANV4]: Rata tengah

*Indonesia is known as a thousand cultures. Culture in Indonesia has distinctive characteristics that differ from one region to another. The diverse culture that exists in Indonesia allows opportunities to be used as a means of learning mathematics so that it can provide a different learning atmosphere, apart from teaching mathematics, you can also get to know your own regional culture. The various cultures that exist in Indonesia which are conveyed in mathematics learning have been reported by many researchers, including (Muhtadi et al., 2017; Prahmana & D'Ambrosio, 2020; Rasna & Tantra, 2017; Suryawan, 2017; Widada et al., 2019).*

---

Culture in Indonesia is very diverse and rich, with different characteristics in each region. This diversity includes everything from language, customs, traditional arts, to beliefs and cultural values. This diversity provides a great opportunity to integrate cultural aspects in mathematics learning. Tasikmalaya as a city in the West Java region and is an East Priangan area which has a variety of cultures, several areas still apply the cultural order that is still in force, including Kampung Naga. Several studies conducted in Naga villages were reported by [\(LIDINILLAH ET AL., 2022; NUR'AENI ET AL., 2020; TURMUDI ET AL., 2021\)](#) SHOWS THAT SEVERAL ACTIVITIES THAT HAVE BEEN PASSED DOWN FROM GENERATION TO GENERATION ARE STILL PASSED DOWN TO THE CURRENT GENERATION, MANY OF WHICH ARE RELATED TO MATHEMATICAL CONCEPTS IN SCHOOLS, APART FROM THAT, THROUGH MATHEMATICS LEARNING THAT LINKS IT WITH CULTURE, IT CAN PROVIDE MEANINGFUL AND CONTEXTUAL LEARNING CONCEPTS AND INSTILL CULTURAL VALUES THAT EXIST AROUND US. APART FROM THAT, RESEARCH ON ETHNOMATHEMATICS IN TASIKMALAYA WAS ALSO FOUND WHICH WAS DOCUMENTED BY [\(AZAHRA & MUNAHEFI, 2022; PRABAWATI, 2016\)](#), WHO RESEARCHED THE TYPICAL TASIKMALAYA GEULIS UMBRELLA WITH BAMBOO CRAFTS IN RAJAPOLAH TASIKMALAYA.

[IN THIS RESEARCH, THE RESEARCHER AIMS TO EXPLORE THE SUKAPURA BATIK MOTIF WHICH IS CHARACTERISTIC OF TASIKMALAYA, THEN CARRY OUT AN ANALYSIS OF THE MORAL MESSAGE REGARDING THE BATIK MOTIF, THEN ALSO ANALYZE IT BY LINKING IT TO GEOMETRIC MATERIAL](#), especially transformation geometric material. Through this research, it can be described how the existing concept of Sukapura batik motifs and their philosophical values can awaken students' love for their own culture.

## **METHOD**

This research uses qualitative research with ethnographic methods. Ethnographic research is research that examines culture in a particular community group. This method was chosen because it is in accordance with the research objective, namely to explore information about ethnomathematics in Sukapura Batik, especially the patterns made by connecting them to formal mathematics, namely transformation geometry material.

Data collection was carried out by observation at the batik making place and interviews were conducted with two people who were considered to have expertise in Sukapura batik. The sample was taken by purposive sampling, namely two sources, the first is the owner of Agnesa batik in Tasikmalaya and the second is a Sundanese cultural expert, Dr. Dodih Heryadi. All data obtained was documented in photos, videos and field notes during the research. The data was then analyzed based on the results of several sources to obtain comprehensive data regarding Sukapura Tasikmalaya batik motifs.

The scope of respondents selected as interviewees were both batik experts in Sukapura Tasikmalaya, domiciled in Tasikmalaya and one was a printed and written batik producer in Tasikmalaya. Based on the research method approach chosen, namely ethnographic research, there are at least three components that need to be present in this research, namely place, actors and activities. The location is at the Tasikmalaya Batik Center on Jalan Cigereung Tasikmalaya, the perpetrator is the person who makes the Sukapura batik motif and the activity is the batik method that the batik maker does.

