PROCEEDINGS OF INTERNATIONAL CONFERENCE ON EDUCATION
TEACHER TRAINING & EDUCATION FACULTY
UNIVERSITAS SERAMBI MEKKAH
NO. ISSN 2987-4564

Realistic Mathematics Education Based on The Ethnomathematics in Rumoh Aceh

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ABSTRACT

Mathematics plays a very important role in everyday life, we cannot imagine how difficult the lives of our students will be in social life if they do not understand mathematics well. Therefore, in learning mathematics in schools should begin with the introduction of problems related to daily life or culture in the area. This study aims to explore ethnomatics in Rumoh Acehin learning geometry for flat mangun material. The research method used in this study is qualitative with an ethnographic approach. The sampling technique uses purposive sampling. The subject of the study was a grade 3 student of Sekolah Alam Bireuen (SABIR) which is located in Bireuen Regency. Data was collected using conservation techniques, and interviews. Data analysis techniques through observation in the form of checks about activities while in Rumoh Aceh, and data analysis for interviews where during the interview will be asked questions about what things can be explored from Rumoh Aceh related to flat building material. The results showed that in geometry learning, abstract flat building material can be presented to a more concrete culture, namely Rumoh Aceh. This study found that there is ethnomatics in Rumoh Aceh building in geometry learning, especially flat shapes (square, square, triangle, parallelogram, and rhombus) taught with RME. Through this, students can know that there is an interrelated unity between mathematics learning in the context of Rumoh Aceh culture.

Keywords: *ethnomathematics, Realistic Mathematics Education (RME), flat plane geometry, Rumoh Aceh*

1. INTRODUCTION

Mathematics is one of the subjects taught at every level of education, ranging from primary education, secondary education to upper education. Based on this, it can be seen that mathematics is very important to learn when studying. According to Carl Friedrich Gauss, a mathematician, "*Mathematics is the queen and servant of the sciences"* (Wahyuni et al., 2013). It can be interpreted that mathematics is the queen and also the servant of science. Mathematics is queen, meaning that learning mathematics only requires itself, and what servants mean is that mathematics always exists and serves in other sciences.

Mathematics is an important subject in human life, it plays the role of most aspects of life today in the technological and digital age. In reality, children are always bored and easily bored in learning mathematics. (Siregar, 2017) If we look at how mathematics is related to everyday life, we can estimate how difficult children will be in social life if they do not understand mathematics well. Because in reality, mathematics is not just about calculations. Therefore, learning mathematics should begin with the introduction of problems related to daily life or culture about the area, so that learning should be contextual and students can find their own mathematical concepts learned. It does not merely understand existing concepts, but is able to process to obtain these concepts. In addition, mathematics learning does not only focus on acquiring knowledge, but instills attitudes that can be applied in everyday life and strengthens students' interest in their culture.

Ethnomathematics is one that can be a bridge between mathematics learning and culture. Ethnomathematics is the learning of mathematics inspired by culture. In addition to learning mathematics, students will learn culture which can foster their interest in learning culture as well as mathematics itself (Wahyuni et al., 2013). Ethnomathematics has several important roles in supporting the improvement of students' mathematical literacy. Ethnomathematics allows students to develop mathematical concepts using their understanding of socio-

culture in mathematical literacy. The development of mathematical concepts is needed as the main foundation that must be understood by students in learning mathematics (Fajriyah, 2018).

Based on the results of interviews and observations at SD SABIR, the learning carried out has been ethno-based but not optimal, especially ethnomathematics and students have not been able to connect the material learned with the culture of the region. The association of mathematics learning with the culture in Bireuen City is needed in this study. Learning will become more interesting because there is a culture around them that can be related.

Ethnomathematics is a form of mathematics that is influenced or based on culture. In this case, the purpose of ethnomathematical studies is to understand the belief system, thought and mathematical behavior of a group which can then be used as a basis for presenting meaningful mathematics learning for students. Because learning must start from things that can be imagined by students, close to students, and related to student life. According to him, ethnomathematics is a research program related to the history and philosophy of mathematics, with pedagogical purposes, focusing on art and technique (TICS) explaining, understanding and overcoming (mathema) different socio-cultural environments (ethno) (Nurhasanah & Puspitasari, 2022a; d'Ambrosio, 2001).

