

Ethnomathematics of Tenun Sapiro in Transformation Geometry

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Abstract

Mathematics is often called uninteresting and considered abstract. One way that can be used to introduce mathematics is by relating it to daily life or a special local culture, which is called ethnomathematics. Ethnomathematics is a combination of mathematical elements with cultural aspects and social context in society. One of the cultures that exists in society is weaving. In South Tapanuli itself there is a woven cloth which is a local cultural heritage, namely the Sapiro Woven cloth. In this research, the science implemented is Transformation Geometry. Transformation Geometry is a science that discusses change, these changes can be in the form of changes in shape or changes in presentation based on matrices and images. This research is included in the type of exploratory research, namely exploring woven fabric motifs that can be used in learning Transformational Geometry. The process of compiling one element of the Sapiro motif can be carried out in various ways and in a certain sequence of transformations. The transformation that will be used to compose Sapiro batik in this article is reflection.

Keywords: Ethnomathematics, Transformation Geometry, Sapiro Tenun

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Introduction

Education is a need in society that must be met. Education is needed so that society is ready to face and adapt to current technological advances. However, education is not only synonymous

with school (Haleem et al., 2022). Knowledge can be obtained from everyday life. Science continues to develop and cannot be separated from mathematics. Mathematics is a science that is very closely related to everyday life. (Virginiawaty & Saragih, 2019) However, mathematics is often said to be uninteresting and considered abstract. One way that can be used to introduce mathematics is by relating it to daily life or a special local culture, which is called ethnomathematics. So that it becomes attractive and can increase students' and society's interest in learning mathematics in general.

Ethnomathematics can be defined as the anthropology of mathematics and mathematics education (cultural anthropology of mathematics) (Zaenuri et al., 2019). Ethnomathematics comes from two words, namely ethno (culture) and mathematics. Ethnomathematics is a combination of mathematical elements with cultural aspects and social context in society (Zaenuri et al., 2019). Ethnomathematics involves understanding and analyzing ways of mathematical thinking in everyday life, community traditions, and the expression of art and symbols of a community group. One of the cultures that exists in society is weaving. Weaving is a type of work made by weaving textile fibers or threads into a certain pattern or design using a loom (Kovačević & Schwarz, 2015). Woven fabrics have high cultural value because of the decorative or artistic traditional motifs that reflect the local cultural heritage and weaving skills of a particular community group. In South Tapanuli itself there is a woven cloth which is a local cultural heritage, namely the Sipirok Woven cloth.

Sipirok weaving is a local cultural heritage that continues to be cultivated today. Its beauty does not make the typical South Tapanuli cloth obsolete. There are various motifs used in Sipirok weaving. In this research, the science implemented is Transformation Geometry. Transformation Geometry is a science that discusses change, these changes can be in the form of changes in shape or changes in presentation based on matrices and images. The types of geometric transformations are as follows:

1. Translation (shift)
It is a type of geometric transformation in which there is a shift or movement from a point to a certain direction in a straight line on a flat plane, thus causing every plane contained in the straight line to also shift in a certain direction and distance.
2. Rotation (rotation)
It is a rotation determined by the center of rotation, direction of rotation, and angle of rotation.
3. Reflection (mirroring)
Reflection or mirroring is a geometric transformation meaning change by moving the property point of a flat mirror
4. Dilation (multiplication)
Is a change in size of an object. Where in dilation there are two concepts, namely, point and factor of dilation.

In everyday life, there are many things that can be related to Transformational Geometry. This is usually often used to make works of art and architecture, one of which is the iconic building of a city, the typical batik motif of a region. As is the case in South Tapanuli, namely sipirok woven cloth.

Methodology

This research is included in the type of exploratory research, namely exploring woven fabric motifs that can be used in learning Transformational Geometry. The approach used is an ethnographic approach, namely an approach that aims to obtain an in-depth definition and

description of a culture based on research conducted in the field. The research was carried out in South Tapanuli district in November 20023, with some information obtained from the local community and the internet.

Results

In this research, various motifs were found from the typical South Tapanuli sipirok woven cloth. Sipirok woven cloth is a cultural heritage from South Tapanuli. Sipirok woven fabric motifs have many variations. One piece of woven cloth usually has several different motifs. One of the motifs raised in this research is as follows:



Figure 1. Floral motif

The motif above is shaped like a flower with four petals and a triangle. If you pay attention, the motifs on the woven fabric are arranged regularly and symmetrically. When it comes to mathematics.

Preparation of Sipirok Batik Motifs Using a Transformational Geometry Approach

The process of compiling one element of the sipirok motif can be carried out in various ways and in a certain sequence of transformations. The transformation that will be used to compose sipirok batik in this article is reflection

Reflection application (mirroring) on the Sipirok Weaving motif

Reflection or mirroring is a geometric transformation meaning change by moving the property point of a flat mirror. The following is a sipirok weaving with a flower-like motif.