## RESULTS AND DISCUSSION

### History of Sukapura Batik

Tasikmalaya written batik is generally known in the Tarumanegara kingdom. The areas of Mangunreja, Sukapura, Maronjaya, Wurug and Tasikmalaya City have traces of the history of Tasikmalaya batik because it is an area of the Tarumanegara government which is centered in Sukapura, which is on the outskirts of Tasikmalaya city. In general, Tasikmalaya batik has batik motifs that tend to give the impression of a spirit of simplicity, openness and pluralism, as well as showing a cute and cute impression in line with the general image of Sundanese women (<https://batik-tulis.com/blog/batik-tasikmalaya/>).

Tasikmalaya batik motifs have three popular batik motifs, namely bird batik motifs, umbrella batik motifs, and long bean batik motifs which are very strong with the nuances of Parahyangan city. Several motifs developed from other Tasikmalaya batik such as orchid flower batik with bird isen-isen, peacock ngibing batik motif, cala culu batik motif, Balinese banana batik motif, broomstick batik motif, and awi ngarambat batik motif, there are also several derivative motifs with motifs. such as roots, balimbing, antanan, urn background stone, lancah tasik, reng leaf peuteuy Papangkah, sente, tsunami udey, peacock, Gunung Kawi, slow side, kadaka, lancah sawat purple, renfiel, rereng orlet, rereng sintung, manuk background scales, manuk rereng peuteuy selong, peacock background haremis, sidomukti umbrella, taleus sukaraja, sinit naga, and turih-wajit-



Limar. Several Tasikmalaya batik motifs

Gambar 3 Batik Sawoan, motif buah sawo coklat  
Sumber: <http://disparbud.jabarprov.go.id>

The research was carried out with the title "Exploration of Mathematical Elements in Making Tasikmalaya Typical Batik". The research was carried out 5 times by visiting Tasikmalaya Typical Batik craftsmen. The craftsmen visited were located around the Cigereung area. Then, for the history of Tasikmalaya Batik, observations and interviews were carried out at the Tasikmalaya Mitrabatik Cooperative. This research was assisted by two students, namely brothers Hendri Maulana and Hesti Novianti. Written batik became known to the people of Tasikmalaya during the Tarumanegara Kingdom. This was reinforced by the large population of tarum trees used for making batik at that time. The areas of Mangunreja, Sukapura, Maronjaya, Wurug and Tasikmalaya City have traces of the history of Tasikmalaya batik because it is an area of the Tarumanegara government which is centered in Sukapura, which is on the outskirts of Tasikmalaya city. The origin of Tasikmalaya batik was a wave of population displacement from the Central Java region due to war in the region, until finally the culture of batik was brought to this day.

### Sukapura Batik Making Process

Exploration of mathematical elements was carried out based on an analysis process carried out by researchers guided by batik semiotics experts. Based on an interview with H. Cacu, owner of Batik Agnesa, making batik can be done in various ways, including:

1. 1. Written canting batik/written batik, written batik is batik that is made manually and only uses canting, wax and hands to make the motifs.
2. 2. Stamped Batik, is batik that is made using special shaped and embossed canting so that you just have to stamp it onto the mori cloth.
3. 3. Tie-Dyed Batik, which is batik that is tied and then dipped in several color variations to produce colorful batik.
4. 4. Printed Batik, is batik which is made using modern machines and does not use wax to color it.
5. 5. Colet Batik, is batik that is made by painting, usually this batik is painted with a brush, cotton and canting
6. 6. The observation process was carried out directly at the Tasikmalaya Typical batik making place.