Ethnomathematics is mathematics applied by certain cultural groups, groups of workers or peasants, children of certain class societies, professional classes, and so on. More broadly, when viewed from a research point of view, ethnomathematics is defined as cultural anthropology of mathematics and mathematics education. Today the field of ethnomathematics, namely mathematics that arises and develops in society and in accordance with local culture, is the center of the learning process and teaching methods. This opens up pedagogical potential that takes into account the knowledge of the students gained from learning outside the classroom (d'Ambrosio, 2001; Nurhasanah and Puspitasari, 2022a).

Ethnomathematics can collaborate with the Realistic Mathematics Education (RME) approach because in the RME approach students learn to find a real problem through objects that are observed and can be imagined where the object is in the student environment, so that real or cultural problems experienced by students can be the initial foothold in learning. This is in line with what was conveyed (Ubaidillah et al., 2014) Mathematics has many benefits and we encounter many in everyday life, one of which is in flat geometry material. Sometimes, students see flat-shaped objects without them realizing it. So, we can use this realistic problem to help students understand the concept of getting flat. Constructivist learning theory is the cornerstone of this approach to learning, which prioritizes the learning phase. (Lestari and Andriani, 2019). Learning based on the principles of constructivism asks teachers to avoid conveying concepts directly. However, a learning process that requires teachers to encourage their students to build or find ideas in a way that they think is right and reasonable.

Gravemeijer (1994) explained that there are three main principles of RME learning, where the principles are guided reinvention/progressive mathematics (progressive mathematization), didactical phenomenology (didactic phenomena) and self developed models (developing own models), in which: (a) Guided reinvention: students are given the opportunity to be able to find their own concepts, definitions, theorems and even ways of solving problems through the presentation of contextual problems; (b) Didactical Phenomenology, in which the teacher introduces materials to students, the material must be presented in a contextual problem. Contextual problems here are interpreted as problems that are close to students and can be imagined by students in the real world. Students create models in their own way when solving contextual problems.

RME-based ethnomathematics includes several learning theories, namely Bruner's theory, Piaget's theory and Vygotsky's theory. According to Umbara (2017), Vygotsky’s theory focuses on social interaction with three focuses, namely culture, language, and zone of Proximal Development (ZPD). In addition, in Piaget’s learning theory, there is a principle of constructivism where in learning mathematics leads students to activities, such as conservation or exploration.

We have encountered many studies related to ethnomathematics. Some previous research, such as by Hastuti & Fauzan (2021) concluded that LKPD based on an ethnomathematical approach to data presentation

material is very valid and very practical so that it can be used in the learning process in elementary schools, especially in Grade V elementary schools. Valda et al. (2022) concluded that ethnomathematics-based learning media in grade VI material in elementary schools is declared a valid and practical use as a learning medium in elementary schools. Also, Wewe et al. (2022) concluded that LKS was developed based on realistic mathematics education in the Ngada ethnomathematical setting meets valid and practical criteria based on the results of student response assessments and teacher responses. Furthermore, Widada (2018) reported that the mathematical comprehension ability of students who were given ethnomathematics-oriented material was higher than those who learned with non-ethnomathematical material after controlling the ability of students' initial abilities.

The existence of GAP from previous research with this research. In previous studies that applied RME, there was no merger between ethnomathematics and Acehnese culture in the Rumoh Aceh building. This study attempted to explain RME in *Rumoh Aceh* culture. Then, it also focused on geometry on two-dimensional flat shapes. The research subjects and ethnos studied were very different from previous studies. This study also combined several data collection and analysis techniques, such as observation, and interviews.

This study described the geometry learning of what flat materials found in Rumoh Aceh and how they were correlated. It is expected that this research can help elementary school students understand the concept of getting up flat and increase their interest in learning mathematics through culture. In the end, the culture of a particular tribe or culture in Indonesia can be maintained through cultural-mathematical, or ethnomathematical, correlation.

2. METHODS

The method used in this study was ethnographic method. This method was chosen because this study aimed to describe culture in Aceh. Ethnographic methods involve the study of cultures found and developed by a certain group of people. Here, the researchers explored mathematical ideas in *Rumoh Aceh* presented based on RME.

