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IMPROVING UNDERSTANDING OF THE CONCEPT OF GEOMETRIC TRANSFORMATION AND MATHEMATICAL SELF-EFFICACY THROUGH CIKADU PANDEGLANG BATIK MOTIFS

Irma Ainni[1], Jaka Wijaya Kusuma[2], Vidya Ayuningtyas[3]
Universitas Bina Bangsa, Serang, Indonesia

***Corresponding Author**:**
Irma Ainni
Universitas Bina Bangsa, Serang, Indonesia
JL Raya Serang - Jakarta, KM. 03 No. 1B, Panancangan,
Kec. Cipocok Jaya, Kota Serang, Banten 42124
irmaainnii@gmail.com
Contact Person: -

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ABSTRACT

This research is based on the low ability to understand concepts and self-efficacy. This study aims to determine the difference in students' ability to understand concepts and self-efficacy after using ethnomathematics-based learning with conventional learning and to explain the ethnomathematical elements contained in the Cikadu Pandeglang batik motif. This study uses a Quasi Experimental experimental design, namely The Nonequivalent posttest-control group Design. The test data collection technique using a concept understanding posttest of 4 questions of non-self-efficacy data contains 20 statements, and the analysis of test data used by normality tests, homogeneity tests and hypothesis tests, and non-test data is analysed by the Likert scale test. The results of the study showed that there was a difference in understanding of concepts and self-efficacy based on the posttest and questionnaire given. In this study, it can be concluded that there is a difference in students' understanding of concepts and self-efficacy after using ethnomathematics-based learning with conventional learning.

Keywords: Concept Of Geometric Transformation, Mathematical Self-Efficacy, Cikadu Pandeglang Batik Motifs

INTRODUCTION

Education has the essence of changing attitudes and behavior in a better direction so that education can be termed as humanizing humans (Ansori, Hakam, Nurihsan, & Hidayat, 2018; Berkowitz & Bier, 2005; Markova, Mironov, Vaganova, & Smirnova, 2019; Revell & Arthur, 2007). According to Rahman *et al.* (2022), Education is a conscious and planned effort to create a learning atmosphere and learning process, so that students can actively develop their potential, which includes religious, spiritual strength, self-control, personality, intelligence, noble morals, and skills needed by themselves and society. According to Fathan (2025), In the education system in schools, various subjects are studied, including mathematics, which is very important for developing logical, analytical, and problem-solving skills. However, most students consider mathematics to be an uninteresting subject and too difficult to understand, which is supported by the statement. of Raisyah *et al.,* (2025), Mathematics is a subject that most students do not like because they consider it a difficult subject; students tend to think that the

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learning is uninteresting. This was also said by Ananda *et al.,* (2025), According to him, there are still many students who consider mathematics an uninteresting subject. Therefore, an approach is needed that can increase students' interest in mathematics, so that they can be more active in learning activities.

According to Rahmawati *et al.,* (2025), Ethnomathematics equips students with the understanding that mathematics is not only found in the classroom, but also present as part of a culture that lives and thrives in their surrounding environment. According to Nursanti *et al.,* (2024), Through the ethnomathematical approach, it is hoped that students can relate mathematical concepts to their daily experiences. More broadly, ethnomathematics is like a bridge connecting our culture with mathematical concepts. It's not just about finding mathematics within culture, but also about how a group of people think and understand the world through their own mathematical lens (Muhtadi, Sukirwan, Warsito, & Prahmana, 2017; Rosa, Shirley, Gavarrete, & Alangui, 2017; Umbara, Wahyudin, & Prabawanto, 2021; Widada, Herawaty, Anggoro, Yudha, & Hayati, 2019).

Based on the results of interviews and observations at one of the high schools in Pandeglang, it was found that the problems faced by students, namely the understanding of concepts and *self-efficacy* of students, are still relatively low. Therefore, researchers are interested in improving students' ability to understand concepts and *self-efficacy* by using an ethnomathematical approach. This is supported by research by Andriyani *et al.* (2024), who stated that there was a difference in the average value of concept understanding and *self-efficacy* in control and experimental classes, after being given ethnomathematics-based learning.

