EFFECTIVENESS OF ETHNOMATHEMATICAL-BASED STUDENT WORKSHEETS IN THE MATERIAL OF POLYHEDRON TO LEARNING OUTCOMES OF CLASS VIII STUDENTS OF ISLAMIC JHS PLUS AT TOHARI TUNTANG

(Effectiveness Studies On Implementation Of Ethnomathematics-based Student Worksheets)

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Abstract

This study aims to determine the effectiveness of teaching materials in the form of ethnomathematics-based Student Worksheets (Joglo Traditional Houses, Central Java) on polyhedron materials to improve student learning outcomes for class VIII Islamic Junior High Schools Plus At Tohari Tuntang for the academic year 2021/2022.

The population in this study were students of class VIII JHS Islam Plus At Tohari Tuntang. The sample used in this study were 22 students of class VIII Rabi'ah Adawiyyah, with a sampling technique using *cluster random sampling*. Collecting data using a test description of the *pretest* and *posttest* to measure whether there is an increase in learning outcomes. Statistical test analysis using *paired sample t-test* with a significance level of 5%.

The results of the data acquisition were analysed using IBM SPSS Statistics 26. The results of the normality test of the data on *the Shapiro-Wilk test* showed that the *pretest* and *posttest* were normally distributed with the results of the *pretest* (0.175) > the significance value (0.05) and *posttest (*0.108) > the significance value (0,05). Then, for the *correlation* of 0.540 with a significance value of 0.010, because the significance value (0.010) > probability (0.05) so can be concluded that there is no relationship between *pretest* and *posttest.* Based on the analysis of the results of the *pretest* and *posttest*, the average learning outcomes increased by 41.136%, from 35.68 to 76.82. Thus, the ethnomathematics-based LKPD used in this study is said to be effective in improving student learning outcomes.

Keywords: ***P****olyhedron, Ethnomathematics, Joglo House, Learning Outcomes, Student Worksheets.*

Introduction

Education will progress due to many factors, one of which is the learning process. The learning process requires an approach so that the implementation process provides effectiveness. To achieve the learning objectives, the teacher is expected to be able to create a comfortable and pleasant learning atmosphere so that students can easily understand the material presented. One thing that can be done is by using a variety of teaching materials.

Based on the results of observations and problems that exist in an effort to improve learning outcomes, a learning media is needed that is in accordance with the needs of students. Besides that, it can also make students want to study the existing material so that it will affect learning outcomes and also the activity of students in class. Because the school has not used LKPD in the learning process, the researchers wish to use LKPD to solve existing problems, especially to improve student learning outcomes.

According to Rahmawati and Wulandari (2020) Student worksheets (LKPD) are worksheets containing guidelines that serve as student facilitators consisting of sheets containing material, instructions and summaries that are done by students so that they can increase the ability of cognitive aspects as information. Provided by students. Learning using LKPD is considered by some teachers to be more effective because of the interaction between the two. It will affect learning outcomes, skills, attitudes and also knowledge of students (Umbaryati, 2016)

According to Ummah (2021) Benefits from the use of LKPD include facilitating the process of understanding students, and LKPD can be used as an alternative learning media. The structure of the LKPD itself in general is: titles, study instructions, competencies, indicators, assignments, and assessments Yunus and Alam (2018) Then, the quality criteria of a good Student Worksheet must meet three requirements, namely didactic requirements, construction requirements, and technical requirements.

Through the learning process, the teacher as a facilitator must also use an approach that can make students interested. According to Malawi, et al (2018) Education is a civilising process, and education is also seen as a tool for cultural change in the learning process in schools. Therefore, seeing the importance of education in the acculturation process, culture-based learning can be used as one step to create a learning environment and design learning experiences that integrate culture as part of the process learning

According to Sunandar (2016) ethnomathematics as a bridge between mathematics and culture. Ethnomathematics is a learning approach that links local cultural wisdom in learning mathematics. The benefits of ethnomathematics in learning, according to Rido (2016) are that ethnomathematics facilitates students to be the ability to form mathematical concepts that students already know from the surrounding environment, proves that solving mathematics is not only through one method, creates a learning environment that fosters innovation, and creates a fun class.

