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Effectiveness of Missouri Mathematics Project Learning Model to Improve Mathematical Learning Outcome

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ABSTRACT

This study aims to determine the effectiveness of improving mathematics learning outcomes for grade VIII-B students of SMP Negeri 5 Polut Takalar through applying the Missouri Mathematics Project Learning Model. This type of research is pre-experimental research with The One Group Pre-test and Post-test design. The experimental unit, class VIII-B, consisted of 24 students consisting of 12 boys and 12 girls. The research instrument was an essay test to see student learning outcomes, observation sheets to observe student activities during learning, and response questionnaire sheets to determine student responses to learning through the Missouri Mathematics Project Learning Model application. Then the working hypothesis is formulated as follows: (a) The average score of learning outcomes is 73 (KKM 73). (b) Classical learning completeness 75%. (c) The average normalized gain of students is more than 0.29 (medium category). (d) The activities of class students during the learning process are in a good category, namely the percentage of actively involved 75%. The results of this study indicate that: (1) the average score of students' mathematics learning outcomes is 78.3 with a standard deviation of 11.79. This means that classical completeness has been achieved. (2) there is an increase in student learning outcomes after the Missouri Mathematics Project Learning Model is applied. The average time value of the gain is normalized, namely 0.4, and generally is in the medium category. (3) student activity is in the good category with an average of 81%. So it can be concluded that the Missouri Mathematical Project learning model is effectively applied to class VIII-B of SMP Negeri 5 Polut Takalar.

***Keywords**: Mathematics learning outcomes, student activities, Missouri Mathematics Project Learning Model.*

1. INTRODUCTION

Education is a significant concern for many people. So many things in aspects of human life make them inseparable from education. The education in question provides the widest opportunity for students to develop their activities and creativity. Informal education, students are given a variety of subjects, all of which make students active and creative, one of the various subjects is mathematics.

Mathematics is one of the fields of science that is very important both in basic education and higher education and in everyday life. Because mathematics in everyday life is always related to events about mathematical concepts, either directly or indirectly. Learning mathematics is logic, understanding of concepts, and other mathematical skills. For this reason, in the process, efforts must be made in such a way so that students do not mistakenly accept mathematical concepts because if students receive a concept that is one of the early stages of learning, it will be very difficult to learn the next concept especially if the concept is a fundamental concept for learning higher concepts.

In teaching mathematics, students must understand mathematical concepts, solve problems, and solve mathematical problems. Counting skills in solving problems and the ability to understand mathematical concepts significantly affect student learning outcomes. If this is allowed to drag on, students will have difficulty accepting mathematics lessons in the next material.

In solving a problem, students always solve the situation in the same way or steps as the solution given by the teacher. Students do not understand the steps or concepts of solving a problem but memorize the steps for solving it so that if the problem changes but the core of the problem is the same, students are less able to solve the problem. This will affect the effectiveness of the learning process and will also impact the learning outcomes.

Based on the observations and interviews at SMP Negeri 5 Polut, Takalar district, several problems were obtained: (1) Students were less active in the learning process. There were only a few students who dared to ask and answer the teacher's questions. (2) the low learning outcomes of students' mathematics can be seen from the average score before giving the action, which is 55.9, which is still below the KKM 73. (3) Students have difficulty solving problems with different problems but still with the same core problem. At the same time, students only focused on memorizing the completion steps presented by the teacher.

For this reason, an appropriate learning model is needed for students. One of the learning models that can be applied is the Missouri Mathematics Project learning model. [1] stated that the Missouri Mathematics Project is a structured learning model with ideas and expansion of mathematical concepts accompanied by practice questions both in groups and individually. Students are trained to improve their mathematical problem-solving skills.

According to [2], the Missouri Mathematics Project learning model contains things that can streamline students' time, namely reviews of previous material, developing new ideas as an expansion of previous mathematical concepts, providing controlled exercises, giving independent assignments to students, and giving assignments. Home so that student time can be used as effectively as possible both inside and outside the school environment. So the purpose of this study is to determine whether the application of the Missouri mathematics project learning model can improve the learning outcomes of class VIIIB students of SMPN 5 Polut Takalar.