From the background explanation above, these problems can be overcome by using an ethnomathematical approach to make learning more enjoyable. This can improve students' understanding of concepts and *self-efficacy* by providing examples of mathematical concepts in the Cikadu Pandeglang batik motif. From the background of the problem that has been described earlier, the researcher will carry out research entitled, "*Improving Understanding of the Concept of Geometric Transformation and Mathematical Self-Efficacy Through Cikadu Pandeglang Batik Motifs*".

METHODS

This research was conducted in one of the high schools in Pandeglang, with a sample of class XI-1, totalling 30 people and class XI-3, totalling 30 students. The design of this study *is quasi-experimental, namely the Nonequivalent Posttest - Control Group Design*, which is used to see the difference in results between the experimental class and the control class. According to Lestari and Yudhanegara (2015), As follows:

Tabel 1. The Nonequivalent Posttest - Control Group Design

Kelas	Treatment	Posttest
Eksperimen	X	O
Control	C	O

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Information :

$\boldsymbol{X}$: Treatment provided or ethnomathematics-based learning.

$\boldsymbol{C}$: Conventional learning

$\boldsymbol{X}$: *Experimental class* posttest

The steps in the experimental class in ethnomathematics-based learning are that the researcher first directs students in the class to explain the purpose of ethnomathematics learning. Then the researcher explained the geometry transformation material while showing various kinds of relevant batik motifs according to the sub-chapters, including translation, reflection, dilation and rotation. Then, after learning, students are directed to fill in the practice questions on the Student Worksheet (LKPD). In the last part of the page, students are instructed to look for various examples of geometric transformations that exist around them. In the end, students are given a *posttest* to measure their ability to understand concepts and *self-efficacy* after being given an ethnomathematics-based learning treatment. Meanwhile, in the control class, students were given conventional learning, then given *a posttest* of concept understanding and *a self-efficacy questionnaire*.

1. Concept Understanding Indicators

   Indicators of concept understanding according to Hendriana *et al.* (2017), As follows:

   a. Redefining concepts in their own words.
   b. Identify examples and non-examples.
   c. Representing a concept.
   d. Change the way concepts are presented from one form to another.
   e. Getting to know the various meanings and interpretations of concepts.
   f. Identify the properties and recognise the conditions that define a concept.
   g. Compare and contrast concepts.

2. Indicator Self-efficacy

Table 2. Indikator self-efficacy

Dimension	Indicator
Magnitude	Have an optimistic attitude when completing lessons and assignments.
	Demonstrate a high interest in school materials and assignments.
	Continue to strive to develop one's potential and achieve achievements.
	Viewing difficulties in tasks as challenges to be faced.
	Carry out learning activities according to a predetermined schedule.
	Selectively choosing steps to achieve learning goals.
Strength	Belief that the efforts made can improve achievements optimally.
	Belief that the efforts made can improve achievements optimally.
	Confidence and awareness of their superiority.
	Perseverance and persistence in completing various tasks.
	Have positive goals in every activity carried out.
	Have good self-motivation to support personal development.
Generallity	Ability to respond to different situations with a positive attitude and an open mind.

	To use past experiences as a provision for future success.
	Have an interest in exploring new situations.
	Able to deal with various situations effectively.
	Dare to take on new challenges.

The *self-efficacy criteria* that will appear in the analysis of non-test data in this study, according to Allanta and Puspita (2021), Are as follows:

Tabel 3. Kriteria Self-efficacy

Self-efficacy	Criterion
$\boldsymbol{SE \leq 20\%}$	Very Low
$\boldsymbol{,20\% < SE \leq 40\%}$	Low
$\boldsymbol{,40\% < SE \leq 60\%}$	Enough
$\boldsymbol{,60\% < SE \leq 80\%}$	High
$\boldsymbol{,80\% < SE \leq 100\%}$	Very High

