Ethnomathematics on Woven Fabric (*Tembe Nggoli*) of Mbojo tribe society

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Abstract. This study aims to reveal the relationship of mathematics with a culture that has been considered to be unrelated. This research was conducted on mbojo tribe society in Bima and Dompu districts. The focus of this research was about the weaving activities of the mbojo tribe society that produces the geometry pattern on their woven fabrics (*tembe nggoli*). The method used in this research was ethnography method with data collection technique that was through observation, interview to the weaver community of *tembe nggoli* of mbojo tribe society, documentation of geometry forms contained on *tembe nggoli*, to the making of field notes followed by literature study about geometry. The results of this study indicate that there is a concept of geometry at woven fabric (*tembe nggoli*) of mbojo tribe society that can be used as a source of learning and make students and the community better understand the relationship between their culture with the concept of mathematics.

1. Introduction

Mathematics is the parent of all knowledge that learned by students in every level of education. As a field of science, mathematics has long been recognized and a part that can not be separated from the life of society and the state. Studies in small and large scale cover the development of mathematics has long been discussed either from the level of the concept to its application.

Referring to some existing literature, mathematics touches various aspects of the social life of society, not only studied and examined and taught in academic culture but also enter and play an active role in the life of society widely. This indicates that mathematics and culture are harmonized with one another. Consequently, when viewed in broad scope, Indonesia as a country in which collected millions of people in which there are ethnic groups with cultural diversity and customs become an important part and very helpful in studying and understanding the concept of mathematics through cultural approach.

Cultural wealth through the many tribes in Indonesia should really be utilized maximally in designing and creating a learning curriculum that can help students understand the lessons received, thus impacting on improving student achievement. Furthermore, when viewed from the achievement of student learning, can be seen still antagonistic students to math lessons. This is also in accordance with the results of research published by TIMSS on the results of Indonesian students' mathematics
learning, the ability of Indonesian students is still below the average. This becomes the home of the house that should be sought immediately by the best solution. One of the causes that need to be understood when viewed in the content of learning content that is in school, is still very rarely link the culture of students who are taught with existing learning.

Many concepts in mathematics that can be related to culture, when linked with learning culture will be more meaningful because students indirectly experience and become part of what they learn. In addition, by learning through the culture of students will more easily understand the concept of mathematics learned. So the purpose of learning other than the cognitive aspects, affective aspects can also be developed through the process of love culture and impact on the love of the homeland which is a form of character education.

As a pluralistic nation with many ethnic groups, it is no wonder that much of the research with the cultural background has to do with mathematics ever done [1-3]. Not only in Indonesia, research that describes the relationship between mathematics and culture has also been done in several other countries [4-5]. Research on the relationship between culture and mathematics includes social activities of society both in the form of craft, language, and customs. This confirms that mathematics is not a subject that has nothing to do with culture. Furthermore, this is in accordance with the disclosed [6] that there are three main properties of mathematics. First, mathematics as an object is found and created man. Second, mathematics is created not fallen by itself but arises from the activity that the object has available, and from the needs of science and everyday life. Third, once created mathematical objects have well-defined properties.

To overcome the problem of the linkage between mathematics and culture, the existence of ethnomathematics is one alternative domain of study that researchers take in this research to show that math and culture have interrelations and influence each other. As expressed by [7] that "Ethnomathematics is a field of study which describes as mathematical". Thus it can be understood the reason for this research by looking at students' views of mathematics that are not related to everyday life that impacts on the assumption that students are difficult to apply in their lives, further this will impact on society's assumption that there is no link between mathematics and culture.

Culture as one of the most important elements in the implementation of learning. The existence of the surrounding culture is very familiar with the students become the key to disclosing the relevance of mathematics with culture in this study. Based on preliminary observation of mbojo tribe society that the result that it is possible to do recording, documentation, and bookkeeping mathematical values on the activity of weaving of gobble (woven) of mbojo people whose motifs on the woven fabric are many forms of geometries. The results of these observations, to be the initial capital for further research to reveal the attachment or mutual relationship between mathematics and culture in the mbojo tribe society.

Based on the above study, the researchers are interested in lifting the activity of weavers tembe nggoli (woven cloth) of mbojo tribe society that contains many geometric elements on the fabric motif they produce. Weaving activity is a daily activity that some tribes mbojo people do, other than as economic supporters where the cloth produced by sale, woven fabric tembe nggoli is also used as a cloth that will always be used in activities of mbojo tribe society both at the official event and in activities Every day people mbojo tribe. Tembe nggoli (woven fabric) which has a geometric motif on the fabric that the tribe mbojo society produces, in this article will be explored, identified, and described its ethnomathematics. From this geometry, forms can be useful as teaching materials in learning geometry in schools that exist in the mbojo tribe society.

2. Methods
The method used in this research is the method of ethnography with data collection techniques that is through observation, interviews to the community of tembe nggoli weaver of mbojo tribe society, documentation of geometry shapes found in tembe nggoli, to making field notes followed by literature study on geometry.

The procedure of research conducted in this research is to refer to the ethnomathematics research design that focuses on cultural practice, constructed with four general questions as the essence of the utilization of ethnography principle [8], which is as follows: 1) Where to start looking? 2) How to
look? 3) How to recognize that you have found something significant? 4) How to understand what it is?

Based on the four general questions above, the research designs made in this study are arranged as shown in the following table.

