The exploration of the elementary geometry concepts based on Tabot culture in Bengkulu

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Abstract. Geometry's direct objects were abstract. It was a learning material that was difficult for elementary students. Therefore, learning was needed close to the minds and daily lives of students. One of them was "Tabot" Culture. That was the ethnomathematics approach. The purpose of this research was to explore elementary geometry concepts based on Tabot Culture. We apply an explorative-qualitative approach. The subjects of this study were the makers of the Tabot, elementary students, and elementary mathematics teachers. This was a needs analysis. Activities were carried out through direct observation, documentation, in-depth interviews and focus group discussions. The research instruments were anecdotal direct observation sheets, and interview guides. Data were analysed qualitatively. The results of the study found that the culture of Tabot provides reinforcement of student character that was obeying the principle, thinking logically, critically, working hard, curiosity, independence, confidence. The geometrical concepts that exist in the Tabot culture were the cube, the beam, the pyramid, the prism, the sphere and its elements. We conclude that Bengkulu Tabot culture can be used as a starting-point for learning the achievement of geometrical concepts and strengthening student character.

1. Introduction
Geometry is a mathematical material that must be studied in schools. The abstract object makes it difficult for students to learn it. It takes a learning approach that is suitable for the character of the material and the character of students. To make it easier for students to do the mathematical process, the starting-point of learning must be close to students' minds. Something realistic [1], contextual, and ethnomathematics oriented [2] will make it easy for students to achieve the concept of geometry. According to Widada et al. [3], the teacher still uses direct learning in giving geometry lessons. Students tend to be passive. They get the geometry formula directly from the teacher. Learning is only one direction, namely coming from the teacher. Students are not directly involved in efforts to understand the concepts and principles of geometry.

Although daily mathematics is not entirely the same as school mathematics taught in the public school system, ethnomathematics approaches are a way to make it easier for students to reach mathematical concepts [4]. In fact we believe that mathematics is a human activity, so students are able to make discoveries or re-inventions of mathematical concepts and principles [5]. For example in Bengkulu, Indonesia has a culture that is very thick with geometric activities, such as making pyramid,
blocks, cubes, cones and balls. That is a culture called Tabot. This activity is carried out regularly in Bengkulu. This culture is very pleasing to the people of Bengkulu and neighboring provinces.

The mathematical process based on ethnomathematics is one way to solve a problem. Students are aware that the ethnomathematics of Rejang Lebong, Bengkulu, Indonesia is the starting point of horizontal mathematical activity. Students using traditional homes are a real problem to achieve geometrical concepts. Students can find out about the surface area and volume of pyramids, prisms, rectangular prisms, and cubes [3]. The implementation of ethnomathematics ideas that combine digital technology with drama techniques in education contributes to a variety of learning techniques. It is challenging the dichotomy of formal and informal learning. Ethnomathematics gives students the freedom to learn mathematical ideas through their context and culture [6]. Ethnomathematics creates a bridge between mathematics and ideas from culture [7]. Something that allows the existence of mathematics in culture. That is making students learn meaningfully. The teacher will more easily arrange teaching materials, student activity sheets and various media for learning mathematics that are close to students' lives and culture. That is an important change in mathematics learning that needs to be made to accommodate ongoing changes in student demographics in mathematics classes [8].

In the world of mathematics education, it must include cultural problems that can help students in learning mathematics [9]. It is a part of the heritage and creations of people's work. Therefore, combining mathematics learning with local culture becomes important. That is making it easier for students to solve mathematical problems. Students can significantly build mathematical concepts in their body of knowledge.

2. Methods
Based on the problem, this research is an exploratory study. We apply an explorative-qualitative approach. We focus on efforts to improve the culture of Tabot related to geometry. That is to find out the geometry in the culture of the Tabot, Tabot makers will be very understanding of the process of building it. Students are spectators as well as subjects who utilize Tabot culture to build geometry concepts. Mathematics teachers become actors in managing learning geometry based on Tabot culture. The subjects of this study were two Tabot makers, two elementary school students, and two elementary school mathematics teachers. That is a needs analysis. We use in-depth interviews with research subjects. Other activities are carried out through direct observation, documentation, in-depth interviews and focus group discussions. The main instrument is the researcher himself. The supporting research instruments were anecdotal direct observation sheets, and interview guides. Data were analyzed qualitatively. We apply genetic decomposition analysis.