One of the materials in mathematics that can be related to culture is the material for a polyhedron, many objects or buildings around us in the form of polyhedron spaces. Because in this material, there are many forms that must be studied, it is necessary to innovate in the learning process so that the material described is easy to understand. Traditional houses are houses that are characteristic of an area in Indonesia that symbolises the characteristics of local culture (Pramono, 2013). An example of a traditional house is the Joglo traditional house in Central Java. The Joglo Traditional House is very appropriate to be used in the process of delivering polyhedron material. Because the shape consists of a combination of polyhedron space wakes. The elements of the polyhedron structure found in the Joglo traditional house in Central Java are as follows:

Thus, ethnomathematics-based worksheets are considered appropriate to be a solution because ethnomathematics is one of the learning approaches that link-local cultural wisdom in learning mathematics, and educators can instil noble values of national culture, which have an impact on character education and can also have an impact on increasing learning outcomes. According to Khatimah, et al (2018) Learning outcomes are scores or values that describe the level of student mastery of the material obtained from tests conducted after learning is carried out. According to Slameto (2013), high and low learning outcomes are influenced by internal factors (physiological factors, psychological factors) and external (curriculum, teaching methods, school-community relations, discipline in schools, learning tools, and school buildings)

Effectiveness is related to increasing the end of student learning and the progress that students make after using LKPD. LKPD is said to be effective if learning outcomes after using LKPD have increased (Yuliska, 2020). Therefore, to overcome the existing problems, researchers conducted research with the aim of testing the effectiveness of ethnomathematical-based worksheets to improve student learning outcomes.

Method

The method used in this research is experimental. The design in this study is one group *pretest-posttest* where, in this study only one experimental class that is given *pretest-posttest* treatment without any control class. Researchers want to test the effectiveness of ethnomathematical-based worksheets in improving learning outcomes. The population of this study were students of class VIII JHS Islam Plus At Tohari Tuntang for the academic year 2021/2022. At the same time, the sampling technique used *cluster random sampling* and obtained class VIII Rabi'ah Adawiyah as the research sample. Broadly speaking, this research involves two variables, namely the independent variable and the dependent variable. Where the independent variable is the use of ethnomathematics-based LKPD, and the dependent variable is the learning outcomes of class VIII Rabi'ah Adawiyah students.

Data collection techniques in this study were carried out using learning tools (RPP, Syllabus, LKPD), learning outcomes test questions, questionnaires, and documentation. Learning tools were used during the research process and were carried out before the research, and documentation was carried out from the beginning to the end of the research.

Then the test instrument used was a test in the form of a pretest and posttest. This question sheet is used to obtain data on student learning outcomes to determine the effectiveness of the ethnomathematics-based LKPD (House Joglo, Central Java) on the polyhedron material. There are four questions used in the study, both pretest and posttest. Before the questions are distributed to students, the questions need to be tested. First, the test questions are tested on ten respondents who are not included in the sample on the condition that they have received po material before. The step that must be prepared before the questions are tested is to determine the score for each item because scoring is an important

step in the processing of the results of the work of the respondents. In this study, researchers used a scaled answer score. There are four test questions that will be carried out by the researchers, including the level of validity, reliability, differentiating power of the questions, and the level of difficulty of the questions.

The data analysis of this research is a test of the effectiveness of ethnomathematics-based worksheets on the polyhedron material. To find out whether student learning outcomes have increased or not, it will be searched using the *Paired Sample t-test*. This test is used to compare the difference between two paired samples with the assumption that the data is normally distributed, and the data results obtained will be processed using IBM SPSS Statistics 26. If in the table sample *Paired Sample t-Test* Sig value. (2-tailed < 0.05, then it means H_0rejected and H_a accepted. This indicates that there is an increase in learning outcomes between the *pretest* and *posttest* , which means that ethnomathematical is effective in improving student learning outcomes.