This research was used to understand theorems in research subjects, such as behavior, perception, motivation, and actions by describing them in words and language (Adam, 2010). The purpose of this study was to describe cultural characteristics in individuals or groups of people as members of a cultural community. This research was centered on the perspective of the subject as the object of research because this ethnographic approach is centered on the study of culture as a whole.

The research location was *Rumoh Aceh* museum. The object was *Rumoh Aceh* with data sources of building space materials and students in three elementary schools of Sekolah Alam Bireuen (SABIR) in Bireuen Regency. Data were collected through observation, and interviews.

This research had several steps as follows: (1) Introduction, where the researchers determined the location and ethno that would be explored in flat geometry material, (2) At this stage, the researchers made an observation sheet and interview format regarding matters related to what they wanted to research, (3) At this stage, the researchers began to collect data through observation and interviews with twelve students who visited the *Rumoh Aceh* museum, (4) At this stage, the researchers verified the data collected directly from observations and interviews, (5) At the data analysis stage, the researchers analyzed the results of observations and interviews related to the geometry of flat material conducted by students of *Sekolah Alam Bireuen* Elementary School (SABIR), (6) Conclusions were drawn from data analysis of activities about flat building carried out by students of *Sekolah Alam Bireuen* Elementary School (SABIR), (7) In this step, conclusions were drawn from previously analyzed data. To facilitate research, a research flow should be created as shown in Figure 1.