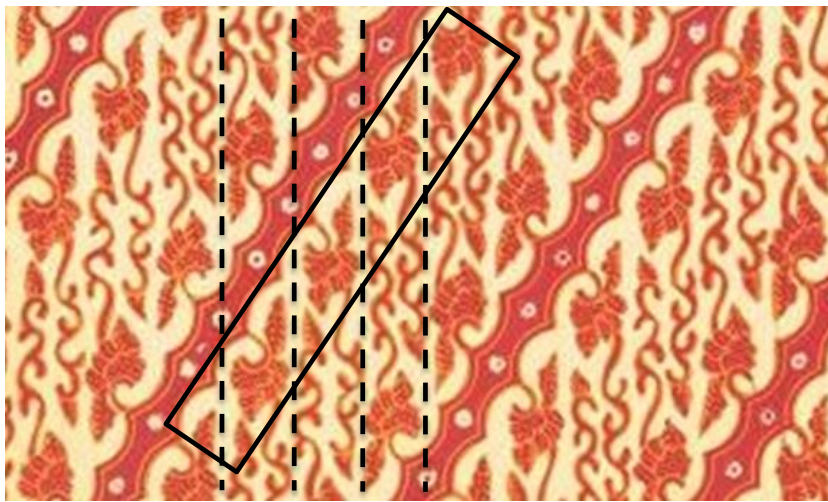
Based on the results of interviews conducted by researchers, it takes around 2-3 days to make hand-written batik. Hand-written batik has a high sales value so the price can reach 2-3 million, because the process takes a long time using hands even though the drawing is previously carried out on cloth that has been provided, so the batik maker just has to continue the results of the image that has been provided. However, you need to be careful because if you make a mistake regarding the motive, it will be difficult to correct it again. Apart from batik owners, researchers also conducted interviews with batik makers directly. Here's the process:



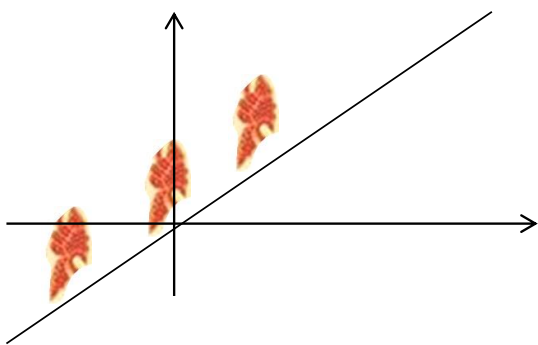
**Gambar 1 Observasi dan wawancara dengan Pembatik**

### **Sawoan Batik Motif, Brown Sapodilla Fruit Motif**

Based on the results of interviews with batik makers, it was found that they did not realize that the batik motifs they made had anything to do with mathematics. They just draw motifs according to the pictures provided without thinking that these motifs have anything to do with mathematics. This means that even though batik makers do not understand the relationship between motifs and mathematics, there is a culture in carrying out the process of making batik. Some of what the author found regarding typical Tasikmalaya batik motifs are as follows:



**Gambar 2 Batik Sawoan, Motif Buah Sawo Coklat**



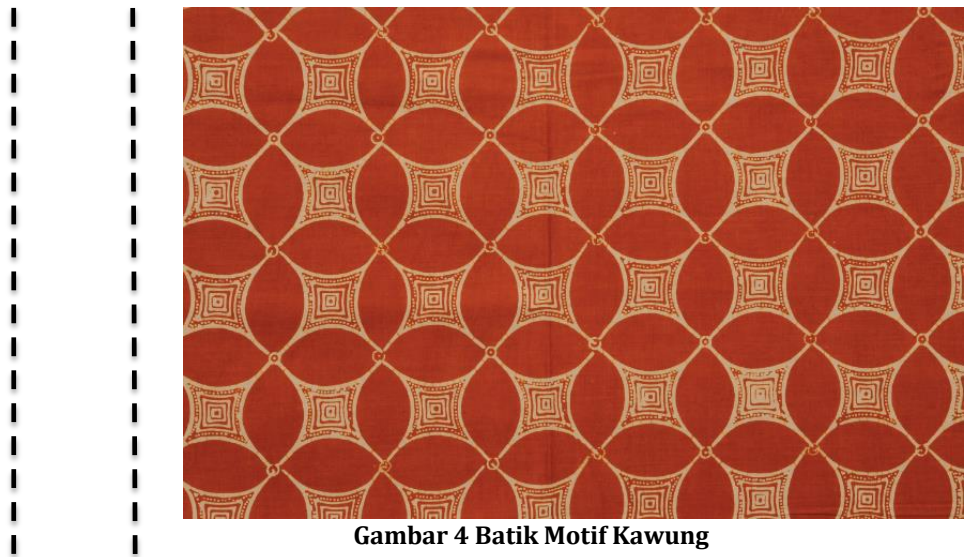
Translation

**Gambar 3 Geometri Transformasi Motif Batik Sawoan, Motif Buah Sawo Coklat**

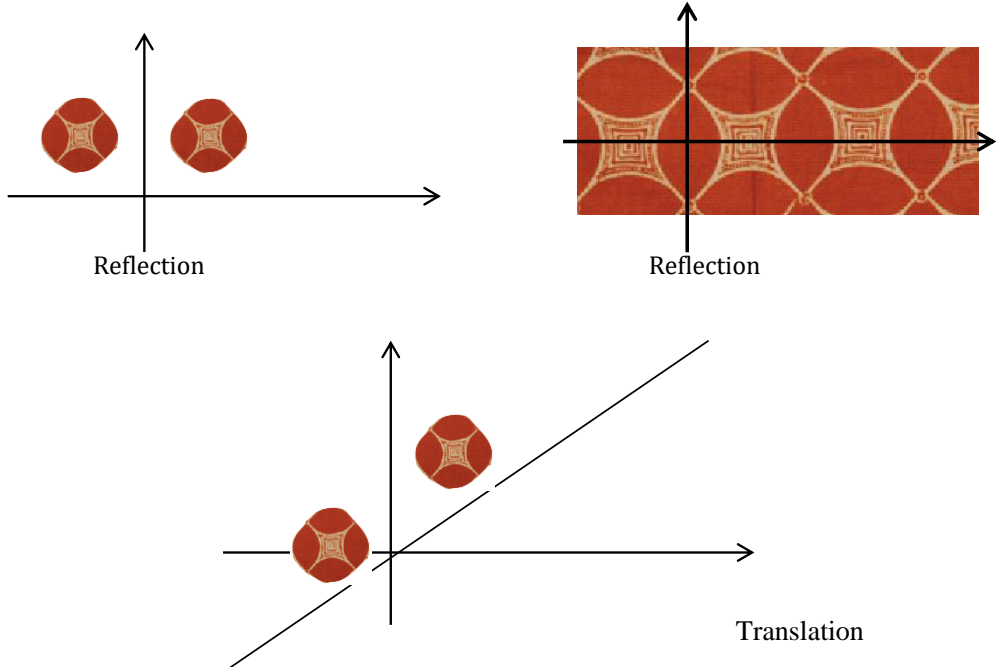
If we observe clearly and deeply, this motif is related to mathematical concepts, namely regarding the transformation of flat shapes, namely translational material. In simple terms, translation can be said to be a shift. If we look at the batik, it has a systematic shift, that is, it moves systematically to the right. Concept of geometry. Regarding this batik motif, the results of interviews with Sundanese cultural observers and batik craftsmen, this motif has the meaning of perfection. Perfection in the sense that humans and nature must sit side by side without destroying each other.