Results and Discussion

In this study, researchers used descriptive questions to measure student learning outcomes. The step before the questions are given to students is to test the questions. The test questions include the validity of the questions, the reliability tests, the differentiating power tests, and the level of difficulty of the questions. The results of the test questions are as follows:

Table 1. The results of the test of the validity of the question

No.	r_{count}	r_{table}	Description
1	0,695	0,549	Valid
2	0,774	0,549	Valid
3	0,727	0,549	Valid
4	0,816	0,549	Valid

The validity test aims to measure the validity of whether or not each of the questions was used in the study. Each question by adding up the total score. After the value results are known, the normality of the data will be tested; after that, proceed to the calculation using the *product-moment* formula. The result of the calculation will produce r_{count} , which will then be compared r_{table}. The value r_{table} is 0.549. because from the validity test table, the value of $r_{count} > r_{table}$ then the question is declared valid. So, all items can be used in research.

Table 2. Reliability Test

Result	Category
0,752	High Reliability

The question reliability test aims to see the level of consistency of an item. To prove whether a problem has a fixed nature. The reliability of the questions can be known using the Alpha formula. The reliability test was carried out by comparing the calculation results with a significant level. The results of the calculation of the reliability test using the Cronbach Alpha. The results of the reliability test show that it is reliable with a high level of reliability. That means the four items have a fixed or consistent nature.

Table 3. Distinguishing Power Test Results Question

Description	Question 1	Question 2	Question 3	Question 4
K_A	3	4	3	2,8
K_B	2	2,8	2,4	1,6
Skor maks	5	5	5	5
DP	0,5	0,24	0,12	0,24
Category	Good	Medium	Low	Medium

The discriminatory power of questions aims to determine the ability of a question to distinguish students who master the material from students who have not/less mastered the material. From the results of the discriminatory power of questions, question number 1 shows the discriminatory power of questions is good, questions number 2 and 4 show the discriminatory power of moderate questions, and question number 3 shows the discriminatory power of questions is low.

Table 4. Test results of the level of difficulty of the questions

Description	Question 1	Question 2	Question 3	Question 4
$\bar{X}$	2,5	3,4	2,7	2,2
Skor maks	5	5	5	5
TK	0,5	0,68	0,54	0,44
Category	Medium	Medium	Medium	Medium

Learning outcomes in this study were seen from the results of the *pretest* and *posttest*. Before entering the learning material, students are asked to do a *pretest* first to determine the students' ability to construct flat-sided space. After the *pretest* is done, then enter the learning process, which discusses the material for polyhedron. Then, after finishing studying the material, students were asked to work on the *posttest* to find out whether there was an increase in learning outcomes in the flat-sided wake-up material. The results of the *pretest* and *posttest* are as follows:

Table 5. *Pretest* and *Posttest* of Students

Result *Pretest*			Result *Posttest*		
No.	Value	Frequency	No.	Value	Frequency
1.	0-10	0	1.	0-10	0
2.	11-20	0	2.	11-20	0
3.	21-30	6	3.	21-30	0
4.	31-40	12	4.	31-40	0
5.	41-50	4	5.	41-50	0
6.	51-60	0	6.	51-60	0
7.	61-70	0	7.	61-70	3
8.	71-80	0	8.	71-80	11
9.	81-90	0	9.	81-90	8
10.	91-100	0	10.	91-100	0
Total		22	Total		22

After the *pretest-posttest*, the next step is to see if there is a difference in average between the two paired samples. This step aims to determine the effectiveness of using ethnomathematical-based worksheets. This effectiveness test is carried out using a *paired sample t-test. T*he first step that must be done is to test whether the results of the *pretest-posttest* are normally distributed or not. Because the data in this study were <50 samples, the normality test of the data used the *Shapiro-Wilk test*. The basis for making decisions using *the Shapiro-Wilk* are:

a. If the value of Sig. < Research Alpha (0.05), then the data is not normally distributed.
b. If the value of Sig. > Alpha Research (0.05), the data is normally distributed.