The characteristic of this MMP learning model is the project assignment sheet. [3] stated that "the project task was intended to improve communication, reasoning, decision-making, and problem-solving skills." The advantages of the MMP learning model are that the material received by students is more, and students are skilled in solving various problems. Based on the advantages of the MMP learning model, namely a large number of practice questions both in groups and independently, it is suspected that it can improve students' mathematical problem-solving abilities.

2. RESEARCH METHODS

This type of research includes pre-experimental with the design of The One Group Pretest-Posttest Design. In this design, one group of subjects is used [4]. In this design, one group of subjects is used. First, measurements are taken and then subjected to treatment for a certain period; this can be described as follows.

Table 1. Research Design Chart

Pretest	Treatment	Posttest
O 1	X	O2

Source : [4]

Information:

O1: Pretest score

O2: Posttest score

X: Implementation of the Model Missouri Mathematical Project

The population in this study was class VIII SMPN 5 Polut Takalar, with a sample of class VIII B consisting of 24 students. The research instruments used are as follows: 1) Students' mathematics learning outcomes test, 2) Observation sheets for student learning outcomes were analyzed using descriptive analysis. The data obtained from the pretest and posttest results were analyzed to determine the increase in learning outcomes. The amount of increase before and after learning is calculated by the normalized gain formula.

Table 2. Classification of Normalized Gain

Normalized Coefficient	Classification
$g < 0.30$	Low
$0.30\ g < 0.70$	Currently
$g\ 0.70$	Tall

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Classical completeness criteria are achieved if at least 75% of students in the class have achieved a minimum completeness score. The criteria for the success of student activities in this study are said to be good if at least 75% of students are actively involved in positive activities during learning. To determine the improvement of student learning outcomes, the pretest and posttest data were tested for normality as a condition for testing the hypothesis by using the t-test one-sample test and the homogeneity test of Levene's test.

The data analysis technique used in this research is descriptive statistical analysis and inferential statistical analysis. Descriptive analysis was used to analyze data on the implementation of learning, student activities during learning, student responses to learning, and student learning outcomes. A descriptive study aims to see an overview of the data in general. Inferential statistics are related to drawing general conclusions from compiled and processed data.

3. RESEARCH RESULT

The descriptive statistical analysis results with statistical scores of students' initial ability test results before being taught using the Missouri Mathematics Project learning model (Pretest) are summarized in the Table 3.

Based on Table 3 above, information is obtained that the average score of students' initial abilities before being taught using the Missouri Mathematics Project learning model is 14.77 from the ideal score of 100. This shows that there are 100% of students get a score of less than 55. The highest score achieved by students is 42.50, and the lowest score is 0, with a standard deviation of 12.95. The mode value of 0 indicates that the acquisition of the pretest value for applying the Missouri Mathematical Project model with a scattered frequency is 0. Based on the size of the dispersion, which includes range, standard deviation, and a relatively small coefficient of variance, it can be concluded that the distribution of the pretest value data tends to be homogeneous.

Table 3. Description of the Initial Ability Test Score (*pretest*) Student Class VIII-B SMP Negeri 5 Polut Takalar

Statistics	Statistical Value
Sample	24
Ideal Score	100
Highest Score	42.50
Lowest Score	0
Score Range	42.50
Average Score	14.77
median	15
Mode	0
Variance	167.67
Skewness	0.58
Standard Deviation	12.95

Based on Table 3, it can be illustrated that of the 24 students of class VIII-B SMP Negeri 5 Pollut Takaar Regency who were used as research samples in the pretest, in general, they had an initial ability test result in the very low category with an average score 14.77 out of an ideal score of 100. From the descriptive statistical analysis results as attached in the appendix, the statistical scores of students' mathematics learning outcomes after being taught using the Missouri Mathematics Project (posttest) learning model are summarized in the following table.

