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IMPLEMENTATION OF THE MISSOURI MATHEMATICS PROJECT (MMP) LEARNING MODEL ON STUDENT COGNITIVE LEARNING OUTCOMES

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ABSTRACT

This research was motivated by students' low mathematics learning outcomes as evidenced by the average learning outcome score being 4.1 out of a KKM score of 7.0. After observing, one of the problems faced is the lack of student involvement in the learning process. The solution to overcome this problem is the use of a learning model. This research aims to determine how implementing the Missouri Mathematics Project (MMP) learning model affects fourth-grade students' cognitive learning outcomes in fraction material. The method used in this research is a quantitative Pre-Experimental approach, a group post-test design. The subjects in this research were 27 fourth-grade students at Second Sidaraja State Elementary School. At the pretest stage, students' cognitive learning outcomes obtained an average score of 40.18; at the post-test stage, the average value obtained was 83.70. These results obtained a gain value of 0.74 with an increase of 43.52, which is included in the high category. Based on the results of the research and analysis that has been carried out, the Missouri Mathematics Project (MMP) learning model can improve students' cognitive learning outcomes. Implementing this learning model is hoped to help students hone their understanding and abilities to use various practice questions.

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1. INTRODUCTION

The Program for International Student Assessment (PISA) survey on the quality of education in Indonesia, which was released simultaneously on Tuesday, December 3 2019, is a good perspective for the progress of Indonesian education. The results of the 2018 PISA study released by the Organization for Economic Co-operation and Development (OECD) show that Indonesian students' ability in reading achieved an average score of 371 with the OECD average score being 487. Then for mathematics the average score reached 379 with an OECD average score of 487. Furthermore, for science the average score of Indonesian students reached 389 with an OECD average score of 489. (Hewi and Muh. Shaleh, 2020).

In line with this, the results of interviews conducted by researchers with the fourth grade homeroom teacher at Second Sidaraja State Elementary School on Tuesday, December 20 2022, showed that students' mathematics test scores did not meet the Minimum Completeness Criteria (KKM). The average mathematics exam score of 27 fourth-grades students was 4.1 from the predetermined KKM score of 7.0. He confirmed that students' understanding, especially of mathematics subjects, was very poor.

Fitria (2019) explains that mathematics learning is a teacher's activity in teaching mathematics to students which is designed to involve mental and physical processes through interactions between one student and another, between students and the teacher, between the environment and other learning sources in analyzing form, structure, arrangement, quantity and abstract concepts and their relationships in order to achieve basic competencies (Fitria, Dinda. 2019). The function of learning mathematics is as a tool, mindset, science and knowledge. The function of learning mathematics as a tool means that students are given the understanding that mathematics is a tool for understanding and conveying information. Meanwhile, learning mathematics as a mindset means that learning mathematics for students is a mindset in understanding an understanding. Then what is meant by learning mathematics to function as science and knowledge is that by learning mathematics students can develop the new discoveries they obtain (Savriani, Ella. 2020).

However, sometimes the mathematics learning process presented by teachers cannot be understood by students because quite a few of these students think that mathematics is difficult, there are many formulas that have to be memorized and so on. Assumptions like these are what ultimately make students stay away from mathematics subjects. There are many ways that teachers can change students' bad views of mathematics subjects, from providing positive motivation to giving assignments to hone students' mathematical skills. However, there are still some students who don't like mathematics.

Students who have the assumption that mathematics is difficult and complicated are caused by several factors, both internal and external factors. One of the internal factors that becomes an obstacle is that students lack focus on the teaching material being explained. One of the characteristics of students is that they get bored easily, children's focus is only in the first 10-15 minutes of learning. Boredom sometimes arises when the learning process does not involve students in it. If students feel bored in the learning process, they will be busy with their own world. A teacher is required to be able to present material in a fun and enjoyable manner so that it can be easily understood by students. Teachers must be able to find solutions to find breakthroughs to eliminate students' boredom during the learning process (Ratriany, 2015).

One external factor that becomes an obstacle is learning, which is still teacher-centred. After interviewing the fourth-grade homeroom teacher at Second Sidaraja State Elementary School, the researcher finally concluded that the learning process still used conventional methods, namely lectures, and focused on the teacher. This conventional learning model causes students to be less able to understand the material because they are not involved too much in the teaching and learning process. An alternative that teachers can use to overcome this is to use varied and exciting learning models.

