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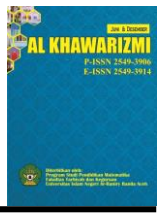

IMPLEMENTATION OF TRIANGLE LEARNING BASED ON ACEHNESE BATIK CULTURE AT MTS KEUTAPANG DUA

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Abstrak

Mathematics is one of the subjects taught at various levels of school because this science has a close relationship and an important role in everyday life. Triangles are one of the important materials taught in schools. However, many students still experience difficulties in mastering this material. One way to overcome this problem is through Ethnomathematics-based learning. Ethnomathematics is a mathematics learning approach that integrates cultural elements and local wisdom of a region. This study aims to determine how the implementation of triangle material learning based on Acehnese batik culture at MTS Keutapang Dua. The method used is quantitative research with a quasi-experimental type. The research design applied is a posttest-only control design. The experimental class received learning about triangles integrated with Acehnese batik motifs, while the control class received conventional learning. The results of the study indicate that the implementation of Acehnese batik culture-based learning has a positive impact on student learning outcomes.

INTRODUCTION

Mathematics is a subject taught at all levels of school due to its close interconnectedness and crucial role in daily life. Mathematics is taught at almost all levels of education, from elementary school to junior high school (Anifarka & Rosnawati, 2023; Setiawan et al., 2022). At the junior high school level, students must master five basic skills in mathematics: problem solving, communication, connections, reasoning, and representation. To achieve these skills, various materials are studied, including triangles.

The concept of the area of a triangle in mathematics teaches how to calculate the area of a triangle. Based on observations and interviews with mathematics teachers at MTS Keutapang Dua, students often experience several obstacles in understanding the concept of

triangles, such as difficulty distinguishing between the base and height, difficulty determining the height of a triangle, and difficulty recognizing the difference between an equilateral triangle and an isosceles triangle. Furthermore, according to Siswanto et al., 2024, another factor contributing to students' difficulty understanding the concept of triangles is the lack of teacher creativity in delivering the material. Teachers tend to rely solely on written notes, leaving students busy copying. As a result, students easily become bored due to the monotonous presentation of material, which in turn diminishes their interest in learning. Ultimately, student learning outcomes are suboptimal. Therefore, teachers should master classroom management techniques to create a pleasant classroom atmosphere and encourage students to be active and creative during the learning process.

One way to address these issues is through ethnomathematics-based learning. Ethnomathematics is a mathematics learning approach that integrates cultural elements and local wisdom of a region, thereby increasing students' learning motivation. According to (Yolanda & Putra, 2022), this approach enables students to learn mathematics through a cultural context familiar to them, which in turn provides a more relevant and meaningful learning experience. Meanwhile, (Rohim, 2021; Salsabila et al., 2025) explain that through ethnomathematics, students can discover, create, search for, and solve various mathematical problems within a cultural framework. Ethnomathematics is essentially the study of mathematical ideas originating from traditional societies. Terminologically, ethnomathematics is defined as mathematics practiced by various groups in society, including certain ethnic groups, laborers, children based on age, and professionals. In line with the opinion of (Khaerani et al., 2024) and (Ifana et al., 2022) which states that the application of ethnomathematics in the classroom will make learning more meaningful, especially if applied in a multicultural classroom environment (consisting of various ethnicities, cultures, social backgrounds, etc.). Thus, ethnomathematics is a combination of mathematics and culture based on the local wisdom of a community, where groups with different cultural backgrounds exchange their mathematical practices, for example in how to group, count, measure, design buildings or tools, play, and so on.

According to (Mahmudi et al., 2023), the application of ethnomathematics is expected to foster students' interest in mathematics learning. This is because students can directly see how mathematical concepts are applied in real life, making it easier for them to understand the material and achieve better learning outcomes. In a learning process that implements ethnomathematics, students are able to master mathematical skills without neglecting their cultural values. Some benefits of ethnomathematics-based learning include making mathematics more enjoyable and contextual, and reducing the perception that mathematics is difficult and abstract. Instead, it creates the impression that mathematics is interesting and truly present in everyday life. Meanwhile, (Aprianto et al., 2026) and (Adrian et al., 2025) state that ethnomathematics can avoid overly formal and abstract mathematics learning methods, making the learning process easier to understand and more engaging for students.