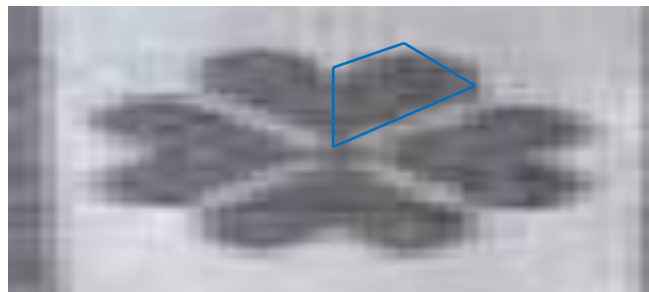


Figure 2. Sipirok weaving with flower-like motifs

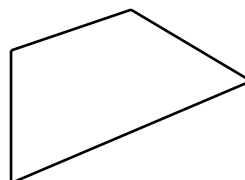


Figure 3. Basic motif like a random trapezoid

So that the pattern obtained on the woven fabric motif is more or less like the following

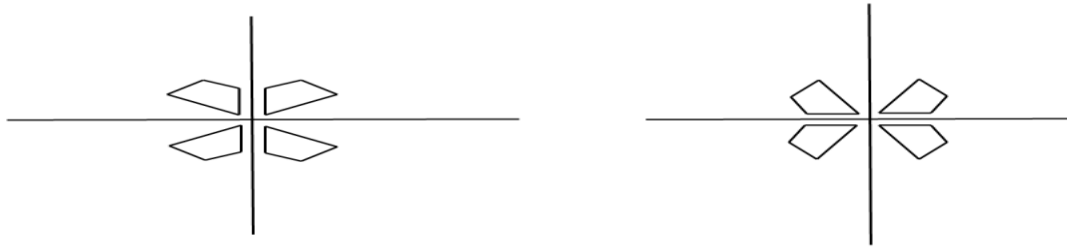


Figure 4. Patterns on ola woven fabric motifs on woven fabric motifs

If you pay attention to the pattern in Figure 5, quadrants I and II are an application of reflection or mirroring, where the image. 4 is reflected against the vertical line. Likewise, quadrant II and quadrant III, quadrant III and Quadrant IV, quadrant IV and Quadrant I. In the pattern in the picture. 6 reflections can be seen in quadrant I and quadrant II, quadrant II and quadrant III, quadrant III and quadrant IV, quadrant IV and quadrant I. The following is another motif from sipirok woven fabric which is an application of reflection. Where is the motif in the picture. 7 is obtained from the fabric motif in the picture. 2.



Figure 5. Isosceles triangle motif

Motif in the picture. 7 looks like an isosceles triangle, where the right and left sides are the same size and symmetrical, as is the reflection produced. The motifs on the woven fabric can be described in the following pattern.

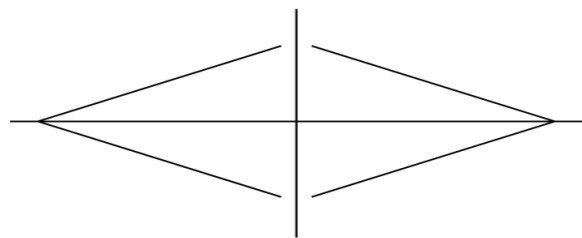


Figure 6. Reflections are found between quadrant I and Quadrant II, Quadrant II and Quadrant III, Quadrant III and Quadrant IV, Quadrant IV and Quadrant I

Conclusion

Education is a very important societal need, especially in facing technological advances. Mathematics, as an integral part of science, can be integrated with daily life and local culture through the concept of ethnomathematics. One example of the application of ethnomathematics is in Sipirok woven cloth, a local cultural heritage in South Tapanuli. Ethnomathematics, which combines elements of mathematics with aspects of culture and social context, provides attraction and increases interest in learning mathematics among students and the general public. This article then focuses on the use of Transformation Geometry, especially translation, rotation, reflection and dilation, in discussing Sipirok woven fabric motifs. This research illustrates that Transformational Geometry can be applied in mathematics learning by using woven cloth motifs as an example. Through an ethnographic approach, this research succeeded in exploring and describing the motifs of Sipirok woven cloth. The research results show that these motifs can be explained and applied through geometric transformations, especially reflections.

Thus, this article contributes to efforts to enrich mathematics learning methods by integrating local cultural elements, such as Sipirok woven cloth, and the concept of Transformational Geometry. This integration is expected to increase students' understanding and interest in mathematics through a more contextual and interesting approach.

Conflict of Interest

No conflict of interest

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