3. Results and discussion
The subjects of this study were interviewed in-depth to explore the ins and outs of the Tabot. It is a culture that contains mathematical concepts and principles, especially geometry. Therefore, we trace against the perpetrators of the Tabot as well as the makers of the Tabot, the mathematics teacher as the developer of the Tabot culture-based mathematics learning tool, and students as the users of the Tabot culture-based mathematics learning tool. The subject consisted of 2 actors and makers of the Tabot (i.e. RD and TS), 2 mathematics teachers (that is DS and GR) and 2 students (namely FR and HD). They were interviewed in-depth about the Tabot and its benefits for learning mathematics in elementary schools. The following are excerpts of the interview and its analysis.

3.1. R (Researcher) interview with RD and TS
This a footage of the interview:

R  : What is the chronology and characteristics of the Culture Tabot in Bengkulu?
RD : Tabot is a traditional ceremony of the people of Bengkulu ... it is a culture to remember the heroic story of Husein bin Ali bin Abi Talib ...
RD : He was a hero in battle with Ubaidillah bin Zaid's forces in the Karbala fields ... precisely on the 10th of Muharram 61 Hijriah (681 AD).
R: Good ... how can culture be realized in Bengkulu?
RD: It was a celebration in Bengkulu that was first held by Imam Senggolo in 1685.
R: Next ...
RD: He was actually Syeh Burhanuddin who married a Bengkulu woman ... All their descendants were called the Tabot family.
R: Ok ... How is Mr. TS
TS: This Tabot culture is held regularly every year, the ceremonies are held from 1 to 10 Muharram.
R: How is this related to education for children in Bengkulu?
TS: Yes ... that culture can strengthen the character of students who always work hard, increase independence, and self-confidence ... this is a manifestation of the role model of Imam Senggolo that builds a strong lifestyle by working on a tap and full of self-confidence ...
TS: That is proven by Imam Senggolo to establish a new settlement called File, now under the name Kelurahan Tengah Padang.
R: Alright ... what next?
TS: Besides that ... they gave the order so that the traditions that were brought up from Madras and Bengali to be inherited were passed on to their descendants who had assimilated with the native Bengkulu people and produced offspring known as the Sipai people.
R: Yes ... that's amazing ...
TS: That is to reinforce the character of students who obey the principles, think logically, critically, and be curious.

Furthermore, it can be seen in Figure 1 and Figure 2. That is the Tabot Building made by Bengkulu people, especially by the descendants of Imam Senggolo called the Tabot Family.

Based on interviews and forms of Tabot construction (Figures 1 and 2), it means that the culture of the Tabot provides character reinforcement for students. Strengthening the character of students that can be preserved and improved continuously is:

- obeying the principle,
- thinking logically,
- critically,
- working hard,
- curiosity,
- self-regulated learning,
- confidence.

**Figure 1.** Tabot building 1.  
**Figure 2.** Tabot building 2.
Strengthening of characters that have been transmitted from Tabot culture can be explored as a process of strengthening character education during geometry learning. It is a good character to build a personality. Students will become problem solvers in their lives. That is as follows.

- **Obeying the principle**, it is proven that the Tabot family still obeys every rule and principle that has been made by its predecessor. In Geometry, the theorems and concepts that are built always obey the definitions and theorems that have been proven before. It is a deductive structure that holds to the principle of obeying the principle.
- **Think logically**, this is the teachings of Imam Senggolo who set an example that building new settlements is done with logical calculations. That is to be a character in learning Geometry, students must be able to think logically to be able to understand and solve Geometry problems.
- **Critically**, this is also a teaching that requires critical thinking skills to be able to survive and establish a new village. That is an important character in Geometry.
- **Working hard**, Imam Seggolo also gave reinforcement to always work hard in building new villages in other countries. Hard work becomes an important character in learning Geometry. Without it, students are often discouraged to study further.
- **Curiosity**, Tabot provides reinforcement of curiosity through various ornaments that exist in the bagot Tabot. Children and adult people lined up to wait by the roadside to take a closer look at the building of the Tabot. His curiosity is very high. And that's a good character to study Geometry through the preparation of conjectures. In the end they tried to prove it.
- **Independent learning**, the Imam teaches learning independently so that they are able to live well in the village they have just built. This becomes a great character for students who are studying Geometry.
- **Self confidence**, this is a strong sense of being able to realize his desire to build a new village. Be a Tabot family village that is still sustainable today. Therefore, students will have high confidence through learning Geometry based on Tabot Culture.