To foster students' interest in mathematics, particularly in the area of triangles, the authors utilized Gayo openwork batik as a means to attract students' attention. With this approach, learning not only conveys the concept of the area of a triangle but also integrates ethnomathematics values. This is expected to increase student motivation while also introducing local Acehnese culture, namely Acehnese batik. This makes the learning process more enjoyable and allows students to more easily understand the material.

The people of Aceh, especially students, need to be familiar with their own regional batik culture because Aceh has a very distinctive and stunning batik, which is the result of a combination of typical Aceh provincial motifs with bright colors that dominate. One example is the Gayo kerawang batik, which contains triangular shapes. From this motif, we can create an attractive learning so that children are more interested in paying attention to the triangle material, so that the learning process does not feel boring. In addition, other important efforts come from the role of artists, academics, and batik cultural experts who help promote batik as an identity and brand of the Indonesian nation. This promotion aims to preserve and develop batik, so that the younger generation also loves and preserves batik as a cultural heritage of the nation. As stated (Hardiarti, 2017), culture is a complete and comprehensive unity that applies in a society, while mathematics is used by society to solve various problems.

The relationship between ethnomathematics and triangles lies in the ability of ethnomathematics to be an innovation in mathematics learning based on local batik culture. Patterns in batik motifs containing mathematical elements in the form of triangles can be used as an alternative learning resource for students. Through this approach, students not only gain an understanding of the concept of triangles but also gain insight into how mathematics, especially triangles, is found in one of the elements of culture. This approach helps students in learning the abstract material of triangles, increases learning motivation, and facilitates students to connect the concepts learned with real-world situations. An effective learning strategy is to present boring academic concepts into visual and practical learning experiences, so students can understand how the material they learn in class applies in real life. Because, if the tools used are not appropriate or not utilized optimally, the results achieved will not be optimal.

Several relevant studies related to batik culture exist, including research by (Nuryami & Apriosa, 2024) on the exploration of ethnomathematics in Probolinggo batik as a source for learning mathematics in schools. They found various mathematical concepts in typical Probolinggo batik, such as rhombuses, rectangles, points, angles, parallel lines, prisms, circles, triangles, as well as the concepts of translation, reflection, and rotation. These concepts not only motivate students in the learning process but can also be used as reference sources. Furthermore, (Laukum et al., 2024) in their research revealed that local cultural elements, particularly in the architecture of Bugis-Makassar traditional houses, have a strong relationship with mathematical concepts, especially triangular geometry. This research is relevant in the context of the Independent Curriculum which encourages contextual learning based on local culture, because it can help students understand mathematics material more meaningfully and rooted in their own cultural identity. In addition, (Mailani et al., 2024) explored ethnomathematics in flat geometry, especially triangles, in traditional Batak Toba clothing using a qualitative approach and literature study. The results showed that sortopi contains elements of isosceles triangles, which indicates a close relationship between cultural elements and mathematical concepts, especially geometry. However, there has been no similar research that examines Gayo openwork batik on triangle material, especially in the Aceh Besar Regency area. This is also the renewal and urgency in this study, so the researcher is interested in examining how to implement triangle material learning based on Acehnese batik culture at MTS Keutapang Dua.

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RESEARCH METHODS

Types of research

This research is a quantitative study with a quasi-experimental type. The research design used is a posttest-only control design. In this design, there are two groups, each selected randomly (R). The first group is given treatment (X), and the other group is not. The group given the treatment is called the experimental group, and the group that is not given the treatment is called the control group. The effect of the treatment is (O_1 : O_2). According to (Sugiyono, 2021), in actual research, the effect of treatment is analyzed using a difference test, for example using the t-test statistic. If there is a significant difference between the experimental and control groups, then the treatment given has a significant effect.

Table 1.
Research Design

Sampling	Treatment	Test
R	X	O_1
R		O_2

source: Sugiyono, 2023

Information:
R : Sampling
X : Treatment using the application of Acehnese batik culture-based learning
o_1 : Test for experimental class
o_2 : Test for control class

Time and Place of Research

This research was conducted at MTS Keutapang Dua, located at Jl. Hadiah No. 4, Lambheu Village, Darul Imarah District, Aceh Besar Regency. The research was conducted at MTS Keutapang Dua during the even semester of the academic year. This research was conducted in class VIII-1 as the experimental class and class VIII-3 as the control class.

