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Implementation of ethnomathematics based mathematics module to improve process skills

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Abstract. The study was conducted to examine the effect of using ethnomathematics-based mathematics modules from the results of exploring Adi Purwo's batik patterns. This study uses a Quasi Experiment research design. The procedure of this study used a descriptive method with pre-experimental research design in the form of "one group pretest-posttest" in which one class was treated using learning modules based on ethnomathematics based mathematics after which a description of process skills was carried out. The results showed the students' process skills improved after seeing the results of the pre-test and post-test. Then the results of the Gain test on the pre-test and post-test showed a score of 0.73 so that the use of the module was quite effective. Tests using the t-test against the score of the pre-test results with the post-test score of 21 students. Based on the calculation results it is known that the obtained t count of 29.54 and the significance value of 0.05 so that it can be concluded that the students' process skills in solving mathematical problems in the use of ethnomathematics-based mathematical modules are better than classes using conventional learning.

Keywords: Ethnomathematics, Adi Purwo, process skills, modules

1 Introduction

The noble ideals of that culture can be created through classroom learning practices so that they are able to prepare intelligent people, in the sense of humans who can become members of the community who educate, know, appreciate, and understand their own culture. If education is also aimed at strengthening cultural values, educational programs held at schools should always be integrated with the development of local cultural values, including through learning programs on all subjects including mathematics learning.

[1] NCTM mentions that teaching effective mathematics requires an understanding of what students know beforehand and needs to learn and then provides challenges and supports them to learn them well. According to Piaget [2], they are in a concrete operational phase. Based on this phase, learning mathematics should begin with something concrete and real and close to the lives, knowledge, and experiences of students. In addition, [3] Freudenthal states that mathematics is a human activity and must be linked to reality [4]. Freudenthal views mathematics, not as a finished product that we provide to students, but rather a process constructed by students. Then the relationship between values, cultural products with mathematics learning is designed culture-oriented realistic mathematics in the form of learning devices called Ethnomathematics.[5]

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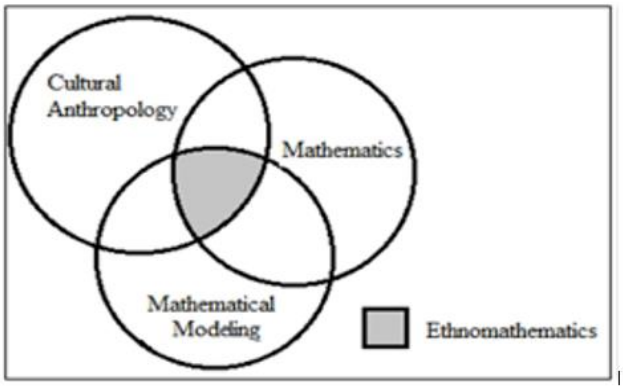

Fig. 1. Ethnomatematics in cultural and mathematical contexts

One of the learning skills that students must possess is process skills. Process skills have the characteristics of encouraging students to make connections between knowledge and the learning process that can provide learning experiences.

[6] According to Pugh, "process skills are intellectual skills that equip students with the ability to think logically, systematically in dealing with a problem in any field and at any level of society". So when a process is carried out systematically, it is expected to get good results and what students get will be recorded in their memory well. Therefore an educator must be able to manage his class so that the teaching and learning process focuses on the active involvement of students.

One of the roles of the media is to help the effectiveness of the learning process. Students can understand the contents of the material easily, analyze and solve problems. In addition, learning media can also increase student motivation and interest in the classroom. One of the learning media that can support the learning process is the learning module. Modules as teaching materials play a role in supporting the process of learning activities in class. As a learning resource, the module also supports competency-based learning where students can learn about a variety of skills that must be mastered. With the module, students have intermediaries and facilities to help the learning process that has been passed. Students can learn independently and can easily adjust the learning process.

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Ethnomathematics-based learning module with the batik motif setting of Adi Purwo is a contextual mathematics learning media because it is based on student experience that is by local wisdom [7]. Modules require the activeness of students in understanding the material or subject matter that is equipped with student skills in carrying out a good process and following predetermined rules.