### **Kawung Batik Motif**

Basically, the Sukapura Tasikmalaya batik motif is influenced by the nature around it. Kawung itself is a type of plant that is often found in Tasikmalaya and is often used for desserts which produces palm fruit or palm sugar. This motif is a kawung motif which is a part of the fruit of the palm fruit that looks round. The image of this motif is as follows:



Gambar 4 Batik Motif Kawung



Gambar 5 Geometri Transformasi Motif Batik Kawung

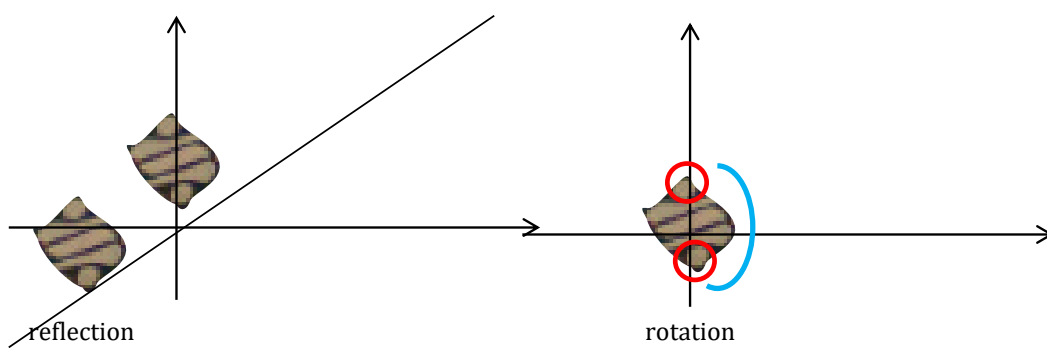
### Sukapura Batik Motif

Sukapura batik motif is a batik motif that is often found in Tasikmalaya City. Sukapura is an area on the banks of the Citanduy river which is the forerunner to becoming Tasikmalaya. Sukapura is closely related to the work of Singaparana which is now the capital of Tasikmalaya Regency. Sukapura Batik motifs can be seen as follows:



Gambar 6 Batik Motif Sukapura

If we analyze it, there is a very strong element of transformation geometry, namely systematic shifting of translation.



Gambar 7 Geometri Transformasi Motif Batik Sukapura

This batik motif is characterized by dark colors and this batik motif also has variations in the shape of long plates. This motif has a meaning of calm and simplicity. Teaching everyone that simplicity must be a reflection of the original Sukapura people, where the earth is stepped on, there the sky is stepped on.

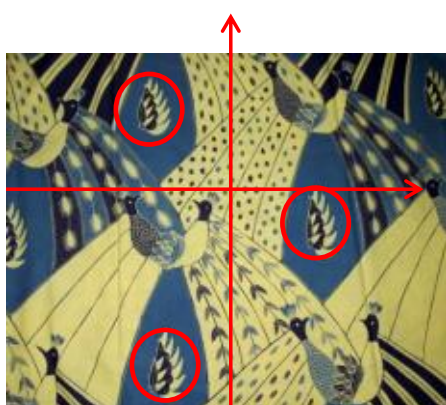
### Ngibing Peacock Batik Motif

As previously explained, batik motifs in Sukapura Land are closely related to the surrounding nature and animals in Sukapura Land. One of the famous motifs is the Merak Ngibing. Ngibing in everyday language is interpreted as dancing or together. This motif is like a peacock moving its tail. The ngibing peacock batik motif is as follows:



Gambar 8 Batik Motif Merak Ngibing

If we look at this batik motif in detail, we will see that this motif has a mathematical idea, namely reflection or mirroring. The reflection in question is a reflection on the y-axis.





### Gambar 8 Geometri Transformasi Motif Batik Ngibing

This batik motif is related to the concept of rotation. The concept of rotation or rotation is part of the transformation geometry in the picture. The rotation occurs in the peacock feather which is symmetrically moving from the first position to the second position of 120°. This concept can be taught to students in junior high schools in studying transformation geometry using batik motifs. The meaning of the motif is about the unyielding spirit that Sukapura people must show so that they are able to produce works during their lifetime.

