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Problem Solving Ability on Independent Learning and Problem Based Learning with Based Modules Ethnomatematics Nuance

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Abstract

The purpose of this study was 1) to know the effectiveness of independent learning and Problem Based Learning models with the nuances of Malay culture based modules in improving students' problem solving abilities in quadrilateral material, 2) to know problem solving abilities of students taught by using independent learning and Problem Based Learning with the nuances of Malay culture based modules on the development of character of love for local culture. This study applied mixed methods method. The study was conducted in grade VII of SMP N 1 Bintan 1 and SMP N 2 Bintan in the academic year of 2017/ 2018 school, where both of them was taken as the experimental classes on triangular and quadrilateral material. Data collection was done by using tests, questionnaires and interviews. The results showed that 1) independent learning and Problem Based Learning with the nuances of Malay culture based modules were effective in improving the problem solving abilities indicated by (a) students problem solving abilities achieving the minimum classical completeness criteria, (b) the average of students' problem solving abilities exceeded the KKM which are given. (c) there is no difference between independent learning and Problem Based Learning models with Malay culture nuances on average. (d) there is an increase in the problem solving ability of students and a sense of love of students on culture after learning. 2) There is an increase in the character of cultural love that can improve students' problem solving abilities.

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INTRODUCTION

According to data from the Human Development Index (HDI) 2015 published by the United Nations Development Program (UNDP) shows that Indonesia ranks 113 of 188 countries (UNDP, 2015), while in 2013 Indonesia was ranked 103 out of 187 countries (UNDP, 2013). This data shows a significant decline in the quality of Indonesia's human resources from year to year. One of the causes of the low quality of human resources is due to the low quality of education (Wardono & Mariani 2014: 362). To form quality human resources can be started from students at school.

In the formation of qualified human resources is influenced by several factors, one of which is the role of educators. Educators interact directly with students. One of the abilities of educators that must be considered is the pedagogical ability in learning management, such as the use of strategies or approaches, and learning planning according to the conditions of students (Rizka, 2014). Qualified study plannig can improve students' problem solving abilities. Every person has unique characteristics in solving mathematical problems, which are not owned by other individuals (Putri, 2017). This is in accordance with the theory of Bruner (Komalasari 2013: 21) stating that the learning process will work well if the teacher provides opportunities for students to find a concepts, theories, rules or understanding through the examples that they encountered in their life.

Mathematics is a tool to develop ways of thinking, are abstract, their reasoning is deductive and related to structured ideas whose relationships are arranged logically (Susi, 2017). The character possessed by mathematics is often the cause of the emergence of students' perception that mathematics is a difficult lesson. This is also strengthened by the condition of students in the learning that cannot stand alone or depend on the teacher and do not have the ability to be able to take initiative based on the desire to master a learning, especially mathematics. Students are reluctant to find out the source of the problem from various sources so that students do not understand the concept of learning, especially mathematics. This assumption is proven to influence mathematics learning achievement, one of them is problem solving ability. Mathematics learning is expected to end in a comprehensive and holistic student understanding. Students' understanding is not just fulfilling the demands of substantive mathematics learning objectives, but students are also better able to think logically, critically, systematically, creatively and innovatively in finding solutions to solve a problem (Laini, 2017).

Problem solving is one of five process standards put forward by the NCTM (National Council of Teacher of Mathematics) in 2000 in addition to communication, reasoning and evidence, connections, and mathematical representations. According to Minister of National Education Regulation No. 22 of 2006, problem solving is one of the competencies that will be achieved in education. Therefore it must be designed so that students gain mathematical experience as a problem solving.

Polya (1985) proposes a problem solving stage which includes (1) understanding the problem (2) planning a solution (3) resolving the problem and (4) a reviewing. Problem solving is basically the process taken by someone to solve the problem he is facing until the problem is no longer a problem for him (Hudojo, 1988).

Based on observations made by the writer at SMP Negeri 1 Bintan Riau Island showed that 70% students still have difficulty interpreting the questions. As in geometry subjects, students still find it difficult to solve problems related to triangles and rectangles. Students do not understand in understanding the purpose of the questions, especially the questions in the form of stories. This shows the need for a problem-based learning in order to improve problem-solving abilities related to everyday life, especially triangular and quadrilateral material. Learning that can be applied to improve problem solving skills and the character of love for local culture are independent learning and Problem Based Learning (PBL) models.

Independent learning is an active learning activity that is driven by the intention or motive to master a competency in order to solve a problem; it is built with the knowledge or competence that has been owned. Self-learning is different from self-study because independent learning is the process by which students are involved in identifying what needs to be learned and being in control of finding and organizing answers. Independent learning can be done alone or in groups, both in study groups and in tutorial groups. This study uses teaching materials/ modules that are specifically designed to be studied independently. Besides students can also take the initiative to take advantage of the library, follow learning both face-to-face and through the Internet and use other learning resources such as the surrounding community. If you have learning difficulties, students can ask for information or assistance to teachers and peer tutors.