An innovative and exciting learning model that can be used to overcome this problem is by applying the Missouri Mathematics Project (MMP) learning model. This learning model will help teachers convey learning material more meaningfully because it prioritizes student involvement in the learning process. In line with the opinion expressed by Chaeriani (2018) that the Missouri Mathematics Project (MMP) learning model is designed to help teachers use practice questions in learning so that students' problem solving abilities can improve.

Research on the Missouri Mathematics Project (MMP) learning model has been carried out by several previous researchers, including, according to Abidin (2020), that by using the Scaffolding-based Missouri Mathematics Project (MMP) learning model, learning outcomes have increased. This is supported again by research by Gunadi et al. (2020) that with the Missouri Mathematics Project (MMP) learning model, the learning process becomes more effective and student learning outcomes increase. As student learning outcomes continue to increase, student learning achievement also increases, in line with research by Sry (2019), which explains that the Missouri Mathematics Project (MMP) learning model focuses on teacher behaviour, which impacts student learning achievement.

The Missouri Mathematics Project (MMP) is a learning model that uses practice questions to help students achieve extraordinary improvements and provides opportunities for students to work in groups, do controlled practice and apply independently in seatwork (Ismarani, 2020). In line with this, Huzaipah's research (2013) explains that the Missouri Mathematics Project (MMP) is a learning model with detailed and systematic steps. More material will be presented, and lots of practice questions will be given, either controlled practice or individual practice, making students more independent, active and skilled in answering various questions (Huzaipah, 2013). Shadik (2009) also explained that the Missouri Mathematics Project (MMP) learning model has five learning steps, namely: 1) introduction (Review); 2) Development; 3) Practice with teacher guidance; 4) Independent work; and 5) closing.

Looking at several descriptions of research results that have been carried out by several previous researchers, which state that the Missouri Mathematics Project (MMP) learning model can be an alternative solution for increasing students' creativity and learning outcomes, especially in Mathematics subjects, the researchers are interested in implementing the Missouri Mathematics learning model Project (MMP) to overcome problems that researchers encounter in the field. This research aims to determine the effect of

implementing the Missouri Mathematics Project (MMP) learning model on the cognitive learning outcomes of fourth-grades students at Second Sidaraja State Elementary School Kec. Ciawigebang, Kab. Brass.

2. METHOD

The method used in this research is the Quantitative Pre-Experimental method. Quantitative methods are also called positivistic methods because they are based on the philosophy of positivism. This method is also a scientific/scientific method because it meets several scientific principles such as concrete/empirical, objective, measurable, rational and systematic. This method is also called the discovery method because, with this method, various new science and technology can be discovered and developed. This method is called quantitative because the research data is in numbers, and the analysis uses statistics (Sugiyono. 2022).

The purpose of this research is to determine whether there is an influence from the implementation of the Missouri Mathematics Project (MMP) learning model on students' cognitive learning outcomes, especially in the mathematics subject of fractions. The design used in this research is a group Pretest-Posttest Design. With this design, research will be more accurate in comparing students' cognitive learning outcomes before and after being given treatment. This design is described as follows (Sugiyono. 2022):

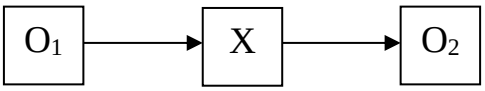

Figure 1. ***One Group Pretest-Posttest Design***

Information:
O_1 = pretest score (before being given training)
O_2 = posttest score (after being given training)
X = training/treatment

The subjects in this research were selected using a saturated sampling technique where all fourth-grades students of Second Sidaraja State Elementary School, Ciawigebang District, Kuningan Regency for the 2022-2023 academic year were the subjects of this research. The number of subjects in the research was 27 students, with details of 14 male students and 13 female students. The data collection technique in this research is a test method in the form of pretest and posttest questions. This test system is carried out twice, namely before the treatment is carried out, it is called a pretest and after the treatment is carried out, it is called a posttest. The number of questions used as instruments in this research was 20 questions for each test, both pretest and posttest. The analysis technique used in this research uses statistical methods, because the data obtained is in the form of numbers which aim to test hypotheses that have been formulated in the form of statements. To test the validity of the analytical technique instruments used are tests of validity, reliability, distinguishing power and level of difficulty. Meanwhile, to analyze the results of the research, the normality test, homogeneity test and t-test were used.