FINDINGS

After the research was carried out, *posttest data* were obtained from the results of the students' concept understanding test, in the experimental class and the control class. The results of the posttest of student concept understanding in both classes are presented as follows:

Tabel 4. Analisis Deskriptif

	N	Minim	Max	Mean	Standard Deviation
Post-test of understanding of experimental concepts	30	64	91	77,87	8,059
Posttest understanding of control concepts	30	52	78	65,80	7,160
Valid	30				

In Table 4, the average score of the *posttest experiment class of* students' concept comprehension ability after being given ethnomathematics-based learning is 77.87, with the highest score of 91 and the lowest score of 64. In the control class, the average *posttest* of students' concept comprehension ability after being given conventional learning was 65.80, with the highest score of 78 and the lowest score of 52. Thus, after being treated, the results show that there is a difference in the average score of the *experimental* class posttest with ethnomathematics-based learning and control with conventional learning.

After that, the researcher conducted a normality test with the tested data as a result of *the posttest* of students' concept comprehension ability, which was obtained from the experimental class with ethnomathematics-based learning and the control class with conventional learning. The test was carried out using *the Shapiro-Wilk test* through SPSS software version 27. Data is declared to be normally distributed if the significance value (Sig.) is greater than α, which is 0.05. The following are the results of the posttest normality test *of* students' concept comprehension ability in the experimental class and the control class:

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Table 5. Normality Test

	Shapiro-Wilk		
	Statistic	Df.	Sig.
Posttest Understanding of Experimental Concepts	0,948	30	0,145
Posttest Understanding of Control Concepts	0,961	30	0,329

Table 5 shows that the significant value for *the posttest* of students' concept comprehension ability after being given ethnomathematics-based learning treatment was 0.145, and the significant value for *the posttest* of students' concept comprehension ability after being given conventional learning in the control class was 0.329, where the result was Sig. > 0.05. This shows that the research is distributed normally.

Based on the normality test, *the posttest* data on students' ability to understand concepts in the experimental and control classes were then tested for homogeneity. The homogeneity test used in this study is *Levene's test* using SPSS software version 27. The data is said to be homogeneous if it meets the criteria of Sig. *Based on mean* > 0.05. The results of the homogeneity test of the *posttest data of* students' concept comprehension ability are as follows:

Table 6. Homogeneity Test

		Levene Statistic	Df1	Df2	Sig
Concept Understanding Posttest Results	Based on the Mean	0,894	1	58	0,348
	Based on the Median	0,878	1	58	0,353
	Based on Median and with adjusted df	0,878	1	57,968	0,353
	Based on the Trimmed Mean	0,895	1	58	0,348

Based on Table 6, it is known that the significance value (Sig.) *based on the mean* is 0.348, which means that Sig. > 0.05. So that the significant value of the test data on the ability to understand the concept of posttest students in the experimental class and the control class can be concluded that the variance of the data is homogeneous.

Hypothesis testing was carried out using an independent sample t-test. The calculation process uses SPSS software version 27. Analysis of the independent samples t-test on students' ability to understand concepts before and after being treated in the experimental class or control class, as follows:

Table 7. Hypothesis Test

		f	Sig.	t	df	Sig. (2-tailed)
Result in a posttest of concept understanding	Equal Variances assumed	0,894	0,348	6,131	58	<0,001
	Equal Variances not assumed.			6,131	57,208	<0,001

Based on Table 7, the output of the *independent samples test* obtained a Sig. Value (2-sided p) of < 0.001, which means P < 0.05. Thus, it can be concluded that **H0 is rejected and H1 is accepted**, so that there is a difference in understanding the concept of the experimental class with the control class

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before and after being given treatment. This means that there is a difference in the ability of students who are given ethnomathematics-based learning and conventional learning to understand concepts.