The results of the exploration carried out by researchers show that the people of Tasikmalaya, formerly known as Sukapura, have long used the concept of transformational geometry in making batik motifs. Sukapura batik motifs are heavily influenced by the surrounding natural conditions so that most of the motifs are an inseparable part of natural activities. The batik motifs made by local residents have long contained many philosophical values in navigating life (Prahmana & D'Ambrosio, 2020; Rukiyati Sugiyo & L. Andriani Purwastuti, 2017; Syarifuddin, 2016).

Several studies on culture in mathematics have been researched by researchers both from within Indonesia and from outside. Several studies reported by (Umbara et al., 2021) who researched the activities of residents in Cigugur Village, Kuningan Regency, then the research was reported by (Muhtadi et al., 2017) who researched the concept of measurement in Sundanese culture up to (Turmudi et al., 2021) regarding traditional games in mathematical activities.

Through mathematical research regarding ethnomathematics, there are several benefits that can be seen from two sides. The first aspect is that learning mathematics can be taught in other ways so as to reduce anxiety in mathematics. Anxiety in learning mathematics is still a serious obstacle in learning mathematics today (Chen & Wang, 2022; Gresham & Burleigh, 2019; Haciomeroglu, 2017; Mahmood & Khatoon, 2011; Mutodi & Ngirande, 2014). Through such learning, it is hoped that it can reduce students' anxiety in learning mathematics. On the other hand, through mathematics learning involving culture, students are indirectly taught to recognize and preserve regional culture which is a reflection of national culture (Fakhrudin & Masrukan, 2018; Kusumasari & Alam, 2012; Mungmachon, 2012; Rasna & Tantra, 2017).

Several countries apply the concept of a mathematics curriculum which includes regional culture (Ascher, 2017; Reston, 2001; Rosa & Orey, 2013, 2019). Some countries believe that the mathematics curriculum must be intersected with regional culture. This means that culture is the result of human creation which has long been able to be explored using mathematical elements. Culture is a product of human creativity that has long been explored in the context of mathematics. This shows the close relationship between mathematics and culture, as well as the importance of recognizing and utilizing cultural heritage in mathematics learning. Every place on earth has its own culture that is different from one another (Storybook, 2020). In this case, each cultural context will have links that can be connected in mathematics learning with a variety of different materials and cultures.

The integration of local culture in the mathematics curriculum aims to achieve several goals. First, it allows students to better connect with the subject matter, because they can see the relevance and application of mathematics in a cultural context familiar to them. Second, it helps promote appreciation for their own cultural heritage, respect for cultural diversity, and build a strong sense of identity. Third, it can motivate students in new and interesting ways, increasing their interest in learning mathematics. On the other hand, there is a need for further research on how to design mathematics learning models that are related to mathematical culture so that they can be applied at elementary to middle school levels.

### CONCLUSION

Culture is the result of human creation which involves mathematical activities. There is a need for a new curriculum paradigm that can include cultural elements in mathematics itself. Apart from that, it is also necessary to develop learning that focuses on the use of culture in formal mathematics learning at school. The Sukapura people are a society that actually uses mathematical concepts in their daily lives and one of them is making batik motifs. Sawoan, Kawung, Sukapura batik motifs to Merak Ngibing. The content of mathematical elements is very strong in the concept of transformation geometry. Apart from having mathematical elements, Sukapura batik motifs also have philosophical values which must be interpreted as a balance between nature and human life.

