UJMER 7 (2) (2018) 123 - 129

Unnes Journal of Mathematics Education Research

http://journal.unnes.ac.id/sju/index.php/ujmer

Problem Solving Ability Viewed From The Adversity Quotient on Mathematics Connected Mathematics Project Learning (Cmp) With Etnomathematics Nuanced

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Articles Info

Article History:
Received 3 March 2018
Accepted 07 August 2018
Published 23 December 2018

Keywords:
Problem solving; adversity quotient; Connected Mathematics Project

Abstract

This study has purpose to (1) determine the effectiveness of learning by using Connected Mathematics Project with ethnomathematics nuanced to enhance the problem solving ability (2) to find out the increase of love local culture characters of students in the learning of Connected Mathematics Project, and (3) to describe the problem solving ability of students vied from the adversity quotient. This research applied mixed method research type with sequential explanatory design. Subjects in this study was determined by the score of the adversity quotient by using the Adversity Response Profile to the students of grade VIIA of SMP N 12 Semarang. Data collection techniques was done by using observation, test and interview. The effectiveness was analyzed based on (1) test of average similarity; (2) test of completeness, (3) test of proportion , (4) test of average different test. The increased of love local culture character wa analyzed by using paired sample t test. The results of the study showed that the learning model of Connected Mathematics Project with ethnomathematics nuanced is effective toward the problem solving ability. Students with Climber category tend to have a better problem solving abilities than students with Quitter category and Camper. Students wuth Quitter category can understand problem, but less able to plan a problem solving and complete the problem solving plan and not being able to crosscheck the problem solving. Students with Camper category can understand problems and devise a plan for the problem solving, but less able to carry out the problem solving plan and crosscheck the problem solving. Students with Climber category were able to understand a problem, plan the problem solving and implement the problem solving plan, as well as re-examine the problem solving obtained properly.

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p-ISSN 2252-6455
e-ISSN 2502-4507

INTRODUCTION

Mathematics is one of the basic science plays an important role in education. Mathematics exist because of the thoughts of men associated with the ideas, processes, and reasoning (Ruseffendi, 2006: 260). According to the National Council of Teacher Mathematic (NCTM, 2000) there are five (5) process of skills that should be mastered by students through the learning of mathematics, namely: (1) problem solving; (2) reasoning and proof; (3) connection; (4) communication; and (5) representation). Problem-solving ability is one ability that must be mastered by the student to be skilled in working on the problems matematika. Senthamarai et al. (2016) suggested that solving the problem is the heart of mathematics.

Polya (1973) outlines the steps in solving problems into four stages: (1) understanding the problem (to understand the problem), (2) devising a plan (planned completion), (3) carrying out the plan (implement the settlement plan) and (4) re-examine (check).

The fact that happened at school, problem solving ability of students in junior high school is still relatively low. According to OECD (2016) on the progamme for International Student Assessment (PISA) 2015, Indonesia only ranks at 62 out of 70 countries evaluated in the field of mathematics. Students in schools concentrate more on exercises that are procedural and mechanistic and rarely given about problem solving.

Problem solving ability of students is still low, seen also in the results of the students' answers on tests of problem-solving abilities in the early step of problem solving of students grade VII of SMP N 12 Semarang for the subject matter of numbers. Students were less understand the problems and while doing algebra calculations were not accurate, so that the students' answers were wrong. Therefore, the mathematical problem solving ability of students need to be improved so that mathematics learning objectives can be achieved.

One of the factors that affect the level of students' problem solving ability is the adversity quotient (AQ). According to Stoltz (2004) AQ is a person's ability to survive and solve a difficulty or problem encountered and were able to exceed expectations for their performance and potential.

AQ has four dimensions abbreviated as CO2RE, is a part of human behavior in facing of problems, namely control, origin and ownership, reach and endurance. Summing all dimension scores AQ (CO2RE) will categorize students into 3 levels, namely Quitter AQ (AQ low), Camper (AQ medium) and climber (high AQ). According to the research results of Widianawati (2017), student ability in facing of problem or difficulties (adversity quotient) among students are different for each other so that the ability of the mathematical representation will be different.

There are various models of learning that could be expected to enhance the problem solving of students such as the model of Connected Mathematics Project (CMP). According to Lappan, et al (2002) in the CMP learning, students are given the widest possible opportunity to build their own math knowledge. CMP Learning aims to help students and teachers develop mathematical knowledge, understanding and thinking skills, as well as recognition and appreciation to the enrichment of the interconnection between the parts of mathematics and between mathematics with other subjects. According to Wahyuningsih (2017) by applying the model to train the CMP on learning students have the responsibility to task for CMP emphasizes providing learning exercises or assignments to students.