Population and Sample

The population in this study were eighth-grade students at MTS Keutapang Dua, consisting of three classes. The sample in this study was students in class VIII-1 as the experimental class and class VIII-3 as the control class. Class VIII-1 had 23 students and class VIII-3 had 21 students. The samples in this study were selected randomly.

Procedure

This research was conducted by implementing Acehnese batik culture-based learning in the experimental class and conventional learning in the control class. At the end of the study, students were given a five-question test based on Acehnese batik culture. The results were then analyzed using a t-test.

Data Sources, Instruments, and Data Collection Techniques

The primary instrument used to measure the abilities studied was an Ethnomathematics-based triangle test sheet. The test given to students consisted of validated essay questions.

The learning materials used in this study included teaching modules, student worksheets (LKPD), and textbooks. The teaching modules and LKPD were also validated by a Mathematics teacher and a Mathematics Education lecturer at Iskandar Muda University.

The data collection technique used in this study was a written test in the form of essay questions, used to measure students' ability to solve problems. The test used five essay questions on the area of triangles.

Data Analysis Techniques

Data analysis on test results is to provide an assessment score for the completion of the test items, on five essay questions. The data processed for this assessment is the results of five essay test data obtained from the experimental class and control class. Next, the data was tested using the t-test with a significance level of 0.05. Before testing the equality of two averages, a normality and homogeneity test of the data is first carried out. Furthermore, if the data is not normally distributed, then it will be continued by carrying out non-parametric tests.

RESEARCH RESULTS AND DISCUSSION

Research result

The sample for this study was 44 respondents from two classes: class VIII-1 with 23 respondents (experimental class) and class VIII-3 with 21 respondents (control class). The data for this study were taken from the scores for the application of Ethnomathematics learning in the form of test questions. The questions given to students aimed to assess the results of the application of learning about triangles based on batik culture. The following are the scores obtained from the posttest-only control design.

Table 2.
Data Processing Results for Control Class and Experimental Class

Class	$\bar{x}$	s^2	s
Eksperiment	88,108	80,311	8,961
Control	79,5	250	15,811

Table 2 shows the average, variance, and standard deviation of the control and experimental classes. This data will be used to determine whether the data in the control and experimental classes are normally distributed. The results of the data processing can be seen in the following table:

Table 3.
Data Normality Test Recapitulation

NO	DATA TEST	Value X_{count}	Value X_{table}	CONCLUSION
1	Experimental class	10,37	11,1	Accepted H_0
2	Control class	3,294	11,1	

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Based on the table above, in the experimental class, x^2 count < x^2 table that is 10,37 < 11,1, then accepting H_0 and concluding that the final test scores in the experimental class are normally distributed. Similarly, in the control class, x^2 count < x^2 table that is 3,294 < 11,1, then accepting H_0 and concluding that the final test data in the control class are normally distributed. Since the decision-making criterion is to accept H_0, it can be concluded that the final test data in the experimental and control classes are normally distributed.

Next, a homogeneity test will be conducted for the control and experimental class data. The results of the data processing can be seen in the following table:

Table 4.
Homogeneity Test Recapitulation

DATA TEST	Value F_{count}	Value F_{table}	CONCLUSION
Experimental class and Control class	1,764	2,07	Accepted H_0

Based on the level of significance 5% ($a = 0{,}05$) with $dk_1 = (n_1 - 1)$ and $dk_2 = (n_2 - 1)$. The decision-making criteria are: "if $F_{count} < F_{table}$ then accepted H_0 and on the contrary "$F_{table} = F_a(dk_1, dk_2) = 0{,}05\ (22{,}20)$. Therefore $F_{count} < F_{table}$ tahat is $1{,}764 < 2{,}07$ then accepted H_0 It can be concluded that there is no difference in variance between the experimental and control classes.

The control and experimental classes are normally and homogeneously distributed, and a test for equality of two means is then performed. The results of the data processing are shown in the following table:

Table 5.
Recapitulation of the Test of Equality of Two Means

DATA TEST	Value t_{count}	Value t_{table}	CONCLUSION
Experimental class and Control class	2,291	2,018	Accepted H_1

In the table above, the results are obtained $t_{count} > t_{table(1-a)}$, $2{,}291 > 2{,}018$, and based on the "test criteria is acceptable H_0 if $t < t_{(1-a)}$ and rejected H_0 for other values", This means that H_1 is accepted, so it can be concluded that the application of learning material on triangles based on Acehnese batik culture in the experimental class is better than in the control class.

