The Analysis of Mathematics Learning using Mathematics Student Work Sheet (LKS) based on Yogyakarta Palace Ethnomathematics

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Abstract
The purpose of this study is to: (1) Describe the results of analysis of mathematics learning using Student Work Sheet (LKS) based on ethnomathematics of Yogyakarta Palace in terms of student learning outcomes. (2) Describe the results of the analysis of mathematics learning using the Student Work Sheet (LKS) based on ethnomathematics of Yogyakarta Palace in terms of students' cultural understanding. Research conducted in the form of descriptive qualitative research. The study was conducted at Taman Adults Junior High School in Yogyakarta, students of class VIII in 2019/2020. Data collection techniques in this study used observation, mathematical tests, questionnaires and interviews. Validity test is done by sending a file to the validator (expert) to be validated and then repaired. The results showed that learning was carried out in accordance with the expected goals, students were motivated to participate in learning so as to improve student learning outcomes in mathematics. Through ethnomathematics based learning, students begin to like the Yogyakarta Sultan's Culture thus increasing understanding of the surrounding culture.

Keywords: Learning analysis, Student Work Sheet (LKS), Ethnomathematics, Yogyakarta Palace

Introduction
National education aims to, among other things, develop the character of students with an Indonesian spirit, and so that students have knowledge in developing science and technology and culture. In Law No. 20 of 2003 concerning the National Education System states that national education functions to develop capabilities and shape the character and civilization of a dignified nation in the context of intellectual life of the nation. This means that education is not only a process of transfer of knowledge from teachers to students, but is also expected to be a means of the process of internalizing Indonesian character and cultural insights.

The influence of modernization in the climate of globalization has an impact on eroding the nation's noble cultural values. As a result, the Indonesian nation is currently experiencing a crisis of national identity, becoming a nation that is easily influenced, and easily dispersed. The reason is due to lack of understanding and application of the importance of cultural values in society.

Cultural values which are the foundation of the nation's character are important to be instilled in each individual, for this cultural values need to be instilled early on so that each individual is able to better understand, interpret, and appreciate and realize the importance of cultural values in carrying out every life activity.

The character building of virtuous students will be rooted in students as the next generation of the nation through cultural-based mathematics learning. Culture-based learning is learning that allows teachers and students to actively participate based on cultures they already know, so that optimal learning outcomes can be obtained (Pannen, 2005). This condition allows students to feel happy and to be recognized for their existence and differences, because the very rich cultural knowledge and experience they have can be recognized in the learning process.
One of the things that can bridge the gap between culture and education, especially mathematics, is ethnomathematics. Ethnomathematics (ethnomathematics) is a form of culture-based learning in the context of mathematics. Ethnomathematics is introduced by D'Ambrosio and Nunes (Pannen, 2009) which states that ethnomathematics is analogous to a lens for viewing and understanding mathematics as a cultural product or cultural product.

Assessment of cultural elements to be integrated into learning is better if it is carried out starting from the culture in the surrounding environment, this is in accordance with the principle of contextual learning, where learning utilizes the things that are in the surrounding environment. One of the cultural sites that is very appropriate to be used as a reference in learning ethnomathematics is the Yogyakarta Palace. In previous studies, researchers have conducted research on the development of Student Work Sheet (LKS) based on ethnomathematics at Yogyakarta Palace. In this study focused on the analysis of learning mathematics using these worksheets to determine student learning outcomes and the level of student understanding of culture, especially the Yogyakarta Palace.

Mathematical Learning

Mathematical learning is the process of providing learning experiences to students through a series of planned activities so that students gain competence about the mathematical material being studied (Gatoto, 2007; 26). According to Suyitno (2004: 2) mathematics learning is a process or activity of teachers in learning mathematics to their students which contains the teacher's efforts to create climate and services to the abilities, potentials, interests, talents, and needs of students about diverse mathematics so that interaction occurs optimal between teachers and students and between students in learning mathematics.

Harta (2006: 4) argues that learning mathematics is a process aimed at fostering students' abilities including understanding mathematical concepts, using reasoning, solving problems, communicating ideas, and having an attitude of respect for mathematics.

Ethnomathematics

Ethnomathematics study is a study that examines the way a group of people in a particular culture understand, express, and use cultural concepts and practices that are described by researchers as mathematical. As stated by Barton that "Ethnomathematics is a field of study which examines the way people from other cultures understand, articulate and use concepts and practices which are from their culture and which the researcher describes as mathematical" (Barton, 1994).

Ethnomathematics was first introduced by educators and mathematicians from Brazil, Ubiratan D'Ambrosio in 1997 in a presentation for the American Association for the Advancement of Science. D'Ambrosio (1993) applied the name of this program by using the etymology of Greek roots, ethno, mathema, and tics to explain what he understood to be ethnomathematics. He said that ethnomathematics was defined as mathematics carried out by members of different cultural groups, identified as indigenous peoples, workers' groups, professional classes, and groups of children of certain age groups, etc. (D'Ambrosio, 1985).

Ethnomathematics studies are so broad, causing ethnomathematics to be considered as one of two centers of thought to understand mathematics (Wedge, 2010). This gives rise to the idea that the role of ethno-mathematics should have a wider influence on society and education especially mathematics education (Begg, 2001). The role is actually very real, but the most important thing is how our efforts and hard work to display the mathematical concepts that exist in ethnomathematics into learning activities, so that these concepts can be directly related to student culture and with their daily experiences (Rosa & Orey, 2001). If we can do that, it will create an ethnomathematical approach to learning mathematics and is expected to be able to make mathematics in schools more relevant and meaningful for students and the quality of their education.

