Geometrical concepts on *Batik Sasirangan*

A Ekawati ¹, M F Astnan¹, and M Hayati²

¹STKIP PGRI Banjarmasin, Banjarmasin, Indonesia
²SDIT Nurul Fikri, Banjarmasin, Indonesia

E-mail: eka2002banjar@gmail.com

**Abstract.** This study aims to explore the concept of geometry on traditional *batik Sasirangan* motifs. *Batik Sasirangan* which is also familiar as *Sasirangan*, is a customary cloth of the Banjar tribe which has many patterns both traditional pattern and modern pattern. If it is observed in detail, the motifs in the *Sasirangan* consist of mathematical concept especially the concept of geometry. This research is a qualitative research with ethnography approach. In this research, researchers are data collectors. The techniques of data collection are library studies, observation, and interviews. The techniques of data analysis through three steps are data reduction, data presentation, and conclusion. For the validity of data used triangulation source. There are 5 craftsmen who are also sellers at the *Sasirangan* shop in Banjarmasin be the informants. Several concepts especially the concept of geometry are found in *batik Sasirangan* such as angle, triangle, rectangular pyramid nets, geometry transformation, parallel line, and congruence.

**1. Introduction**

Education cannot be separated from cultural values. In the process of education there is an effort to inherit cultural values from generation to generation so that cultural values are maintained. In maintaining and preserving culture in the most effective process through education, the relationship between education and culture is very closely complementary and supports each other. Education on the formal path through school is expected to use cultural approach in the implementation.

Mathematics is one of the subjects in school. Nowadays, teaching mathematics tends not to link mathematics lesson with cultures around students. Mathematics is part of culture and history [1, 2]. Even though the culture around us has many mathematical concepts, for example (1) playing traditional games, (2) making buildings such as houses, mosques, buildings, etc. (3) patterns of handicrafts such as *batik*, wicker, and others. By involving culture in learning activities, teachers can provide different nuances in learning mathematics so that students are expected to be motivated.

Ethnomathematics is a study of mathematics in cultural perspective. Ethnomathematics is one approach that can bridge between culture and mathematics. The presence of mathematics with cultural values will contribute greatly to mathematics learning [3]. However, before reaching the stage of developing ethnomathematics-based mathematics learning, teachers should explore the potential of the cultures that can be used for learning.

Ethnomathematics-based learning innovation is in line with the nature of students learning mathematics, namely mathematics as an activity to trace patterns and relationships, mathematics as creativity that requires imagination [4]. According to Sirate [5], the application of ethnomathematics can be a means to motivate and stimulate students so that they can overcome boredom and give new nuances to mathematics learning. The potential of students is also expected to be developed optimally,
through assumptions and implications in the form of students need different contexts and situations in their learning [6].

In daily life, many mathematical concepts can be used to solve daily problems and likewise in the pattern of community life that highly upholds its cultural values. No matter how primitive a society is, mathematics is part of a culture because actually mathematics has been used by everyone in his life, starting from the pre-historical era, the days of the ancient Egyptians, the Greeks, the Indians, the Chinese, the Romans, to the Europeans today. Surprisingly, mathematical concepts have been applied in every cultural activity [7–8], whether it is realized or not.

The presence of mathematics that has cultural nuance will contribute greatly to mathematics learning because formal education is a social institution that is different from the others, thus enabling the occurrence of intercultural socialization [1]. It was also said that all formal mathematics education is a process of cultural interaction and each student experiences various cultural conflicts in the process. A mathematical idea arises naturally, through the knowledge and views of tribes or certain groups of people without going through a formal education. Therefore, culture-based learning is needed, to foster a sense of love for Indonesian culture, especially in this matter through the batik Sasirangan, from South Kalimantan.

Batik Sasirangan which is familiar as Sasirangan only, is a customary cloth of Banjarnese which has many pattern both traditional and modern [9–10]. According to Seman [10], there are as many as 20 traditional pattern in the Batik Sasirangan. The pattern of traditional Batik Sasirangan is generally dominated by double or triple lines. The lines are arranged vertically in double or triple, then next to them are arranged vertically [10].

In details, several mathematical concepts can be found in the patterns of Batik Sasirangan. This shows that concept of geometry, indirectly rooted in the Banjar community, whether it is the craftsmen, sellers, or users of the Batik Sasirangan itself. The concept of geometry obtained from a social and cultural environment that is inherited from generation to generation is certainly one of the initial capitals in learning mathematics, so that mathematics can be learned more easily by the community. Therefore, due to the various mathematical concepts in Batik Sasirangan, this study was conducted to explore mathematical concepts especially geometrical concept in traditional pattern of Batik Sasirangan.

2. Method
This research used qualitative descriptive method, a research methods to explain and obtain information overall. This data was collected by interviewing 5 craftsmen who are also seller of Batik Sasirangan and observe pattern of traditional Batik Sasirangan. There are 20 patterns of traditional Batik but in this research just 7 patterns will be explored randomly. Data analyses through three steps are data reduction, data presentation, and conclusion. For the validity of data the researchers used triangulation source.

Here are the steps of the research: (1) introduction, at this step, the writer decided the craftsmen; (2) making a guidelines of interview for exploring knowledge of craftsmen about Batik Sasirangan patterns; (3) implementation, collecting data taken from interview and observing Batik Sasirangan in craftsmen. 4. Data analysis, analysing the result of interview and observation; (5) conclusion, concluded the data analysis which has been analysed in the previous steps.