3. RESULT & DISCUSSION

The research began with field observations to gather information about general problems in elementary schools. After making observations, the focus of the researcher's attention was the low mathematics scores obtained by fourth-grades students at Second Sidaraja State Elementary School. Therefore, finally, the researchers were interested in overcoming this problem by applying the Missouri Mathematics Project (MMP) learning model to fraction material. The research to be carried out must have appropriate references or research materials, so first, the researcher carries out a literature review by looking for previous research results related to problems found in the field. The next step is preparing the research instrument. The research instrument consisted of 20 multiple-choice questions with four answer options.

The instrument created must first go through a testing process by testing the questions' validity, reliability, difficulty level and distinguishing power. The results from material experts regarding the instrument created by the researcher reached a score of 86%, which is included in the very suitable category for use in this research. The results of calculating the difficulty level vary significantly in the problematic category with 1 question, the easy category with 18 questions and 1 question in the easy category. Calculating the discriminating power of the questions states that the instrument created is suitable for this research.

The validity of this instrument is related to the accuracy and suitability of the instrument as a measuring tool and the object to be measured. Based on the results of calculations that have been carried out, the 20 questions created have valid criteria and are suitable for collecting research data. Next, a reliability test was carried out, which obtained a result of 4.2 and was in the interval with a reasonable interpretation; this shows that the instrument can be trusted to be used as a data collection tool. If all stages have been fulfilled,

the next step is conducting research. The subjects in this research are the fourth-grade students of Second Sidaraja State Elementary School, totalling 27 students, with details of 14 male students and 13 female students.

The learning implementation begins with working on pretest questions, which aim to determine students' initial abilities in fraction material before being given treatment using the Missouri Mathematics Project (MMP) learning model. Meanwhile, posttest data was obtained by researchers by giving multiple choice test sheets to students to find out students' abilities in fraction material after being given treatment using the Missouri Mathematics Project (MMP) learning model.

The analysis technique used in this research uses statistical methods because the data obtained is in the form of numbers that aim to test hypotheses formulated in the form of statements. The normality test is used to determine whether the resulting data is typically distributed or not. Data is said to be normally distributed if the significance value (sig) > α (0.05). The homogeneity test determines whether the two pretest and posttest scores are homogeneous. Data is said to be homogeneous if the significance value (sig) > α (0.05). The t-test is used if both data obtained, both pretest and posttest values, are declared regular and homogeneous. The purpose of this test is to find out whether the specified hypothesis is accepted or rejected. The hypothesis (H1) is said to be accepted if the significance value (sig) < α (0.05) (Ananda, Rusydi. 2018).

Table 1. Recapitulation of Pretest and Posttest Results

Analysis	*Pretests*	*Posttest*
Average	40,18	83,70
SD	13,6	10,9
Maximum Score	65	100
Minimal Score	15	60

Based on table 1 above, there is a recapitulation of pretest and posttest cognitive learning outcomes data on fraction material before and after using the Missouri Mathematics Project (MMP) learning model. The table above shows that the minimum score at the pretest stage is 15, while at the posttest stage the minimum score is 60. The maximum score at the pretest stage is 100. The average score for the 27 students at the pretest stage is 40.18, whereas at the posttest stage, he got a score of 83.70. So that the differences between the two results are clearly visible, below is a bar diagram of the pretest and posttest data.

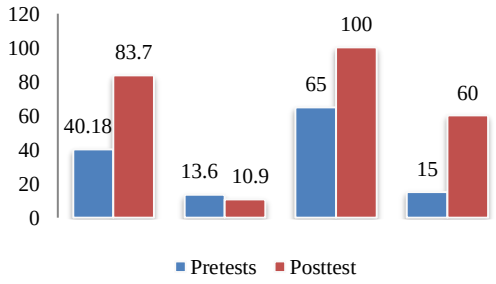

Figure 2. Recapitulation of Pretest and Posttest Results

Next, data analysis of cognitive learning results from the pretest and posttest was carried out. The results of this data analysis are in the form of hypothesis testing carried out by researchers with the aim of finding out differences in students' cognitive learning outcomes before and after being given treatment using the Missouri Mathematics Project (MMP) learning model on fraction material. The normality test is used to determine whether data is normally or not normally distributed. The normality test used was the chi square test, researchers carried out normality test calculations manually with the help of Microsoft Excel. The following are the results of the pretest and posttest data normality tests.

Table 2. Normality Test Results

Data	(x^2)	(x^2) Table	Information
Pretest	3,51	7,81	Normal
Posttest	2,38		Normal

The results of the normality test of the pretest data obtained a calculated chi square value of 3.51 and the posttest data obtained a calculated chi square value of 2.38 with a table chi square value (0.05) of 7.81. Because the pretest $\chi^{2\text{count value}}$ (3.51) < $\chi^{2\text{table}}$ (7.81), the pretest results are normally distributed. Likewise, with the posttest $\chi^{2\text{count value}}$ (2.38) < $\chi^{2\text{table}}$ (7.81), the posttest results are normally distributed. The next stage is the homogeneity test of both pretest and posttest data.

