THE INFLUENCE OF PROBLEM POSING AND MISSOURI MATHEMATICS PROJECT (MMP) ON LEARNING MATH LEARNING OUTCOMES REQUIRED FROM COGNITIVE STYLE

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ABSTRACT

Mathematics learning in class VIII SMPN 1 Kasihan Bantul academic year 2017/2018 using Problem Based Learning (PBL) learning model, which resulted in students still difficulty solving problems given by teachers so that teachers still guide students in solving the problem by giving its settlement step. As well as in learning, students lack confidence in conveying ideas or opinions. The use of a less precise learning model made the students less understood with the material described by the teacher and resulted in poor learning outcomes. This study aims to determine the effect of cognitive style on learning outcomes, the influence of the learning model of problem posing and MMP learning model on learning outcomes, and the interaction effect between cognitive style and problem-posing model and MMP on learning outcomes. This study's population is the student's class viii State Junior High School (SMP N) 1 Kasihan Bantul consisting of 5 classes. Samples of 2 classes with the number of 63 students taken with random sampling technique to the class obtained VIII D as experimental class A and class VIII E as experimental class B. Research instrument in the form of Group Embedded Figures Test (GEFT) test, initial ability test, and test result learning. Data analysis used a two-way analysis test of variance analysis. Based on the first hypothesis test with a significance level of 5% and the value of F_A = 5,05 while $F_{0,05;\ 1,59}$ = 4,004 mean $F_A > F_{tabel}$, indicating that there is the influence of cognitive style to result learn. The second hypothesis test with a 5% significance level and F_B value = 3.70 while $F_{0,05;\ 1,59}$ = 4,004 mean $F_B < F_{tabel}$, indicating no effect of learning model of problem posing and Missouri mathematics project (MMP) model of outcome learn. The third hypothesis test with the cell is not equal to a 5% significance level and F_{AB} value = 4.40, whereas $F_{0,05,1,59}$ = 4,004 means $F_{AB} > F_{tabel}$ interaction between cognitive style and learning model to learning result.

Keywords: Influence, PBL, Cognitive Style, Problem posing, MMP, Learning Outcomes.

INTRODUCTION

Education is a critical component of life. Through education, students can learn a variety of knowledge and can develop talent within themselves. Also, education is a conscious and planned effort to prepare human resources; in this case, students through guidance, training, and learning activities. Learning is a process of teaching and learning between students and teachers, where the teacher as a facilitator for students. According to Law Number, 20 the Year 2003, Article 1, paragraph 20, Learning is the process of interaction of students with educators and learning resources in a learning environment. The implementation of learning has benchmarks to determine achievement in learning, as outlined in the indicators and learning objectives. With the learning objectives, student learning outcomes can be measured.

Learning outcomes are a measure of how far students understand the material that has been taught. To achieve maximum learning outcomes depends on the learning process experienced by these students. Therefore to measure learning outcomes, an educator must create situations and conditions that allow for the achievement of a quality learning process. The teacher must pay attention to methods or models that can improve learning outcomes. The teacher's method or model must be able to measure students' abilities in the cognitive realm. According to Muzaini (2015), Cognitive style is a consistent way students use in observing and mental activities in the cognitive field, processing information, and solving problems. This style includes the independent field style (FI) and the dependent field style (FD).

According to Slameto (2010: 161), it is stated that individuals who study in a field-independent style tend to express a picture independent of the background of the picture, and can distinguish objects from the surrounding context more efficiently, to look around the situation more analytically and generally able to deal with tasks that require differences and analysis quickly. Individuals with this field-dependent learning style receive things globally. They have difficulty separating themselves from their surroundings, tend to know themselves as part of a group.

Based on the results of an interview with one of the mathematics teachers at SMP N 1 Kasihan Bantul on October 24, 2017, the learning model commonly used by teachers is Problem Based Learning (PBL). By using the learning model, PBL, students are still having difficulty solving problems given by the teacher so that the teacher is still guiding students in solving problems by providing steps to solve them. Moreover, in learning, students lack confidence in conveying ideas or opinions, and students are still weak in the necessary calculations. Based on the results of interviews with several students at SMP N 1 Kasihan Bantul on October 28, 2017, that students do not like mathematics because it is difficult to understand. Students' difficulty in learning mathematics is that it is difficult to understand story problems. It is challenging to use formulas.