### REFERENCE

- Ascher, M. (2017). *Ethnomathematics: A multicultural view of mathematical ideas*. Routledge.
- Azahra, A. S., & Munahefi, D. N. (2022). *Ethnomathematical Exploration in the Geulis Group Tasikmalaya West Java. ... Journal of Ethno ...*, 2(1), 32–42.
- Barton, B. (1996). *Making sense of ethnomathematics: Ethnomathematics is making sense*. *Educational Studies in Mathematics*, 31(1–2), 201–233. <https://doi.org/10.1007/BF00143932>
- Chen, L., & Wang, Y. (2022). *Mathematics anxiety and mathematical calculation in deaf children: A moderated mediation model of mathematics self-efficacy and intelligence*. *Research in Developmental Disabilities*, 120, 104125. <https://doi.org/10.1016/j.ridd.2021.104125>
- D'Ambrosio, U. (2007). *Peace, Social Justice and Ethnomathematics*. *Montana Council of Teachers of Mathematics*, 1, 25–34.

- D'Ambrosio, U., & Rosa, M. (2017). *Ethnomathematics and Its Pedagogical Action in Mathematics Education*. 285–305. [https://doi.org/10.1007/978-3-319-59220-6\\_12](https://doi.org/10.1007/978-3-319-59220-6_12)
- Fakhrudin, D. F., & Masrukan, M. (2018). *The Analysis of Mathematical Literacy Skill and Respect to Local Culture toward Pogil Learning with Ethnomathematics*. *Unnes Journal of Mathematics ...*, 7(79), 145–151.
- Gresham, G., & Burleigh, C. (2019). *Exploring early childhood preservice teachers' mathematics anxiety and mathematics efficacy beliefs*. *Teaching Education*, 30(2), 217–241.
- Haciomeroglu, G. (2017). *Reciprocal Relationships between Mathematics Anxiety and Attitude towards Mathematics in Elementary Students*. *Acta Didactica Napocensia*, 10(3), 59–68.
- Herawaty, D., Widada, W., Nugroho, K. U. Z., & Anggoro, A. F. D. (2019). *The Improvement of the Understanding of Mathematical Concepts through the Implementation of Realistic Mathematics Learning and Ethnomathematics*. January. <https://doi.org/10.2991/icetep-18.2019.6>
- Kusumasari, B., & Alam, Q. (2012). *Local wisdom-based disaster recovery model in Indonesia*. *Disaster Prevention and Management: An International Journal*, 21(3), 351–369. <https://doi.org/10.1108/09653561211234525>
- Lidinillah, D. A. M., Rahman, R., Wahyudin, W., & Aryanto, S. (2022). *Integrating Sundanese Ethnomathematics Into Mathematics Curriculum and Teaching: a Systematic Review From 2013 To 2020*. *Infinity Journal*, 11(1), 33. <https://doi.org/10.22460/infinity.v11i1.p33-54>
- Mahmood, S., & Khatoon, T. (2011). *Development and validation of the mathematics anxiety scale for secondary and senior secondary school students*. *British Journal of Arts and Social Sciences*, 2(2), 169–179.
- Muhtadi, D., Sukirwan, Warsito, & Prahmana, R. C. I. (2017). *Sundanese ethnomathematics: Mathematical activities in estimating, measuring, and making patterns*. *Journal on Mathematics Education*, 8(2), 185–198. <https://doi.org/10.22342/jme.8.2.4055.185-198>
- Mungmachon, M. R. (2012). *Knowledge and Local Wisdom : Community Treasure*. *International Journal of Humanities and Social Science*, 2(13), 174–181.
- Mutodi, P., & Ngirande, H. (2014). *Exploring mathematics anxiety: Mathematics students' experiences*. *Mediterranean Journal of Social Sciences*, 5(1), 283–294. <https://doi.org/10.5901/mjss.2014.v5n1p283>
- Nur'aeni, E., Pranata, O. H., Muharram, M. R. W., & Apriani, I. F. (2020). *SPADE: Geometry Learning Model within Elementary School*. *Indonesian Journal of Primary Education*, 4(2), 204–211. <https://doi.org/10.17509/ijpe.v4i2.29433>
- Prabawati, M. N. (2016). *Etnomatematika Masyarakat Pengrajin Anyaman Rajapolah Kabupaten Tasikmalaya*. *Infinity Journal*, 5(1), 25. <https://doi.org/10.22460/infinity.v5i1.p25-31>
- Prahmana, R. C. I., & D'Ambrosio, U. (2020). *Learning Geometry and Values from Patterns: Ethnomathematics on the Batik Patterns of Yogyakarta, Indonesia*. *Journal on Mathematics Education*, 11(3), 439–456.
- Rasna, I. W., & Tantra, D. K. (2017). *Reconstruction of Local Wisdom for Character Education through the Indonesia Language Learning: An Ethno-pedagogical Methodology*. *Theory and Practice in Language Studies*, 7(12), 1229. <https://doi.org/10.17507/tpsls.0712.09>
- Reston. (2001). *What is ethnomathematics, and how can it help children in schools?* *National Council of Teachers of Mathematics*, 7(6), 308.
- Rosa, M., & Orey, D. C. (2013). *Ethnomodelling as a Research Lens on Ethnomathematics and Modelling*. 6(2), 117–127. [https://doi.org/10.1007/978-94-007-6540-5\\_10](https://doi.org/10.1007/978-94-007-6540-5_10)
- Rosa, M., & Orey, D. C. (2019). *Ethnomathematics and the responsible subversion of its pedagogical action: an investigation based on three anthropological approaches*. *Revista Brasileira de Estudos Pedagógicos*, 100, 191–210.
- Rukiyati Sugiyo, & L. Andriani Purwastuti. (2017). *Local Wisdom-Based Character Education Model in Elementary School in Bantul Yogyakarta Indonesia*. *Sino-US English Teaching*, 14(5), 299–308. <https://doi.org/10.17265/1539-8072/2017.05.003>
- Samo, D. D., Darhim, & Kartasmita, B. G. (2018). *Culture-based contextual learning to increase problem-solving ability of first year university student*. *Journal on Mathematics Education*, 9(1), 81–93. <https://doi.org/10.22342/jme.9.1.4125.81-94>
- Storybook, L. C. (2020). *Local Culture-based Storybook and Its Effect on Reading Competence*. 13(2), 253–268.
- Supiyati, S., Hanum, F., & Jailani. (2019). *Ethnomathematics in sasaknese architecture*. *Journal on Mathematics Education*, 10(1), 47–57. <https://doi.org/10.22342/jme.10.1.5383.47-58>
-