The results of the normality test of the *pretest-posttest* are as follows:

Table 6. Normality Test Results of Data

Tests of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
pretest	.152	22	.200*	.937	22	.175
posttest	.134	22	.200*	.927	22	.108
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

From the results of the data normality test, it can be seen that the value of Sig. on the *Shapiro-Wilk test* on *pretest* is 0.175, meaning that the value of Sig. > 0.05, then, the results of the *pretest* are normally distributed data. Then in *posttest,* the value of Sig. is 0.108 meaning the value of Sig. > 0.05 then, the *posttest* are also normally distributed data. So, it can be concluded that the results of the *pretest-posttest* data are normally distributed data.

After the results of the normality test, the results showed normal distribution. The next step is to test the results of the data using the *paired sample t-test* using the IBM Statistics 26 application. The results of the *paired sample t-test* on the *pretest-posttest* are as follows:

Table 7. *Paired Samples Statistics*

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pretest	35.68	22	6.432	1.371
	posttest	76.82	22	5.869	1.251

From the calculation of *paired samples statistics,* it can be seen that for the *pretest* in class VIII Rabi'ah Adawiyyah before using the ethnomathematics-based worksheet, and the average learning outcome was 35.68. Then the results of the *posttest* obtained an average of 76.82. So, the use of ethnomathematics-based LKPD in class VIII Rabi'ah Adawiyyah JHS Islam Plus At Tohari Tuntang experienced an increase in learning outcomes by 41.136.

Table 8. Result Paired Samples Correlations

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	pretest & posttest	22	.540	.010

Table of results of *paired samples correlations* This is a table that shows the results of the correlation test or the relationship between the *pretest* and the *posttest.* It is known that the *correlation* off 0.540 with the value of Sig. of 0.010. Because of the value of Sig. > probability (0.010 > 0.05) then, it can be concluded that there is no relationship between *pretest* and *posttest*

Table 9. *Paired Sample t Test*

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	pretest - posttest	-41.136	5.992	1.263	-43.762	-38.510	-32.579	21	.000

The *paired samples test* table is the most important table. Because in this table, we will find out whether or not there is an influence on the use of ethnomathematical-based LKPD (Joglo Traditional House, Central Java) on polyhedron material on the learning outcomes of class VIII Rabi'ah Adawiyyah JHS Islam Plus At Tohari Tuntang academic year 2021/ 2022. For decision-making we need to develop research hypotheses. The formulation of the research hypothesis is as follows:

H_0: There is no difference in the average learning outcomes between the *pretest* and *posttest*

H_a : There is a difference in the average learning outcomes between the *pretest* and *posttest.*

Because of the known value of Sig. (2-tailed/) is 0.000, which means 0.000 < 0.05, which means H_0 rejected and H_a accepted. So it can be concluded that there is an increase in learning outcomes between *pretest* and *posttest*, which means that there is an effect of using ethnomathematics-based LKPD (Joglo Traditional House, Central Java) on polyhedron material on the learning outcomes of class VIII Rabi'ah Adawiyyah JHS Islam Plus At Tohari Tuntang for the academic year 2021/2022. So it can be concluded that the ethnomathematics-based worksheets ethnomathematics-based LKPD is effective for improving student learning outcomes.

Conclusion

The effectiveness is seen by whether there is an increase in student learning outcomes. From the results of the students' work, the *pretest* and *posttest* showed an increase in the average learning outcomes of 41.136 from 35.68 to 76.82. Then, it is strengthened by the results of the paired *sample t-test* where H_0 is rejected and H_a is accepted. This means that there is an effect of using ethnomathematics-based LKPD (Joglo Traditional House, Central Java) on polyhedron material on the learning outcomes of students in class VIII Rabi'ah Adawiyyah at JHS Islam Plus At Tohari. Tuntang for the academic year 2021/2022. Thus, this ethnomathematics-based LKPD is effective for improving student learning outcomes.

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