Learning outcomes are influenced by the learning model used by the teacher. The learning model must be by the characteristics or cognitive style of students. The application of learning models can properly affect learning outcomes. One of them uses problem posing learning model and the Missouri mathematics project (MMP) learning model. Problem posing learning model is a model of asking questions or problems. Students here are required to analyze a problem so that students can solve problems. Simultaneously, the MMP learning model will have a lot of practice questions and projects. Hence, students are skilled in solving various kinds of questions. Ngalimun (2017: 331) states that Problem posing is problem-solving through elaboration, which is to redefine the problem into simpler parts so that it is understood. The syntax is understanding, solutions, identifying errors, minimizing writing counts, looking for alternatives, compiling questions. The Missouri Mathematics Project (MMP) learning model is a model that actively engages students while learning (Utami, Riski Sari, et al.: 2014). This model is a learning model used in learning mathematics by implementing a work plan that has a goal in achieving the goals of mathematics learning (Rahmi, Arifa, and Rahmi Depriwana: 2015). Novi, marliani (2016) A characteristic of the Missouri Mathematics Project (MMP) learning model is the existence of a project assignment sheet (student worksheet).

Based on the description that has been presented above, it is necessary to investigate further the effect of the problem-posing learning model and the Missouri mathematics project (MMP) learning model on mathematics learning outcomes in terms of cognitive style in students. The objectives of this study are:

1. To determine the effect of cognitive style on learning outcomes.
2. To determine the problem's effect posing the learning model and the Missouri mathematics project (MMP) learning model on learning outcomes.
3. To determine the effect of interaction between cognitive style and problem posing and Missouri mathematics project (MMP) learning models on learning outcomes.

METHODS

This type of research is experimental quantitative research. In this study, using two classes, namely experimental class A and experimental class B, this research uses experimental design in a factorial design. Sugiyono (2017: 113) states that factorial design is a modification of the true experimental design, that is by considering the possibility of a moderator variable that influences the treatment (independent variable) on the outcome (dependent variable). In this study using two factors, the first factor is a cognitive style consisting of independent fields (FI) and field-dependent (FD). In contrast, the second factor is a learning model consisting of problem posing and MMP learning models. The design of this study is illustrated in table 1.

Table 1. Factorial design research design

Cognitive style	Learning model	
	Problem Posing	MMP
FI	O_1	O_3
FD	O_2	O_4

Information:
FI: Cognitive style that does not depend on the environment.
FD: Cognitive style that depends on the environment.
O_1: FI student learning test results using the problem-posing learning model.
O_2: Results of FD student learning tests using the problem-posing learning model.
O_3: FI student learning test results using the MMP learning model.
O_4: Student FD test results using the MMP learning model.

This research was conducted at SMP N 1 Kasihan Bantul. The subjects of this study were class VIII SMP N 1 Kasihan Bantul Even Semester 2017/2018 Academic Year. The population in this study were all class VIII SMP N 1 Kasihan Bantul Even Semester 2017/2018 Academic Year. The class is class VIII A, VIII B, VIII C, VIII D, and VIII E. All classes have the same ability because they are arranged randomly. The total number of students in class VIII is 162 students. Sampling in this study is a random sampling technique for class, which is taken two classes randomly without regard to strata in the population. The sampling class is done by lottery to determine the sample class from the sampling obtained class VIII D as experimental class A and VIII E as experimental class B.

The data collection method in this research is the test method. The test method is used to obtain data about students' cognitive styles and student learning outcomes in mathematics. Tests given to research subjects use the GEFT (Group Embedded Figures Test) test instrument for cognitive style. GEFT is a perception test where subjects are given a collection of images and are asked to place simple images that have been seen into increasingly complex images (Witkin in Nigrum, Prawita: 2016). The GEFT instrument used in this study uses the GEFT instrument developed by Witkin et al. This test consists of 3 groups of 3 question groups. The first question group consists of 7 items, the second and third question groups each consist of 9 items. The first question group was not given a score because the question group was intended to exercise for the respondent already and determine whether the respondent understood the instructions and how to work on the test. The second and third group of questions is the real test given a score is the second and third group of questions. Each one is given a score of 1 if the answer is correct and a score of 0 if the answer is wrong so that a maximum score of 18 and a minimum score of 0. The time given for the first group of questions is 5 minutes and for the second and third group of questions is 18 minutes. The student's task in this test is to put a simple picture that is hidden by thickening. Nurrakhmi and Lukito, Agung (2014) stated that students with correct answers> 9 included students with independent cognitive field styles. Whereas students with many correct answers ≤ 9 include students with field-dependent cognitive styles.