The Problem Based Learning (PBL) model is based on the results of Barrow's research (1986, Barret, 2005) and was first implemented in medical schools at McMaster University in Kanda in the 60's. There are five phases or stages in the learning syntax using the PBL model according to the Ministry of Education and Culture (2013), namely (1) orienting student to the problem, (2) organizing students to study, (3) guiding individual and group investigations, (4) developing and presenting results of works and (5) analyzing and evaluating the problem solving process. This learning is not enough to be conducted by using the learning model but it needs a tool in the form of modules. This module contains triangular and quadrilateral material that will be taught to students.

Problem solving ability is a high level of mathematical thinking ability, so it needs to be the attention of educators. Educators can relate everything in the students' environment to mathematics learning so that they are easily accepted, including cultural elements. This learning approach is known as etnomatematics (Kiptiyah, 2018). Mathematics according to Jone as quoted by Shockey & Bear (2006: 71) is a multicultural math activity that uses culture to make connections with topics Typical mathematics can motivate diverse cultures and ethnic students to investigate and gain respect for their own cultural heritage while learning significant mathematical content. Mathematical problem solving learning with daily life can not only improve students' cognitive abilities, but also demand to develop affective abilities, one of which is the importance of instilling a love of local culture in students so that students can preserve the existing local culture. Learning resources developed using ethnomatics are modules with triangular and quadrilateral material based on Malay culture of the Riau Islands.

Based on the above description, the purpose of the study was to analyze 1) the effectiveness of independent learning and Problem Based Learning models with the nuances of Malay culture of Riau based modules in improving students' problem solving abilities in quadrilateral material 2) mathematical problem solving ability with independent learning and problem based learning with the nuance of Malay culture of Riau based module with the development of love characters of local culture.

METHOD

This study was an experimental research conducted by using a combination method or mixed methods. The results of qualitative analysis were used as supporting results of quantitative research. The research was conducted at SMP N 1 Bintan dan SMP N 2 Bintan in the academic year of 2017/ 2018, and both taken for the experimental classes on triangular and quadrilateral material.

One trial class was determined, namely grade VII A in SMPN 1 Bintan. Data collection was done by using test results, questionnaires and interviews. The population in this study was all seventh grade students which were randomly selected by using random sampling technique. Therefore, grade VII H from SMP N 1 Bintan was taken as experimental class 1 (E1) and grade

VII E from SMPN 2 Bintan was taken as experimental class 2 (E2), then 6 students were taken in both experimental classes to be analyzed qualitatively. Quantitative data analysis in this study was used to analyze the effectiveness of learning carried out. Quantitative data analysis by using normality test, homogeneity test, completeness test, t-paired test and average difference test, while qualitative data were analyzed using data reduction, data presentation and data verification stages.

The instrument used to collect the quantitative data was in the form of questionnaires and problem solving ability test questions. The experimental class was tested for normality and homogeneity and obtained results that can be seen in the following table 1.

Table 1. The Result of Prerequisites Test of Item Questions

Prerequisites Test of Items	Result	sig	Information
Normality test	0.200	0.05	Normal distribution of data
Homogeneity test	0.663	0.05	The second variance homogeneous class
The average similarity test	0.555	0.05	there is no difference in the average of data both classes

The subjects of this qualitative study were 6 subjects consisting of 3 E1 class subjects and 3 E2 class subjects. To get the research subject, qualitative researchers first conduct a quantitative analysis to classify students into three groups, namely students with high, medium and low abilities. The instruments used to collect qualitative data in the form of interviews about the results of test problem solving abilities and character of students' cultural love. Qualitative data analysis stages of data reduction, data presentation and data verification.

RESULT AND DISCUSSION

Validator examination of learning tools instruments includes syllabus, lesson plans, student activity sheets, modules, questionnaires and interview guidelines are considered in good categories. The learning device was used in the learning process in the experimental class 1. The learning in experimental class 1 was carried out by using the PBL model with the help of the Malay cultural of Riau nuances based module, whereas, the Experimental class 2 learning was carried out by using mentoring learning or independent learning based modules with the nuance of Malay cultural of Riau.

The results of this study are divided into two parts according to the formulation of the problem which includes 1) the effectiveness of independent learning and Problem Based Learning model with the nuances of Riau Islands-based Malay culture in improving students' problem solving abilities in quadrilateral material and 2) analyzing mathematical problem solving skills with independent learning and Problem Based Learning nuances of the Malay culture of Riau Islands based on modules with the development of the character of love for local culture. To test the effectiveness of independent learning and Problem Based Learning models with the help of Riau Islands Malay culture nuanced modules on students' problem solving ability through (1) two average equality tests; (2) classical completeness test (3) proportion test and (4) average difference test with prerequisite test including normality and homogeneity test, (5) paired t-sample test.

The values obtained for normality test, homogeneity test and average similarity test can be seen in table 1. The values of the classical completeness test are zcount = 2.433 and ztable = 1.64, therefore, zcount > ztable , this states that 75% of students in the experimental class 1 reached KKM more than 75%.