Table 4. Description of Study Results Score (posttest) Class Student Mathematics VIII-B SMP Negeri 5 Pollut Takalar

Statistics	Statistical Value
Sample	24
Ideal Score	100
Highest Score	100
Lowest Score	45
Score Range	42.50
Average Score	78.33
median	79
Mode	75
Variance	139.12
Skewness	-0.98
Standard Deviation	11.79

Based on Table 4 above, information is obtained that the average score of students' mathematics learning outcomes after being taught using the Missouri Mathematics Project learning model is 78.33 from the ideal score of 100, this shows that there are 83% of students who score more than or equal to the KKM, which is 73, and 17% of students score less than 73. The highest score achieved by students is 100, and the lowest score is 45. with a standard deviation of 11.79. The mode value of 75 indicates that the posttest score with the largest frequency is 75. Based on the size of the dispersion, which includes range, standard deviation, and a relatively small coefficient of variance, it can be concluded that the distribution of posttest value data tends to be homogeneous.

Table 5. Description of Mathematics Learning Outcomes for Class VIII-B. Students SMP Negeri 5 Pollut Takalar

Score	Categorization	Frequency	Percentage (%)
$0 \leq x < 73$	Not Complete	4	17
$73 \leq x \leq 100$	Complete	20	83
Amount		24	100

The results of observing student activities in learning mathematics through the application of the Missouri Mathematics Project learning model to class students VIII-B SMP Negeri 5 Polut Takalar Regency shows that students are active in learning both before and after learning, students' social relations are getting better, students and teachers have met the active criteria. While the results of the analysis of student activity observation data show the average percentage of the frequency of student activities with the application of the Missouri Mathematics Project learning model, namely 81%.CriteriaThe success of student activities in this study is effective if at least 75% of students are actively involved in the learning process. Thus the application of the Missouri Mathematics Project learning model can increase student activity in learning mathematics.

Hypothesis testing was analyzed using a t-test to find out whether mathematics learning was effective through the Missouri Mathematics Project learning model for Class VIII-B students of SMP Negeri 5 Polut Takalar Regency, namely: 1) The average student learning outcomes after being taught with the Missouri Mathematics learning model The project is calculated using the t-test one sample test which is formulated with a hypothesis against which: the average score of student learning outcomes. The results of the SPSS analysis show that the p-value (sig. (2-tailed)) is 0.000 <0.05, indicating that the average student learning outcomes after being taught through the Missouri Mathematics Project learning model is more than$H_0: x \leq 72{,}9\ H_1: x > 72{,}9$. This means that H0 is rejected and H1 is accepted, namely the average learning outcomes (posttest). Class VIII-B students of SMP Negeri 5 Polut Takalar Regency are more than or equal to the KKM, 2) The average normalized gain of students after being taught using the Missouri Mathematics Project learning model is calculated using the t-test one sample test formulated with the hypothesis against$H_0: \mu \leq 0{,}29\ H_1: \mu > 0{,}29, where$ μ: average score of normalized gain. The analysis results show that the p-value (sig. 2-tailed) is 0.000 <0.05, indicating that the average normalized gain in class VIII-B students of SMP Negeri 5 Polut Takalar Regency is more than 0.29. This means that H0 is rejected and H1 is accepted. Namely, the normalized gain of student learning outcomes is in the high category, 3). After being taught with the Missouri Mathematics Project learning model, mastery of student learning is classically calculated using the proportion test, formulated with the opposite hypothesis: classic. A classical completeness test was carried out using the proportion test. To test the proportion using the significant level$H_0: \mu \leq 74{,}9\%\ H_1: \mu > 74{,}9\%$ μ 5% obtained Ztable = 1.64, meaning that H0 is accepted if Zcount < 1.64. Because the value of Zcount = 9.4 is obtained, then H0 is rejected, meaning that the proportion of students who reach the minimum completeness criteria is more than 79.9% of all students who take the test.

Based on the description above, it can be seen that the proportion of students who reach the completeness criteria of 73 (KKM) is more than 74.9%. So, it can be concluded that the students' mathematics learning outcomes after being taught using the Missouri Mathematics Project learning model meet the effectiveness criteria.

From the analysis above, it can be concluded that the average score of student learning outcomes after learning through the application of the Missouri Mathematics Project learning model has met the effectiveness criteria.