Data analysis techniques used in this study are:

1. They are testing data analysis prerequisites, namely testing the normality and homogeneity of the data.
2. The hypothesis is an assumption or conjecture about something that is made to explain it, which is often required to check (Sudjana, 2005: 219). To test the difference in the average test of student learning outcomes, the test statistic used is the two-way analysis of variance test with unequal cells

RESULTS AND DISCUSSION

The results of the study obtained the following data:

Table 1. Description of Mathematics Learning Outcomes Test Data

Variable	Experiment Class A (Problem Posing)	Experiment Class B (MMP)
Many students	32	31
The highest score	95	100
Lowest Value	60	65
Average	80,63	83,55
Standard Deviation	7,38	8,96
Variance	54,44	80,32

Based on the description of the value, it is known that the experimental class A (Problem Posing) obtained an average score of 80.63 with a standard deviation of 7.38, while for the experimental class B (MMP), an average score of 83.55 with a standard deviation of 8.96. The normality test is a prerequisite before testing the hypothesis test. A normality test is used to determine whether data is normally distributed or not. In this study, the normality test used is the Chi-Square formula. Criteria for a data is usually distributed if $X^2_{count} \leq X^2_{table}$. Based on the calculation of normality tests that have been carried out and summarized in table 12 above, it appears that in the experimental class A with a significant level of 0.5 and degrees of freedom 5, the value of $X^2_{count} \leq X^2_{table}$. So the data on the mathematics learning outcomes of experimental class A is usually distributed. Whereas in the experimental class B, with a significance level of 0.5 and degrees of freedom 5, the value of $X^2_{count} \leq X^2_{table}$. So that the data on the mathematics learning outcomes of the experimental class B is also normally distributed data.

The results of the normality test scores for the mathematics learning outcomes of the experimental class A and the experimental class B are presented in Table 2 below

Table 2. Summary of Normality Test Data on Mathematics Learning Outcomes Test Results

Class	χ^2_{count}	χ^2_{table}	Level Of Significance	df $(k-1)$	Info.
Experiment Class A (Problem Posing)	4,217894	11,0705	0,5	5	Normal
Experiment Class B (MMP)	10,76786	11,0705	0,5	5	Normal

Then the homogeneity test is performed. A homogeneity test is carried out to determine whether experimental class A and experimental class B have the same ability or homogeneous, or have the same variance. In this study, to test the homogeneity of the sample, the Bartlet test was used. The results of homogeneity test calculations are summarized in the following Table 3:

Table 3. Summary of Homogeneity Test Data on Mathematical Learning Outcomes

χ^2_{count}	χ^2_{table}	Level Of Significance	Df	Info
1,15	3,8415	5%	1	Homogeneous

Homogeneous sample criteria if χ^2_{count} two $\leq \chi^2_{table}$. Based on Table 17 above shows that the value $\chi^2_{count} = 1.15$, $\chi^2_{table} = 3.8415$ at a significant level of 5% and df = 1 so that $\chi^2_{count} \leq \chi^2_{table}$, then the data variance in the value of student mathematics learning outcomes used as research samples is homogeneous.

After testing the normality and homogeneity test, the hypothesis test is then performed. Hypothesis testing uses a two-way analysis of variance test with unequal cells in mathematics learning outcome data. Based on Table 4. (1) Inline effect (A), the value of F_A= 5.05 is obtained while $F_{0,05;1,59}$ = 4.004 means $F_A > F_{table}$, H_{0A} is rejected. This means that the cognitive styles of FI and FD have

different effects on student mathematics learning outcomes. (2) In the effect of column (B), obtained the value of F_B= 3.70 while $F_{0,05;1,59}$= 4.004 means $F_A < F_{table}$, H_{0B} is accepted. This means the problem-posing and MMP learning models do not influence the learning outcomes. (3) On the interaction effect (AB), the value of F_{AB}= 4.40 while $F_{0,05;1,59}$= 4.004 means $F_{AB} > F_{table}$, then H_{0AB} is rejected. This means there is an interaction between cognitive style and learning models on student learning outcomes.