According to Marsigit (2014: 2) the presence of learning innovation is indispensable so that the learning of mathematics can be more fun. Hartoyo (2012) stated that one of the goals of learning mathematics is forming a new

schemata in cognitive structure taking into account of the existing schemata in youth so that assimilation could be happened. One of the aspect that can be developed for such learning innovation is the local culture or commonly called as ethnomathematics. Ethnomathematics is a science that is used to understand how mathematics was adapted from a culture.

According to D'Ambrosio (2006) mathematics arises from the needs of organized society, which can not be separated from the activities and practices developed by people in the society. Ethnomathematics by using mathematical concepts are widely associated with a variety of mathematical activity, including activity of grouping, counting, measuring, designing buildings or instrument, play, specify a location, create graphics, and using props (Rachmawati, 2012). Learning with ethnomathematics nuanced would allow a material learned from the students' culture can generate the students motivation to study and their understanding on the material so that the learning becomes easier since the material is directly related to their culture.

Ethnomathematics in this study were taken from other forms of geometry in Semarang society. These forms are the forms contained in the local culture of students in this Semarang.

Based on the above explanation, the purpose of this study include: (1) determine the effectiveness of learning by using Connected Mathematics Project with ethnomathematics nuanced; (2) tto determine the elevation of character of love local culture on the learning of Connected Mathematics Project with ethomathematics nuanced (3) to describe the problem solving ability of students based on adversity quotient.

METHODS

This research applied mixed method type with sequential explanatory model. The Quantitative research was done to determine the effectiveness of learning by using *Connected Mathematics Project* quantitatively, whereas the qualitative research was done to analyze the mathematical problem solving ability of students by using adversity quotient. The experiment was conducted in SMP Negeri 12 Semarang in grade VII A academic year of 2017/ 2018, by using a rectangular material. The subject of the quantitative research was grade VII A, taken as the experimental class and grade VII C, taken as the control class. Pre-test of problem solving was given to both classes to get the initial data.

The preliminary data of the mathematics problem solving ability was then tested for normality, homogeneity test and median equality test to find out that the classes have the same capability so that it can be used as the subject of the research.

The result of prerequisite test results can be seen in Table 1.

Table 1. The Result of Prerequisites Test

Prerequisites test	Score	Sig	Result
Normality Test	0.200	0.05	Normal distribution of data
Homogeneity Test	0.119	0.05	Data homogeneous
Test similarity average	0.119	0.05	The population has the same capacity

Subjects of the qualitative research that used was only the experimental class, where the selection of subjects was done by using a score of adversity quotient, which are grouped into three categories Quitter (low AQ), Camper (AQ medium), and Climber (high AQ) where in each group two students were selected to be analyzed on their mathematics problem solving ability and an interview with the triangulation of data.

Data collection techniques in this study consisted of: observation, test and interview. The data collection technique was done by using the questionnaire of adversity quotient adapted from the questionnaire of adversity quotient in the work field of Stoltz (2004) into the world of education that has been declared valid by the validator expert.

The data collection technique of problem-solving abilities was done by using problem solving ability test consisting of six questions that have been declared valid by the validator expert. Data analysis was first performed in the preliminary observation then during the analysis steps in the research area. The preliminary analysis was done by using validation devices and research instrument. The analysis of the quantitative data obtained from the test problem solving, comprising: an average similarity test, completeness test, and average difference test, proportion test and paired samples t test. Whereas, the qualitative data analysis was done by reducing the data, presenting the data, and draw conclusions from the data collected and verified this conclusion on the subject that have been selected based on the category of adversity quotient.

RESULTS AND DISCUSSION

Validator examinatiion of the learning device which includes syllabus, RPP, Student Activity Sheets, Instructional Materials, Questionnaire and Interview Guidelines based on the average value were considered in good categories. Those learning device used in the learning process in the experimental class. The learning in the experimental class was carried out by using CMP models with ethnomathematics nuanced, whereas the learning in the control class was done by using PBL method with scientific approach.

The results of this study were described in two stages, namely a quantitative research and qualitative research. In quantitative research phase, researchers tested the effectiveness of learning by using CMP model with etnomathematics nuanced towards the problem solving ability of students through (1) the average completeness test; (2) the classical completeness test (3) the test of proportion and (4) the average difference test with the prerequisite test including normality test and homogeneity, (5) paired samples t test.