Table 1. A framework of ethnomathematics research on woven fabric (*tembe nggoli*) of mbojo tribe society.

| Generic Question | Initial Answer | Critical Construct | Specific Activity |
|------------------|----------------|--------------------|------------------|
| Where to look?   | On the weaving activities of *tembe nggoli* (woven cloth) in the home of mbojo tribe society. | Culture | Conducting dialogue and interviewing to Weavers of *tembe nggoli* (woven cloth) of mbojo tribe society. |
|                  |                |                    | Describing how the daily generated weave of woof weavers from the mbojo community weavers have many geometric motifs. |
| How to look?     | Investigating aspects of QRS (quantitative, relational, and spatial) aspects of the activity of weaving of *tembe nggoli* (woven cloth) at home of mbojo tribe society. | Think alternative | Determine what QRS ideas is founded in the activity of weaving of *tembe nggoli* (woven cloth) in the home of mbojo tribe society. |
| What it is?      | Proof (result) think alternative in the previous process. | Philosophical mathematics | Identify the mathematical characteristics associated with QRS on the weaving activities of *tembe nggoli* in the home of mbojo tribe society when using the concept of geometry. |
|                  |                |                    | Demonstrating that the motive of the gobbled (woven) cloth in the home of mbojo tribe society is indeed mathematical after being linked and studied the characteristics of mathematics. |
| What Does It Mean? | Valuable for culture and mathematics. | Anthropologic methodology | Describes the connectedness Between two systems of knowledge (mathematics and culture). |
|                  |                |                    | Describing the new conceptions of mathematics on geometry by using the weaving activity of *tembe nggoli* (weaving cloth) of the mbojo tribe as its context. |

3. Results and discussion

The result of the research shows that the woven of *tembe nggoli* (woven fabric) of mbojo tribe society with the motive of the woven fabric are geometric. *Tembe nggoli* is a woven fabric woven in the traditional way of cotton yarn by stacking up to a certain thickness. Woven fabrics that are usually produced by weavers from the mbojo tribe society has motives such as flower motifs and geometry motifs. Flower motifs that exist on the woven fabric are usually soggy flower motif, flower sprigs motif, and bamboo shoots motif. The geometric motif is line motif, motif nggusu tolu (triangle), motif nggusu upa (rectangle), motif pado waji (parallelogram), and motif nggusu waru (octagonal).
Any motive that exists on the woven fabric of tembe nggoli mbojo tribe has its own meaning. Line motif implies that human beings must be honest and firm in carrying out the task. The motive with nggusu tolu (triangle) implies that the supreme power is in the hands of God symbolized in the triangle's peak. Nggusu upa (rectangle) is a symbol of togetherness with neighbors and relatives. Furthermore, the motive of the pado waji (parallelogram) whose meaning with nggusu tolu (triangle) is almost the same, but acknowledges the power of Allah as the most omnipotent god, also must recognize the power of the leader depicted by two blunted corners of his left side. As for nggusu waru (octagonal) is ideally a leader must meet the eight requirements that are devout, have the knowledge, intelligent and skilled, A polite and courteous word, polite behavior, from good descent, healthy physical and spiritual, able to meet the needs of everyday life.

In this study, from two common motifs found on the woven cloth of the tribe of mbojo tribe people who became the focus of the discussion of the ethnomathematics studies is the woven fabric of the geo-textile motifs. As for the motive of nggusu tolu (triangle) can be seen in the picture below.

Figure 1. Figures (a) and (b) are examples of woven fabric of motive of nggusu tolu (triangle).

From the picture above can be seen that from the woven tembe nggoli of mbojo tribe society looks triangular shape which is one of motive. As for when described clearly the shape of the geometry in question is like the following picture.

Figure 2. Tembe nggoli with motive nggusu tolu (triangle).

Figure 3. Design of triangle on tembe nggoli.

Based on the above picture if examined in geometry concept, making the first triangle will facilitate the design of triangle which further by utilizing the perpendicular line as a mirror as in the picture below.
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Figure 4. Design of triangle on tembe nggoli.

Thus, can be seen based on the picture above, the triangle pattern is formed as well as the pattern of triangle formation on the motif of tembe nggoli using geometry pattern by utilizing the concept of translation and reflection. This gives us the fact that the motive that exists in the woven fabric of mbojo tribe society has its relevance to the concept of geometry in mathematics.

The result of woven tembe nggoli of mbojo tribe society that has a rectangular motif, parallelogram, or octagon. The concept of manufacture is almost identical with triangle, where the repetitive geometrical pattern of the mathematically generated motif uses the concept of reflection, translation, and dilation even on some motifs using the concept of rotation.

4. Conclusion

Based on the explanation above, the results of this study indicate that the motif woven fabric of tembe nggoli of mbojo tribes society there are concepts of geometry such as the concept of translation, reflection, and the concept of dilatation as well as the concept of rotation in pattern making nggusu tolu (triangles), nggusu upa pattern (rectangle), waji pado pattern (parallelogram), and the pattern of nggusu waru (octagon). This causes unconsciously of mbojo tribe society of their motive on the fabric weaving that they make has applied the concept of mathematics. So this strengthens the relationship of mathematics with culture, especially the culture of mbojo tribe society. Ethnomathematics in tembe nggoli (woven cloth) of mbojo tribe society can be used as a source of learning in mathematics, can expand the students about the existence of mathematics there in one element of culture that they have specifically tembe nggoli, and facilitate students in relating the concept of geometry studied With real-world situations.

5. References

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