4. DISCUSSION

In the discussion of the results of descriptive analysis covering student learning outcomes, student activities in the learning process through the application of the Missouri Mathematics Project learning model and the implementation of learning, which will be described as follows: 1) Student learning outcomes are said to be effective if students in the class have reached the classical mastery level. At least 75%, 2) The results of data analysis on students' mathematics learning outcomes after the application of the Missouri Mathematics Project learning model show that there are 20 students or 83% of students who achieve the Minimum Completeness Criteria (KKM) while students who do not achieve the Minimum Completeness Criteria (KKM) as many as 4 students or 17%. In other words, students' mathematics learning outcomes after applying the Missouri Mathematics Project learning model is in the high category, which indicates that students' mathematics learning outcomes have met the criteria for classical mastery. 3) The results of observing student activities in learning mathematics through the application of the Missouri Mathematics Project learning model to class students VIII-B SMP Negeri 5 Polut Takalar Regency shows that students are active in learning both before and after learning, students' social relations are getting better, students and teachers have met the active criteria. While the results of the analysis of student activity observation data show the average percentage of the frequency of student activities with the application of the Missouri Mathematics Project learning model, namely 81%. Criteria of the success of student activities in this study are said to be effective if at least 75% of students are actively involved in the learning process. Thus**,** applying the Missouri Mathematics Project learning model can increase student activity in learning mathematics [6].

The results of the inferential analysis show that the pretest and posttest data have met the normality test, which is a prerequisite test before testing the hypothesis. The pretest and posttest data from each school were normally distributed because the P-value > = 0.05. Because the data is normally distributed, it meets the criteria for using the t-test to test the research hypothesis. Hypothesis testing in this study using t-test one sample test by previously performing Normalized gain on the pretest and posttest data. The normalized gain test aims to determine how much increase in student learning outcomes after being given treatment. The results of hypothesis testing using the t-test one sample test by previously performing Normalized gain on the pretest and posttest data. From each school has been obtained value p(sig. (2-tailed)) is 0.000 < 0.05 $=x$, so that it was rejected and accepted, which means that "There was an increase in mathematics learning outcomes after it was applied" H_0 H_1Missouri Mathematics Project learning model in class students VIII-B SMP Negeri 5 Pollut Takalar where the gain value is more than 0.29".

Mastery of student learning after being taught using Missouri Mathematics Project learning model classically more than 74.9% by using the proportion test obtained the value of Zcount Ztable = 9.4 > >1.64 which means that the learning outcomes of class students VIII-B SMP Negeri 5 Polut Takalar with application Missouri Mathematics Project pembelajaran learning model classically complete.

The results of the descriptive and inferential analysis obtained it is quite supportive of the theory that has been put forward in the literature review. Thus, it can be concluded that "Mathematics learning through the application of the Missouri Mathematics Project learning model effectively improves the learning outcomes of Class VIII-B students of SMP Negeri 5 Polut Takalar".

5. CONCLUSION

Based on the results of the research data analysis and discussion that have been described previously, it can be concluded that: 1) The mathematics learning outcomes of class VIII-B students of SMP Negeri 5 Polut Takalar Regency after the application of the Missouri Mathematics Project learning model are included in the high category with an average score 78.33 and standard deviation 11.79. These results also show that there are 20 students or 83% who achieve the KKM and 4 students or 17% who do not achieve the KKM (scores below 73), and the normalized gain value of 0.74 is in the high

category, while the results of the inferential analysis show that students' mathematics learning outcomes are applied classically by the Missouri Mathematics Project learning model, namely≥ 75%. 2) The average percentage of student activities related to learning activities from the observed aspects as a whole is categorized as active. This is indicated by acquiring the average percentage of student activity, namely as many as 81% are active in learning mathematics.

6. SUGGESTION

Based on the research results obtained, several suggestions are put forward to improve students' mathematics learning outcomes as follows.

1. Students are expected to apply the knowledge obtained from the teacher and continuously improve understanding for each lesson so that learning outcomes will increase.
2. This research is very limited in terms of variables and population, so it is hoped that researchers in the field of mathematics education, in particular, conduct further research to expand the results of this study.

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