Significant value of normality and homogeneity test on the initial test of problem-solving ability, respectively 0,200 > 0,05 and 0,119 > 0,05 , therefore, it can be assumed that the initial test data derived from the problem solving abilities are normally distributed populations and homogeneous. On average similarity test values obtained on equal variances assumed is 0,119 > 0,05 , therefore, it can be concluded that the average initial problem solving ability in the experimental class is equal to the average initial problem solving ability in the control class. The value obtained from the test of classical completeness is $zhitung$ = 1.66 and $ztabel$ = 1.64, therefore, $zhitung > ztabel$ it, it can be stated that 75% of students in the experimental class taught by using CMP model with ethnomathematics nuanced were classically complete.

The average results of tests on a problem solving abilities in the experimental class is 83.5 with a standard deviation of s = 9.68 and the number of students were 36. The calculation of t_{value} on the average completeness test obtained t_{value} = 5.891 whereas, the t_{table} = 1.70, therefore, $t_{value} > t_{table}$, therefore, it can be concluded that the average of students' problem solving abilities in the experimental class was significantly exceeds the KKM. The significant value of normality and homogeneity test on problem solving ability test, respectively 0.2> 0.05 and 0.146> 0.05, therefore, it can be assumed that the data of problem solving ability test derived was a normaly distributed population and

homogenous. The average test results in the problem solving ability in the experimental class and control class respectively was 83.5 and 75.8. The results of average different test on problem solving ability obtained t_{value} = 2.861 and t_{table} = 1.67. Since $t_{value} > t_{table,}$ therefore, it can be concluded that the average of students' mathematics problem solving ability by using CMP learning model with ethnomathematics nuanced is better than average of students' mathematic problem solving ability in the PBL learning model with scientific approach.

Based on the research data analysis results obtained result (1) the learning device used in the experimental class has very good criteria; (2) the learning in the class taught by using the model of CMP with ethnomathematics approach can achieve the classical completeness; (3) the average problem-solving abilities in the class taught by the model of CMP with ethnomathematics nuanced was more than the KKM; (4) The average of students' problem solving abilities in the class taught by using CMP model with ethnomathematics nuanced was more than the average of problem solving abilities in the class taught by using PBL model with a scientific approach. Therefore, it can be concluded that the learning model of CMP with ethnomathematics nuanced is effective.

Based on the results of the questionnaire of love local culture obtained result that there is an increased in the character of love local culture by using CMP learning model with ethnomathematics nuanced. The result was obtained from the different average score of the love of local culture before and after taught by using CMP model with ethnomathematics nuanced. Before taught by using CMP model with ethnomathematics nuanced, students were less familiar with the local culture in Semarang. Many of them do not know much about the culture, customs, and areas which contain historical values in Semarang. After the learning by using the CMP model with ethnomathematics nuanced, students become more acquainted with the diverse cultures in Semarang.

The analysis of the mathematical problem solving ability of students in the learning of CMP was seen from the three category of adversity quotient, (AQ) namely, low (Quitter), medium (Camper), and high (Climber). In determining the level of AQ was done by using the total score of the Adversity Response Profile. AQ questionnaire was distributed to students of grade VII of SMP N 12 Semarang with the total number of students is 36. The questionnaire was given in order to find out the character of each student and also used for the selection of the subject to be interviewed with depth interview about the problem solving ability.

The test data of students' problem solving ability were analyzed based on indicators of problem solving abilities in accordance with the stages proposed by Polya. Four indicators of problem solving in accordance to the stages by Polya: (1) understand the problem; (2) develop problem solving plan; (3) conduct problem solving plan; and (4) re-examine the results of problrm solving.

Based on the result of obtained, it can be assumed that the problem solving of the research subjects was vary. It can be seen from the research subject scores at any problem solving steps on Question 1 to 6. Scores of research subject students' problem solving abilities Quitter 1 (SE-36), Quitter 2 (SE-27), Camper 1 (SE -19), Camper 2 (SE-34), Climber 1 (SE-01), and Climber 2 (SE-18) in question of numbers 1 through 6 can be seen in the following Figure 1.

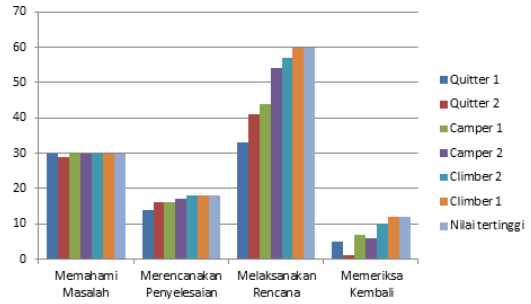

Figure1 1. Problem Solving Ability of Students Viewed from the AQ.