The homogeneity test was carried out to determine whether the two samples were homogeneous or not homogeneous, so the homogeneity test of the variants was carried out using the F test. The results of the homogeneity test from the pretest and posttest data are presented in the form of a table below:

Table 3. Variant Homogeneity Test Results

Data	*N*	F_{count}	F_{table}	Information
Pretest *Posttest*	27	1.557	1,662	Homogen

Test the homogeneity of the data by obtaining an $F^{\text{count value}}$ of 1.557 and an F^{table} of 1.662. Because F^{count} (1.557) < F^{table} (1.662), both pretest and posttest data are homogeneous. Because both pretest and posttest data are normally distributed and homogeneous, data processing is continued using a parametric test, namely the t test (t-test).

Hypothesis testing (t-test) is used to determine the acceptance of hypotheses that have been established by previous researchers. Hypothesis testing was carried out to determine whether there was an influence from the implementation of the Missouri Mathematics Project (MMP) learning model on students' cognitive learning outcomes in fraction material. The results of the t-test calculation are expressed in table form below:

Table 4. Hypothesis Test Calculation Results

Analysis	*Pretest*	*Posttest*
Average	40,18	83,70
SD	13,6	10,9
varian (SD^2)	184,96	118,81
Sample (n)	27	
SD Summary	33,8	
T_{count}	4,73	
t_{table}	1,6745	
Conclusion	Homogen	

The statistical hypothesis test on students' cognitive learning outcomes regarding fractions obtained a t^{count} of 4.73 and a t^{table} of 1.6745. Because the value of t^{count} is 4.73 > t^{table} 1.6745, then H^1 is accepted and H^0 is rejected with a significance level of 5% or ($\partial = 0.05$) and a degree of freedom (db = 52). This means that the students' cognitive learning outcomes before and after being given treatment using the Missouri Mathematics Project (MMP) learning model were significantly different, the posttest scores were higher than the pretest scores. This is because before the posttest was carried out, the sample was first treated with the Missouri Mathematics Project (MMP) learning model.

The N-Gain test was carried out to determine the difference between the pretest cognitive learning result scores and the posttest cognitive learning result scores. The results of the n-gain test calculation are presented in table form below:

Table 5. Recapitulation of N-Gain Test Results

Analysis	*Pretest*	*Posttest*
Maximal Score	65	100
Minimal Score	15	60
Ideal Score	100	100
Gain Average	40,18	83,70
Gain Score	0,74	

Gain Category	Tinggi
Improvement	43,52

Based on the data obtained from the N-gain test results, the minimum pretest value is 15 and the maximum value is 65, the minimum posttest value is 60 and the maximum value is 100. The average pretest gain value is 40.18 and the average posttest gain value is 83 .70. So, based on the recapitulation results of the N-Gain test from the pretest and posttest values above, a gain value of 0.74 was obtained with an increase of 43.52, including in the high category.

The findings of this research are in line with the research results of Gunadi, et al (2020) which stated that the Missouri Mathematics Project (MMP) learning model is effective for improving student learning outcomes. This is in accordance with the results of research that has been carried out, that with the implementation of the Missouri Mathematics Project (MMP) learning model, students' cognitive learning outcomes have increased as evidenced by the results of calculating the N-Gain value from the pretest and posttest of 0.74 with an increase of 43.52. So with the implementation of the Missouri Mathematics Project (MMP) learning model it has a high category in improving students' cognitive learning outcomes.

4. CONCLUSION

Based on the results of research and analysis carried out by researchers regarding the implementation of the Missouri Mathematics Project (MMP) learning model on the cognitive learning outcomes of fourth-grades students at Second Sidaraja State Elementary School, it can be concluded that with the implementation of the Missouri Mathematics Project (MMP) learning model, the participants' cognitive learning outcomes students experience changes for the better. This is proven by the results of the pretest and posttest which are different and have experienced significant improvement for the better. With the implementation of learning models, especially in mathematics subjects, it will influence students' cognitive learning outcomes. If students are familiarized with implementing the Missouri Mathematics Project (MMP) learning model in the learning process, then students will become familiar with various forms of practice questions which are useful for honing students' understanding and abilities..

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