The average test results on problem solving abilities in experiment class 1 were 80.13

with a standard deviation s = 5.632 and the number of students were 31. The value of thitung on the test was obtained tcount = 5.071, whereas ttable = 1.67. Problem solving ability of students is more than KKM 75. The average test result on problem solving ability in the experimental class 2 is 78.00 with a standard deviation s = 0.795 and the number of students were 31. The value of tcount on the test obtained tcount = 4.402 whereas ttable = 1.67. Since tcount ≥ t table, it can be concluded that the average problem solving ability of the experimental students is more than KKM, which is 75.

The significant values of normality and homogeneity tests on problem solving ability tests, respectively 0.200 > 0.05 and 0.663 > 0.05, therefore, it can be assumed that the test data of problem solving ability comes from normally distributed and homogeneous populations. The average test results in problem solving abilities in experimental class 1 and experimental class 2 were 80.13 and 78.00 respectively. The results of the t-paired test with the help of the SPSS program were obtained by the sig value = 0.504 > 0.05 so that Ho was accepted meaning there was no average difference in the data of experimental class 1 with the data of experimental class 2.

Based on the results of questionnaires and interviews, the results showed that there is an increase in the character of love for local culture after independent learning or using the PBL model. These results are obtained from differences in the average score of the questionnaire for love of local culture before and after learning. Before being taught using independent learning or PBL models, Malay culture nuances were obtained that students were not familiar with Malay culture in the Riau Islands. Students do not know much about the history, customs, and local wisdom of Malay culture and also students do not know the benefits of mathematics learning in a concrete manner. After student learning becomes more understandable of cultural diversity in Riau Islands and students can link culture and learning, especially mathematics. This present study is in line with Hartoyo's research (2012) which shows that ethnomatematics can be developed as a source of learning mathematics in schools such as in the following Figure 1, Figure 2 and Figure 3.

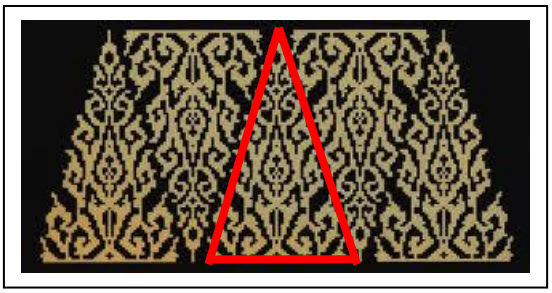

Figure 1. Malay Songket Motives

Songket is classified in the family of brocade woven. Songket is woven by hand with gold and silver thread and is generally worn at formal occasions. Metallic metallic threads that are woven on a fabric background have a brilliant sheen effect. We can make this traditional Malay Songket Motives as a learning material in the broad material and around the triangle.

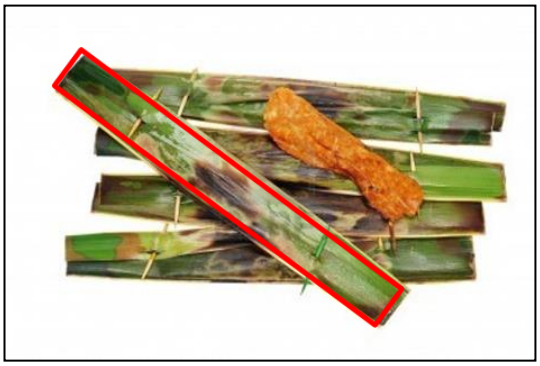

Figure 2. Grilled Fish Cake (*Otak-otak*)

Bintan's typical food made from seafood is the brain of the cuttlefish. Cut is a kind of flat squid, while the squid is more cylindrical. This brain-brain wrap uses coconut leaves which are cut into rectangles. Malay people in Riau Islands use coconut leaves as a container or food wrapper. This is because some areas of the Riau are coastal areas that are overgrown with coconut trees. We can make this traditional food as a learning

material in the broad material and around the rectangle.

Figure 3. Indera Patra Hall

This traditional hall of mighty senses is located on the island of penyengat. The adat hall was made in the form of a stilt house which depicted the traditional house of Malay Islands. This stage house describes the homes of the Riau people who generally live in coastal areas and above the sea. We can make this traditional house as a learning material in the broad material and around the flat field.

CONCLUSION

Based on the results of the above analysis showed that 1) independent learning and Problem Based Learning models with the nuances of Riau Islands culture based modules are effective in improving problem solving skills characterized by (a) students' problem solving ability with independent learning and Problem Based Learning models achieve the minimum classical completeness criteria (b) the average of students' problem solving abilities taught by using independent learning and PBL assisted by ethnomatematics with the nuances of Malay culture based modules exceeded the KKM given (c) there was no average difference between students taught with mentoring and PBL models with Malay culture nuances (d) there is an increase in problem solving ability and a sense of love of students' on local culture after learning 2) there is an increase in problem solving ability that can foster the character of cultural love of students either by independent learning or the learning model of Problem Based Learning.

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