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Ethnomathematics-based mathematics modules by integrating Adi Purwo batik motifs to improve process skills can be observed from the following stages [8]:

a. Observe
   At this stage the module is designed so that students utilize the five senses that are used to observe based on the processes that occur.
b. Calculate
   At this stage the module is designed so that students calculate the circumference and area of a flat figure on the Adi Purwo batik motif with a good process.
c. Measure
   At this stage, the module directs students to compare with related material.
d. Classifying
   At this stage, the module provides opportunities for students to group based on characteristics that have the same characteristics.
e. Find
   At this stage, the module directs students to find new flat shapes so that students' knowledge becomes more extensive.
f. Predict
   At this stage, the module directs students to make hypotheses as a basis for determining what steps will be done.
g. Try
   At this stage, the module facilitates students to test hypotheses through practical experimental activities which include planning and implementation.
h. Collecting and analyzing data
   At this stage, the module guides students to gather information related to the material being studied. The activity of trying and analyzing what has been done next is required of students to make conclusions.
i. Interpret data
   At this stage, the module directs students to interpret the results obtained by redrawing on paper.
j. Communicating
   At this stage, the module directs students to communicate their findings to others.

[9] In principle, ethnomathematics-based mathematics modules are learning modules that are structured to facilitate students in their learning references and foster an attitude of independence in dealing with a problem. In this learning process, students will be trained in their independence in solving a problem and are required to be able to use all their abilities to jump directly into the problem.

2 Method

[10] This research is a quasi experiment study conducted to determine the effectiveness of the products that have been tested. The subjects of this study were elementary school students. Data analysis using descriptive methods with a pre-experimental research design that is "one group pretest-posttest" which is one class in the treatment of learning using ethnomathematics-based mathematics modules and then compared to obtain a final description of the process skills of students in solving mathematical problems.

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The research design is described as follows:

O1 X O2 [11]

Information:
O1 : learning outcomes before treatment
X : treatment is learning by using ethnomathematics-based mathematics modules
O2 : learning outcomes after treatment

Final data analysis uses Gain Test [12] and t-test. Gain test is performed to determine the increase in results after learning using a module.

$$Gain = \frac{(\text{post test score} - \text{pre test score})}{(\text{ideal score} - \text{pre test score})}$$

Tabel 1. Estimated Gain test

Gain Score	Estimated
<0,40	ineffective
0,40 – 0,55	less effective
0,56 – 0,75	effective enough
> 0,76	effective

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Then to test whether or not there are differences between the process skills of students who are treated using modules and without modules use the t-test.

2 Discussion

Based on aspects of process skills which include 1) observing; 2) counting; 3) measure; 4) classifying; 5) find; 6) predict; 7) try; 8) collecting and analyzing data; 9) interpreting the data and 10) communicating, of the 10 aspects are grouped in the pretest and posttest scores.

The number of pre-test scores is the number of scores obtained by students before treatment using an ethnomatematics-based mathematics module. The total number of student pre-test scores totaling 21 students was 956, while the students' post-test score was 1639. so the percentage of completeness of the pre-test questions was 0% and the post-test was 90.47%.

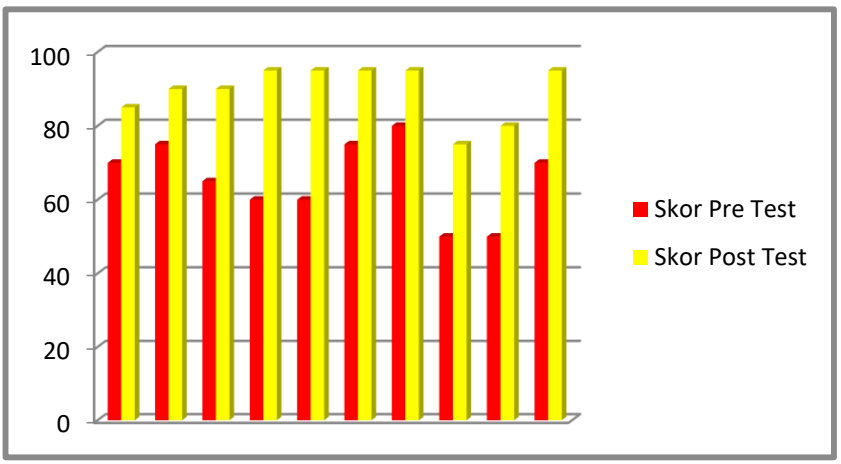

Fig 1. Student process skills results

Image data can be explained that the results of the pre-test and post-test of the achievement of the classical indicators for students' process skills are that there are differences in achievement of learning outcomes before and after treatment using ethnomathematics-based mathematical modules.

This is according to what was conveyed by Astuti [7] that learning mathematics with the use of ethnomathematics based modules can be more interesting and meaningful. With the introduction of certain motifs, students can better understand the variety of motifs presented and can better understand mathematical concepts that are more commonly found in a typical Adipurwo batik motif presentation Purworejo.

3 Conclusion

Based on the results of this study, it can be concluded that the mathematics module based on ethnomathematics by exploring the Adi Purwo batik motif influences the ability of elementary school students' process skills. This is indicated by the increase of the pretest and posttest scores with very significant differences.

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