3.2. **Interview with mathematics teachers (i.e. DS and GR)**

We interviewed mathematics teachers as managers and developers of Tabot's culture-based mathematics learning tools. The teacher is the DS and GR who collaborate to develop Tabot culture-oriented learning tools. It was done based on the needs analysis that he did at the beginning of learning geometry. The following are the results of our interview.

**R**: How are you interested in developing Tabot's culture-based learning tools?

**DS**: The Tabot culture has been in Bengkulu for hundreds of years, so the children are very familiar with the Tabot building that they take along the streets of Kota Bengkulu.

**R**: What can you take from Tabot culture for learning Geometry?

**DS**: ... for the first one is the concept of a square ... (see Figure 3 and Figure 4) Students can easily understand it ... students can also find definitions of the concept of squares...
Based on interviews with DS, the teacher developed Tabot-based teaching materials. That is a square concept. The teacher asks students to construct their own concept of square through the student activity sheet. Finally students are able to define a square. That is a good definition. Square is a square is a rhombus whose angles are angled inside. It shows that the previous knowledge they have mastered well, namely the concept of rhombus. Based on this definition, students state that the proximum genus is the rhombus and the differentiator is specifically the inner angles of the elbows. That is an excellent starting point to be able to continue learning geometry. We ask Guru GR, the following excerpt.

R : What do you think of the Tabot culture-based geometry teaching material that can be developed?
GR : We can take from the middle of the Tabot building, it is a structure arranged by a rectangle ... We try to lure students to connect the rectangle with the ladder level ...
R : What do you mean by that?
GR : We hope that students will be able to define a rectangle with the proximum genja of the ladder.
GR : Based on our experience students are able to define it ... it is a cognitive process that we carry out using student activity sheets and learning media based on Tabot. (It can be seen in Figure 5 and Figure 6).

We then confirm students. Students (i.e. FR and HD), we interviewed in depth. That is the triangulation that we do to produce complete meaning. One of the interview excerpts is as follows.

R : Based on the learning guide given by your teacher, can you make sense of "rectangle"?
FR : Yes you can, Ma'am.
R : Are you HD, can you also set the definition?
HD : ... yes ma'am ... I learned together with FR to discuss with each other ...
R : OK ... you try FR ... define it ...
FR : ... the rectangle is a jajargenjang whose angles are angled inside ... That is the definition of the results of our discussion together ...
R : ... based on the definitions that you have compiled ... can you show a diagram of the relationship between the flat fields that you have studied?
DH : yes ma'am ... we've been breastfeeding ... it can be seen in this picture of us (see Figure 7).

![Concept maps prepared by students.](image)

**Figure 7.** Concept maps prepared by students.

Based on in-depth interviews with students (FR and HD) and Figure 7, we can conclude that through learning with the ethnomatematics approach (*Tabot* culture) students are able to understand flat field concepts. Among the concepts that they can understand are quadrilateral, trapezium, kite, jajargenjang, rhombus, square and rectangle. This proves that the ethnomatematics learning approach is appropriate for the achievement of geometrical concepts.

Next we got geometry concepts based on *Tabot* culture. These are triangles (see Figure 8 and Figure 9), the concept of the Cube (see Figure 10 and Figure 11), the Beam concept (Figure 12 and Figure 13), the Limas Quadrilateral concept (see Figure 14 and Figure 15), and the Ball concept (see Figure 16 and Figure 17). Actually there are still many more concepts that we can express based on *Tabot* culture, but we limit this.

![Part of the *Tabot* building.](image)

**Figure 8.** Part of the *Tabot* building.

![Triangle.](image)

**Figure 9.** Triangle.
Figures 8 and 9, show a concept which is managed by a triangle. It is a flat shape bounded by three segments that meet at the ends. Students are able to make triangles through meaning based on parts of the Tabot building. Students in Bengkulu are familiar with the Tabot building and its parts.