Discussion

The Ethnomathematics learning model was applied to eighth-grade students of MTS Keutapang Dua to assess the results of their learning on triangles, based on Acehnese batik culture. The ethnomathematics learning model, based on Acehnese batik culture, improved students' problem-solving skills, enhanced their understanding of concepts, and increased their active participation in learning activities. They engaged in thinking and demonstrating to find the final result, discovering it themselves, thus creating a sense of satisfaction. This inner satisfaction encouraged further discovery, fostering a sense of increased interest in learning.

This was evident in the positive interaction between students and the teacher, with students confidently asking questions and seeking guidance from the teacher in completing assignments. Overall, student activity was highly effective, contributing to the achievement of the planned learning objectives. The achievement of learning objectives is crucial for the success of any learning process. The success of the learning process significantly influences the success of the research.

Based on the test results of the experimental class taught using the Ethnomathematics learning model based on Acehnese batik culture and the control class taught using the conventional learning model, differences in student learning implementation on triangles were evident. This means that the experimental class using the Ethnomathematics learning model is better than the class using the conventional learning model, where learning is considered more effective in delivering material. This is in accordance with the results of research (Husna, 2024) which states that the use of Ethnomathematics learning media can help improve student learning achievement as reviewed from the acquisition of student learning outcomes. Likewise, the results of research and discussion by (Jariyah et al., 2025), it can be concluded that the application of realistic mathematics learning based on Ethnomathematics is effective in improving student learning outcomes and shows an increase and influence from the implementation of the learning carried out.

The ethnomathematics exploration of Gayo openwork batik can be an attractive way to learn mathematics, particularly in the area of triangles. The mathematical concepts found in Gayo openwork batik can not only motivate learning but also serve as a learning tool, utilizing traditional motifs and patterns as contextual mathematics learning media. This medium also connects mathematical concepts such as geometry with local wisdom, making it easier for students to understand the material. Integrating local culture into learning creates meaningful learning experiences, fosters pride in cultural heritage, and reduces the perception of mathematics as an abstract subject. By utilizing Gayo openwork motifs, learning becomes more engaging, creative, and can increase student motivation and active participation.

This aligns with the findings of a study (Nuryami & Apriosa, 2024) on the ethnomathematics exploration of Probolinggo batik as a resource for school mathematics learning. The mathematical concepts found in Probolinggo batik not only motivate learning but also serve as a reference source. In line with research by Syam & Pujiastuti (2023), ethnomathematics plays a crucial role in learning mathematics by engaging in activities or exploring regional cultural values, thus facilitating a person's understanding of a concept. The mathematical concepts found in Cilegon batik can motivate students to learn mathematics through culture.

The application of learning the Gayo openwork batik motif enables students not only to gain mathematical understanding but also to recognize their cultural heritage. This helps maintain a sense of pride in cultural identity among the younger generation. Consistent with research by Yolanda & Putra (2022), in a study on the exploration of mathematics in East Javanese batik motifs, by utilizing local cultural elements, such as batik motifs, students in mathematics learning not only gain mathematical understanding but also recognize and appreciate their cultural heritage. This helps maintain cultural values relevant amidst changing times and instills a sense of pride in cultural identity in the younger generation. From the results of this study it is also known that the application of learning triangle

material based on Acehnese batik culture to students of MTS Keutapang Dua is effective and can be an effort to overcome the obstacles of delivering material that seems boring. The reason is that by using the Ethnomathematics approach (Gayo openwork batik culture on triangle material) students can play an active role in solving learning problems and students can more easily understand the material because it is taught through concrete things and the culture of the surrounding environment. Likewise, research (Nurhaliza, 2023), it is known that the application of Ethnomathematics geometry games to elementary school students is effective and can be an effort to overcome the obstacles of delivering material that seems boring, where students can play an active role in solving learning problems and students can more easily understand the material because it is taught through concrete things and the culture of the surrounding environment.

CONCLUSION

Based on the research that has been conducted at MTS Keutapang Dua with the title "Implementation of Learning Triangle Material Based on Acehnese Batik Culture at MTS Keutapang Dua" it can be concluded that the implementation of learning triangle material based on Acehnese batik culture taught using the Ethnomathematics model in the experimental class is better than that taught using the conventional learning model.

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