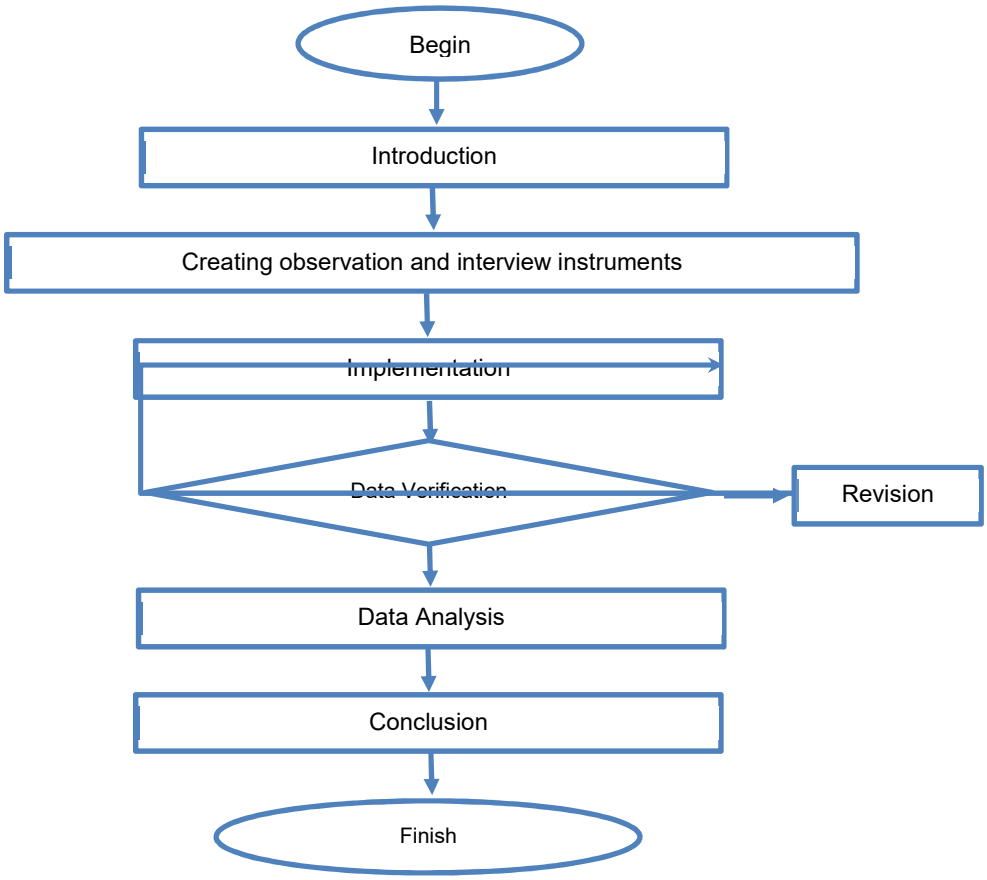

Figure 1. Research Procedure

Students in the third grade of SD Sekolah Alam Bireuen (SABIR) were the subjects of this study. They were selected using the purposive sampling method. This was due to the fact that not all students in the third grade became subjects of research. The researchers made observations about student activities in the *Rumoh Aceh* museum. Then, they documented the data. Data was collected while students were in the *Rumoh Aceh* museum. During the break, the researchers conducted interviews with students about the flat-shaped parts of the Rumoh Aceh building they drew in books. The type of interview used was semi-structured, so the questions can be tailored to the situation and context of the conversation. The researchers used several instruments, such as observation checklists and interview sheets, to analyze the data. At the end of the analysis, the researchers examined all the data for triangulation.

3. RESULTS & DISCUSSION

Based on the results of field observations on RME-based ethnomathematics, it can be concluded that learning flat building material from the Rumoh Aceh building provides a new experience for students. Based on the observed *Rumoh Aceh*, it can be seen that students can find some pictures or two-dimensional flat shapes such as squares, rectangles, and triangles. They can name the flat wake of some parts of *Rumoh Aceh*.

In addition, based on the results of interviews with students involved in this activity, several conclusions were obtained from an ethnomathematical point of view, namely:

1. Can develop critical and creative thinking skills because students have to imagine what part of Rumoh Aceh can be in the form of a flat building.
2. Develop Self-regulated learning (SRL) skills because it gives personal responsibility to the learners who are implemented. Self-regulated learning (SRL) is part of cognitive learning theory which states that behavior, motivation and aspects of the learning environment, will affect the achievement of a student.
3. This learning makes students feel happier because they experience new things, where they can associate culture with mathematics, and students are able to solve contextual problems.
4. Students are able to explain and distinguish flat shapes based on their properties based on real-world contexts through ethnomathematics.

The following table is an ethnomathematical exploration based on RME in the Rumoh Aceh building

Table 1. The Concept of Geometric Shapes in Rumoh Aceh building

Picture	Mathematical Concepts
	Know and understand the flat shape of rectangular shapes
	Understand the properties of rectangles, squares, and rhombuses.
	The building is triangular. Rectangle, and rhombic.

Picture	Mathematical Concepts
	Rectangle

Math problems with RME can improve students' cognitive abilities in learning mathematics because linking problems with daily life and surrounding culture can improve student learning outcomes. As a result, Acehnese ethnomathematics can help students understand two-dimensional spatial building material. Rumoh Aceh contains many mathematical elements that can be given to students, through Rumoh Aceh ethnomathematics students will be more interested and motivated to learn mathematical material. In addition, through ethnomathematics Rumoh Aceh, students will better understand and love the culture around them. Rumoh Aceh is expected to be a learning medium and learning resource for students at the elementary school level.

4. CONCLUSION

The results of data analysis and discussion concluded that there was an exploration of Ethnomathematics based on Realistic Mathematics Education (RME) in *Rumoh Aceh* museum. The ethno-mathematics that appears in the building *Rumoh Aceh* is that students can describe the characteristics of various flat shapes (quadrilaterals and triangles). Through ethno-mathematics in the *Rumoh Aceh* building, students can understand flat building material by looking directly at the socio-cultural life of the Acehnese people, especially in Bireuen district. Apart from understanding the material to students, the introduction of RME-based ethno-mathematics also provides new experiences and understanding for teachers that the *Rumoh Aceh* building can be a bridge between culture and flat building material. Based on this research, it is recommended to conduct further research to be able to develop RME-based ethnomathematics teaching materials in the *Rumoh Aceh* building. It can be applied to other cultures in Aceh Province.

5. ACKNOWLEDGMENTS

We would like to express our deepest gratitude to all parties who have supported intensively in this research. We express our sincere appreciation to Sekolah Alam Bireuen (SABIR) who have provided assistance, support, and extraordinary cooperation during the implementation of this research. The assistance provided in the form of facilitation of access, time, and resources is very meaningful for the smoothness and success of this research. Hopefully, the cooperation and contribution that has been established can bring benefits not only to us, but also to the development of education in the Bireuen area. Thank you for the dedication and commitment that has been given.

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