According to Francois (2012), the expansion of the use of ethnomathematics in accordance with students' cultural diversity and with the practice of mathematics in their daily lives brings mathematics closer to the student environment because ethnomathematics is implicitly a program or activity that delivers values in mathematics and mathematics education. D'Ambrosio (2007) added that, the use of ethnomathematics in learning activities should be used as a means of supporting solidarity and collaboration between students.

Various alternatives can indeed be used in learning activities, but more importantly is to productively modify learning to have a beneficial impact on teaching reform such as group work and problem-based learning (Staats, 2006).
Ethnomatematics of Yogyakarta Palace

In the 2013 curriculum, educators are expected to be able to create meaningful learning so that the material delivered does not just pass by without any impression at all. One step to create meaningful learning is to utilize Indonesian culture as a source of learning. Considering that there are still many young people who still lack cultural knowledge, a cultural approach to learning is also one of the strategies to create meaningful learning while providing cultural knowledge to students. One of the Indonesian cultures that can be studied in terms of ethnomatematics is the Yogyakarta Palace.

Parts of Yogyakarta Palace are mostly related to geometry learning material. The whole building and historical heritage objects are geometrical objects in the form of two-dimensional shapes, which are called flat shapes and three-dimensional shapes, or which are called space structures. In this study, ethnomatematics is discussed which relates to flat arising and spatial arising, both arising of flat sided space and arcing of flat arcs.

The concept map of ethnomatematics study of Yogyakarta Palace can be seen in the following Figure 1:

![Figure 1. Concept Map of Ethnomatematics Study](image)

Method

In accordance with the problems studied, this type of research is a qualitative descriptive study. This research was conducted at Taman Dewasa Junior High School in Yogyakarta, students of class VIII in the academic year 2019/2020 in July-August 2019. The subjects studied were students of class VIII, through a purposive sampling technique.

The study began by carrying out mathematics learning using Student Work Sheet (LKS) of Mathematics Based on Ethnomatematics of the Sultan's Palace. The Student Work Sheet consists of two worksheets, namely the worksheets of the circle and worksheets that build flat side spaces. After the implementation of learning then tests are conducted to find out student learning outcomes and data collection through interviews and questionnaires to determine the level of student understanding of culture, especially the Yogyakarta Palace.

Data collection techniques in this study were through observation of learning, implementation of mathematics tests, interviews with students and filling out questionnaires on cultural understanding. Data analysis techniques used in this study include (1) Data on observations of mathematics learning using worksheets and interview data analyzed using quantitative descriptive methods, (2) Data on students’ mathematical tests and questionnaires were analyzed using quantitative descriptive methods.

Results and Discussion

Learning to implement Student Work Sheet (LKS) based on ethnomatematics in Yogyakarta Palace has been carried out in accordance with the Learning Implementation Plan (RPP). The simulation was carried out at the Taman Adults Junior High School in Yogyakarta in class VIII for the 2019/2020 academic year in July-August 2019. In accordance with the Student Work Sheet (LKS) compiled, the material was intended for class VIII, so
the class used for learning activities was selected through techniques purposive sampling, namely class VIII A and class VIII B

**Learning Outcomes**

The results of ethnomathematics based learning include the following:

1. Learning takes place in accordance with expected goals. Learning runs smoothly, in addition students can also accept differences in learning methods used than usual.
2. Students are motivated to take part in learning. The statement is based on the results of researchers' interviews with students. Students become more excited because at each meeting students will find out new things related to Yogyakarta Palace.
3. Student learning outcomes are quite good. After carrying out enthusiastic learning based on ethnomathematics, students certainly not only get knowledge about culture but also learning material related to mathematics which will be easier to understand. This has a positive effect on student grades when working on tests after a series of learning takes place.
4. Students begin to like the Yogyakarta Palace Culture. This was proven at the end of the lesson when students asked for a video and images from the Yogyakarta Palace to be displayed using an LCD.
5. Through ethnomathematics-based mathematics learning of Yogyakarta Palace students have a fairly good understanding of culture, especially with regard to the culture of Yogyakarta Palace, this is shown from the results of interviews and analysis of students' cultural understanding questionnaire.

**Learning Problems**

Although learning takes place well, but there are still obstacles or problems that occur during learning. These problems include:

1. When distributing worksheets, students are too enthusiastic in observing the pictures on the worksheets and interacting with friends next to them. This results when learning has begun and researchers provide explanations, students pay less attention.
2. In LKS 1 regarding circular elements, the pictures are lacking so much that students feel bored when learning them.
3. Students' understanding of visualization in the shape of flat side space is not what the researchers expected. This happens because not all buildings and objects in the Yogyakarta Palace are shaped according to the geometry being studied. Like the example in Figure 2 below.

![Figure 2. One of the buildings in Yogyakarta Palace](image)

The roof of the building in the picture can be likened to a picture of a triangular prism, but because the roof on the side is not upright so students find it rather difficult to imagine the geometrical shape, for that in the next explanation visualized the framework of the triangular prism space so that students' understanding is uniform. The picture can be reviewed in Figure 3 below.

![Figure 3. Triangular Prism](image)
Conclusion

The conclusions of this study are:
1. Mathematical test analysis results show that student learning outcomes are quite good, it is because students are motivated to participate in learning.
2. Students begin to like the Yogyakarta Palace Culture so that students' understanding of culture is better especially those related to the Yogyakarta Palace culture.

Recommendations

Suggestions based on the results of this study are:
1. Ethnomatematics-based mathematics learning is very good to be carried out at all levels of the school.
2. For further research, ethnomatematics can be applied to other cultural sites so students understand various cultures.

References

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