In addition to processing data on *the results of the posttest* of concept comprehension ability, *posttest data on student* self-efficacy *questionnaires* from the experimental class and the control class were also obtained. The questionnaire used is in the form of a questionnaire containing 20 statements to measure *students' self-efficacy* in learning mathematics. Data collection was carried out in class XI.1 as an experimental class and XI.3 as a control class, each consisting of 30 students. The questionnaire data from the two classes are presented as follows:

Table 8. Eksperimen Self-efficacy

Experimental Classes				
No.Item	**Number of Items**	**Skor**	**Frequency**	**Average Score**
1,2,3,4,5,6,7,8, 9,10,11,12,13, 14,15,16,17,18, 19,20	20	SS(4)	152	608
		S(3)	329	987
		TS(2)	111	222
		STS(1)	8	8
	Sum		600	1825
Skor Max				2400
Percentage				76%
Criterion				High

Table 8 represents the statement indicators numbers 1 to 20, with a total of 20 statement items, the Strongly Agree score (4) the frequency of answers that appear 152, the Agree score (3) the frequency of the answer 329, the Disagree (2) the frequency of the answer 111, and the Strongly Disagree score (1) the frequency of the answer 8. The average score of 1825 divided by a maximum score of 2400 was obtained *from the average percentage of students' self-efficacy* ability in the experimental class of 76% with *high* self-efficacy criteria.

Table 9. Self-efficacy Control

Control Class				
No.Item	**Number of Items**	**Skor**	**Frequency**	**Average Score**
1,2,3,4,5,6,7,8, 9,10,11,12,13, 14,15,16,17,18, 19,20	20	SS(4)	50	200
		S(3)	283	849
		TS(2)	231	462
		STS(1)	36	36
	Sum		600	1547
Skor Max				2400
Percentage				64%
Criterion				High

Table 8 represents the indicators of statements numbers 1 to 20, with a total of 20 statement items, the Strongly Agree score (4) the frequency of the answers that appear 50, the score of Agree (3) the frequency of the answer 283, the Disagree (2) the frequency of the answer 231, and the Strongly Disagree score (1) the frequency of the answer 36. The average score of 1547 divided by a maximum

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score of 2400 was obtained *from the average percentage of students' self-efficacy* ability in the experimental class of 64% with *high* self-efficacy criteria.

DISCUSSION

Based on the results of the analysis of test and non-test data that the researcher has conducted, it can be concluded that ethnomathematics-based learning through Cikadu Pandeglang batik motifs affects the ability of students to understand concepts in grade XI.I. There is a difference in the average results of *the posttest students in the experimental class with the average results of the posttest* students in the control class. Ethnomathematics-based learning of Cikadu Pandeglang batik motifs affects students' concept comprehension ability and *self-efficacy* because, through ethnomathematics-based learning, students will learn to redefine concepts in their own words, identify examples and non-examples, represent a concept, change the way concepts are presented from one form to another, get to know various meanings and interpretations of concepts, identify characteristics and recognise the conditions that determine a concept, compare and contrast concepts by observing these concepts in the Cikadu Pandeglang batik motif. Students will also be directed to achieve 3 dimensions of *self-efficacy: the magnitude dimension* is how students can overcome their learning difficulties, the *strength dimension* describes how strong the student's confidence is in facing various learning obstacles, and the *generality dimension* is related to the extent of the student's confidence in their abilities. This is supported by research (Indriyani, 2017; Lusiana, Afriani, Ardy, & Widada, 2019; Pratiwi & Pujiastuti, 2020; Sarwoedi, Marinka, Febriani, & Wirne, 2018)that ethnomathematics helps students understand mathematics well.

Through the learning process, test and non-test data were obtained, which were then analysed by the researcher. It was found that there was a difference in students' ability to understand concepts and *self-efficacy* in the experimental class after being given ethnomathematics-based learning, with the control class with conventional learning, where students were invited to explore a concept in the Cikadu Pandeglang batik motif.

CONCLUSION AND SUGGESTION

Based on the results of the research that has been carried out, it can be concluded that there is a difference in students' ability to understand concepts and *self-efficacy* after using ethnomathematics-based learning with conventional learning. Ethnomathematics has been proven to help mathematics learning in the classroom by exploring the ethnomathematical elements contained in the Cikadu Pandeglang batik motif

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