3. Results and Discussion
After observing and interviewing the subjects, the researchers found several Batik Sasirangan patterns. They have their own traditional names and have their own meanings. In this part we will elaborate and relate the patterns to the mathematical concepts. In complete, the traditional patterns of batik Sasirangan are gigi haruan, kambang kacang, hiris gagatas, kambang sakiki, tampuk manggis, bintang, kangkung kaumbakan, ombak sinampur karang, bayam raja, kulat kurikit, hiris pudak, ular lidi, mayang maurus, naga balimbur, banawati, turun dayang, ramak sahang, gelombang, dan daun katu. Because there are so many patterns in batik Sasirangan and limited time the researcher have to
explore all the patterns, in this research, it will be explored some of those patterns. They are Hiris gagatas, bintang, turun dayang, ramak sahang, mayang maurai, dan kambang sakiki.

3.1 Hiris Gagatas
The first pattern is *hiris gagatas*. Generally, traditional cakes from Banjar is formed and cut like *hiris gagatas*. This pattern can be also found in some traditional clothes. *Gagatas* means beautiful and good looking. Figure 1 shows the pattern of *hiris gagatas*. Based Figure 1, it can be said that there is a concept rhombus on a *hiris gagatas*, because the basis of *hiris gagatas* made of flat two-dimensional formed by four side the same length and have two pairs of right-angled corner instead, each as large as a corner in front of him. The other mathematical concepts that can also be observed in this pattern are translation and congruence.

![Figure 1. Hiris Gagatas](image)

3.2 Bintang
*Bintang* is one the pattern of batik sasirangan which means star. The pattern of *Bintang* means that stars are one sign of the greatness of the Almighty, we as humans will not be able to count how many stars there are in the universe. Figure 2 is pattern of Bintang

![Figure 2. Bintang](image)

The concept geometry from pattern of *bintang* are angle, triangle, and rectangular pyramid nets. If we make line like blue line on Figure 2, we can get that pattern of *bintang* has reflection concepts.

3.3 Kambang Sakiki
Kambang Sakiki, a flower as a symbol of beauty, is used in many typical Banjar ornaments, such as architecture of traditional Banjar houses and reliefs of a whiting place called *panginangan*. 
The concept geometry from pattern of *kambang sakiki* are angle, reflection, and translation concepts.

### 3.4 Mayang maurai

Mayang is flower of coconut tree. *Mayang maurai* means a mayang who decomposes. Mayang is being symbol of Banjar tradition, is used for bathing and showering in the Banjar tradition which is usually done one day before the bride married. Besides that, mayang is also used in bathing a woman who is 7 months pregnant. The concept geometry that we find is rotation.

### 3.5 Turun Dayang

The pattern of *turun dayang* is often abstract or unclear. The *turun dayang* has three main colors, namely red, yellow, and green. We can see the pattern of *turun dayang* on Figure 5.
The pattern of *turun dayang* have concept of angles, dilation, triangle, and parallel lines.

### 3.6 Banawati

Banawati is another pattern for behambur star (behambur its means the star scaretted). This batabur star is applied in small forms with a free composition. Bahambur star decorations are not only on *Sasirangan*, but also on the wall of the water jar with white silver or yellow gold, hence meaning majesty. The pattern of Banawati have concept of angles, translation, and congruence.

![Figure 6. Banawati](image)

### 3.7 Ramak sahang

Sahang is the name Banjar language that means pepper. Ramak means destroyed, because it was crushed with peaches over the mortar. The friendly motif of this piece is from the two-sided pattern of *hiris pudak*, but the picture is intermittent, not compound. The pattern of *ramak sahang* has reflection and congruence.

![Figure 7. Ramak Sahang](image)

### 4. Conclusion

Ethnomatematics is mathematics in culture. On *Batik Sasirangan* we can find mathematical concepts especially the concept of geometry. The concept of geometry on *Batik Sasirangan* is angle, triangle, rectangular pyramid nets, geometry transformation, parallel line, and congruence. The *Batik Sasirangan* can be used in the learning of geometry.

### References

[1] Putri, L I 2017 Eksplorasi etnomatematika kesenian rebana sebagai sumber belajar matematika pada jenjang MI *J. Ilmiah Pendidikan Dasar* 4 21-31
[2] Arwanto 2017 Eksplorasi etnomatematika batik trusmi Cirebon untuk mengungkap nilai filosofi dan konsep matematis J. Pendidikan Matematika 7(1) 36-40
[3] Zayyadi M 2017 Eksplorasi etnomatematika pada batik Madura J. Sigma 2 L35
[4] Marsigit 2018 Pengembangan pembelajaran matematika berbasis etnomatematika Proc. Seminar Nasional Etnomatnesia (Yogyakarta: Universitas Sarjanawiyata Tamansiswa) p 20
[5] Sirate, F 2012 Implementasi etnomatematika dalam pembelajaran matematika pada jenjang pendidikan sekolah dasar Lentera Pendidikan: J. Ilmu Tarbiyah dan Keguruan 15(1) 41-54
[6] Ebbutt S and Staker A 1995 Children and Mathematics: Mathematics in Primary School Part I (London: Collins Educational)
[7] Sudirman S Rosyadi R and Lestari W D 2016 Penggunaan etnomatematika pada karya seni batik Indramayu dalam pembelajaran geometri transformasi Pedagogy: J. Pendidikan Matematika 2(1) 75-85
[8] Zulkifli M N and Dardiri 2016 Etnomatematika dalam sistem pembilangan pada masyarakat melayu Riau Kutubkhanah: J. Sosial Pendidikan Keagamaan 19(2) 220-38
[9] Kholis N 2016 Kain tradisional sasirangan “Irma Sasirangan” kampung melayu Kalimantan Selatan Serupa: J. Pendidikan Seni Rupa 5(5) 1-9
[10] Seman S 2010 Sasirangan Kain Khas Banjar (Cetakan Kelima) (Banjarmasin: Lembaga Pengkajian dan Pelestarian Budaya Banjar Kalimantan Selatan)