![Part of the Tabot building](image1)

**Figure 10.** Part of the Tabot building.

![Cube](image2)

**Figure 11.** Cube.

Figures 10 and 11 are illustrating the existence of geometry in Tabot culture. That is a cube. Students are guided by activity sheets compiled by the teacher to be able to make an understanding of the cube. It turns out students are able to make sense that the cube is a geometrical shape that is bounded by six concurrent squares that meet at the sides of the square.

![Part of the Tabot building](image3)

**Figure 12.** Part of the Tabot building.

![The beam](image4)

**Figure 13.** The beam.

Based on Figures 12 and 13 gives a picture for students to arrange an understanding of the beam. It is a concrete representation to make understanding based on the learning guide prepared by the teacher. Finally, students can make sense of the beam is geometrical constrained by three pairs of square or rectangular. Students also mentioned that the beam has 6 sides, 12 ribs and 8 corner points. They also stated that the beams which were bounded by six equal squares were congruently called cubes.
Figures 14 and 15 are an association that exists in Tabot culture. That is the concept of a quadrilateral pyramid that is on the part of the Tabot. Because students are familiar with Tabot culture, they do not experience significant obstacles to make understanding. A rectangular pyramid is a geometrical structure that is bounded by a rectangular shaped base and four vertical triangular sides. Also, students were able to mention that the quadrilateral pyramid has 5 sides, 8 ribs and 5 corner points.

In the end, we show the existence of mathematics in Tabot culture. That is the concept of the ball. See Figures 16 and 17, it is an association of parts of the Tabot and sphere building. In this connection students easily make the sense that the sphere is geometrical shapes formed by infinite circles of radius of the same length. Its center is at the same point. Students also say that the ball has exactly one side.

Based on the results of this study illustrates that the concepts of geometry actually exist in the Tabot building and ceremony procession. That provides support for previous research. Ethnomathematics is enriching the realm of mathematics learning. That is an impact on the philosophy of mathematics education. Mathematics teachers are challenged to deal with the cultural diversity of people that occurs in each classroom [10]. Ethnomathematician comes from mathematics in a culture. Ethnomathematics practices are carried out with integrity, increasing there is an awareness that aspects of practices and concepts are based on other cultures and which were not initially considered mathematical [7]. In the ethnomathematics approach, that classrooms connect mathematics and culture through craftsman practices, which can be identified by hidden mathematics. That is a mathematical knowledge in a culture [6]. The results of the study showed that the ability to understand mathematical concepts from students who were taught with realistic mathematics learning based on ethnomathematics was higher than those.
taught with direct instruction [11]. In addition, mathematics learning tools are suitable for application and easy to use. It's easy to learn and very helpful in the process of learning mathematics. Students learning about mathematics through mathematics learning tools is more than students learning conventionally [12]. Other research shows that students using local culture perform their metacognition processes to validate propositions in geometric 2-dimensional and 3-dimensional. That includes the surface area and volume of the pyramid, prism, rectangular prism, and cube [3]. After implementing the ethnomathematics learning approach, students are able to reach higher levels of thinking and are able to develop mature schemes. The student builds a thematic relationship between actions, processes, objects, and other schemes. That took the previous scheme. Students can solve problems encountered [13]. Mathematical understanding of students studying ethnomathematics-oriented material is higher than non-ethnomathematics material [1]. The genetic decomposition of ethnomathematics students illustrates the ability of students to understand mathematics completely [14]. The students' mathematical problem solving ability after being given an ethnomathematics learning approach implemented outside the room is higher than before being given the learning approach [2]. Thus, we are fully convinced that the ethnomathematics learning approach can have a positive impact on the achievement of the concept of geometry.

4. Conclusion
We conclude that Tabot culture can strengthen student character education. That is covering obeying the principle, thinking logically, critically, working hard, curiosity, self-regulated learning, self-confidence. Geometric concepts that exist in Tabot culture are two-dimensional figure, cubes, beams, pyramids, prisms, spheres and their elements. Students are able to compile maps of concepts about flat buildings precisely. Bengkulu Tabot culture can be used as a starting point to study the achievement of geometric concepts and strengthen student character education.

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