Suryawan, I. P. P. (2017). *Exploring ethnomathematics in Central Java Exploring ethnomathematics in Central Java. Internasional Conference on Mathematics, Science and EDUCATION*, i.

Syarifuddin, D. (2016). *Nilai Budaya Batik Tasik Parahiyangan Sebagai Daya Tarik Wisata Jawa Barat. Jurnal Manajemen Resort Dan Leisure*, 14(2), 9–20. <https://doi.org/10.17509/jurel.v14i2.8530>

Turmudi, T., Susanti, E., Rosikhoh, D., & Marhayati, M. (2021). *Ethnomathematics: Mathematical concept in the local game of tong tong galitong ji for high school. Participatory Educational Research*, 8(1), 219–231. <https://doi.org/10.17275/per.21.12.8.1>

Umbara, U., Wahyudin, W., & Prabawanto, S. (2021). *Exploring Ethnomathematics with Ethnomodeling Methodological Approach: How Does Cigugur Indigenous People Using Calculations to Determine Good Day to Build Houses. Eurasia Journal of Mathematics, Science and Technology Education*, 17(2), 1–19. <https://doi.org/10.29333/EJMSTE/9673>

Widada, W., Herawaty, D., Anggoro, A. F. D., Yudha, A., & Hayati, M. K. (2019). *Ethnomathematics and Outdoor Learning to Improve Problem Solving Ability. 295(ICETeP 2018)*, 13–16. <https://doi.org/10.2991/icetep-18.2019.4>

---