From Figure 1, it can be seen that in the stage of understanding the problem, it seems that overall or the whole subjects were able to understand the problem well. All subjects included in in good categories with the subject of Quitter who were slightly lower than other subjects. Based on the analysis, in the stage of understanding the problem, subject Quitter tend to write the same thing stated in the question. At the completion planning stage, it appears that the Quitter subject has not been able to plan a settlement well and is in a less category. In the third stage, namely implementing the plan, it appears that the Quitter subject is less able to solve the problem and algebraic manipulation is still wrong. In the re-checking stage, it can be seen that the Quitter subject has a relatively lower ability with less categories because it is not right in writing conclusions and has not checked the answers. The results of students' answers to the Quitter category in implementing the problem solving plan can be seen in Figure 2.

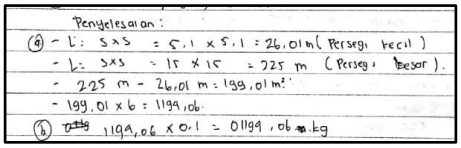

Figure 2. The Sample Results Of Student Quitter In Implementing The Problem Solving Plan

Subjects Camper tends to do better in analyzing the problem. Subjects Camper was able to interpreted the given problem in a mathematics sentence and write the right formula, but less thorough in algebraic calculations. At the stage of reviewing the subject Camper is able to write conclusions but has not checked the answers obtained. The results of students' answers to the Camper category in carrying out the problem solving plan can be seen in Figure 3.

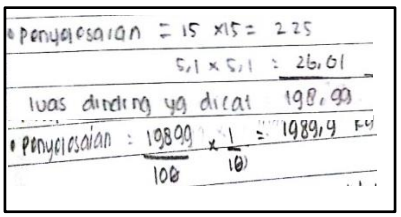

Figure 3. The Sample Results Of Student Camper In Implementing The Problem Solving Plan

Climber subjects are able to write things that are known by their own sentences in a short, clear and correct manner. Climber subjects have also been able to plan solutions with and be able to solve problems very well. In the re-checking stage, the Climber subject wrote down the conclusions and re-examined them so that they were included in a very good category at each stage of problem solving. The results of students' answers to the Climber category in carrying out the problem solving plan can be seen in Figure 4.

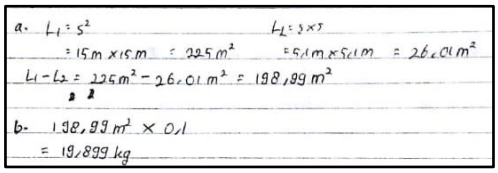

Figure 4. The Sample Results Of Student Climber In Implementing The Problem Solving Plan

The effectiveness of the model of CMP with ethnomathematics nuanced in this study

was supported by the findings of several previous studies, including research conducted by Wahyuningsih (2017) which suggests that the literacy skills of mathematics in class that implement the model of CMP is higher than the class that received conventional learning model and there is an increase in the students' metacognition. In addition, Damaryanti (2017) found that by applying the CMP learning model can develop students' reasoning power and liveliness. In line with those researches, the research conducted by Rohendi (2013) states that the ability of students' mathematics connection by using CMP model of media presentation based is better than learning by using a conventional model and it makes students become more active in learning.

CONCLUSION

The conclusions of this study are as follows. The learning of CMP model with ethnomathematics nuanced is effective. This is demonstrated through the learning model of CMP with ethnomathematics nuanced which was classically completed and the average of problem solving abilities in the class taught by using the model of CMP with ethnomathematics nuanced is above the KKM, the proportion of completeness of problem solving ability of students learning by using CMP model with ethnomathematics nuanced is higher than the proportion completeness of problem solving ability of students taught by using PBL learning model. The average of students' problem solving abilities in the class taught by using CMP learning model with ethnomathematics nuanced is more than the average of students' problem solving abilities in the class taught by using PBL model. There is an increase of students' character of love local culture by using the teaching and learning model of Connected Mathematics Project (CMP) with ethnomathematics nuanced. Students with the category of Climber have a better ability than students of Camper and Quitter category viewed seen from their way in understanding the problem, problem solving plan, implement the problem solving plan, and crosscheking the problem solving. Students with different AQs will have different problem solving abilities, therefore it is recommended that the teacher can analyze student's AQ before learning in order to understand students' character.

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