Table 4. Summary Analysis of Two Way Variance Analysis of Mathematical Learning Outcomes

Source	JK	df	RK	F_{obs}	F_{α}	p
Cognitive Style (A)	298,88406	1	298,88406	5,05	4,004	<0,05
Learning Model (B)	219,0386	1	219,0386	3,70	4,004	>0,05
Interaction (AB)	260,3986	1	260,3986	4,40	4,004	<0,05
Error	3489,09	59	59,1371	-	-	-
Total	4267,4113	62	-	-	-	-

a. There is an influence of cognitive style on learning outcomes in class VIII SMP N 1 Kasihan Bantul, even the semester of 2017/2018.
   Based on the results of the two-way analysis of variance with unequal cells, the value of F_A= 5.05 while $F_{0,05;1,59}$= 4.004 means $F_A > F_{table}$. So that H_0 is rejected, and H_1 is accepted, which means that there is an influence of cognitive style on learning outcomes in eighth-grade students of SMP N 1 Kasihan Bantul even semester of the academic year 2017/2018. The results showed that students who had a Field Independent (FI) cognitive style had more significant learning outcomes than students who had a Field Dependent cognitive style (FD) measured through student mathematics learning outcomes tests. This can happen because students with FI cognitive style in the learning process prefer fields that require analytical skills such as mathematics compared to FD students, who are more likely to choose areas that involve social, interpersonal relationships. FI students are more confident and are not easily influenced by the environment. What is believed to be true is consistent in their choices. Students with FD cognitive styles often have difficulty in analyzing problems. Specifically for FI students, data obtained that the average learning outcomes of mathematics taught using problem-posing are more significant than the average learning achievement taught using the Missouri Mathematics Project (MMP), the learning model. This is very reasonable because students with FI cognitive styles have good analytical skills. They are calmer and not confused about the problem of inductive thinking. The description shows that the individual's influence cognitive style on student learning outcomes.
b. There is no influence of the problem-posing learning model and Missouri mathematics project (MMP) learning model on the learning outcomes of the eighth-grade students of SMP N 1 Kasihan Bantul on the even semester of the academic year 2017/2018.
   Based on the results of two-way analysis of variance with unequal cells, the value of F_A= 3.70 while $F_{0,05;1,59}$= 4.004 means $F_B < F_{table}$, H_{0B} is accepted. This means the problem-posing and MMP learning model does not influence students' learning outcomes of class VIII SMP N 1 Kasihan Bantul, even semester 2017/2018 school year. So, because there is no influence of the problem-posing learning model and the Missouri mathematics project (MMP) learning model on learning results, the hypothesis analysis is not continued. Next, the learning process during the research will be discussed. Based on the average learning outcomes of the experimental class A (Problem Posing) and the experimental class B (MMP), the average learning outcomes of the experimental class B (MMP) is higher than the experimental class A (Problem Posing) which is 83.55 for the class experiment B (MMP) and 80.63 for experiment class A (Problem Posing). The average value of class B (MMP) students' mathematics learning outcomes is higher than the experimental class A (Problem Posing). This happens because, in the experimental class B (MMP), students are given many practice questions and projects so that students are skilled in solving various kinds of problems. Experimental Class A (Problem Posing) students are required to analyze a problem. Hence, students can solve problems, but indirect learning, some students still

have difficulty in analyzing a problem. Based on data analysis and some of the factors above, in the end, the MMP learning model and Problem Posing tend to be the same. Thus, there is no effect on student mathematics learning outcomes using the MMP learning model and Problem Posing.

c. There is an interaction between cognitive style and learning models on learning outcomes in class VIII SMP N 1 Kasihan Bantul, even semester 2017/2018 school year.
The analysis shows that the interaction between cognitive style and problem posing and Missouri mathematics project (MMP) learning model on learning outcomes has a value of F_{AB}= 4.40 while $F_{0,05;1,59}$= 4.004 means $F_{AB} > F_{table}$ then H_{0AB} is rejected, which means that there is the interaction between cognitive styles and learning models on learning outcomes. Judging from the average of students with FI cognitive style who were given problem-posing treatment was 84.00. Those treated with the MMP model were 83.64, while students with FD cognitive style were treated with problems posing 75.00 and those treated with the MMP model. 83.33. Therefore, cognitive style and the presence of problem posing and MMP learning models affect student learning outcomes.

CONCLUSION

1. There is an influence of cognitive style on learning outcomes in students of class VIII SMP N 1 Kasihan Bantul, even semester 2017/2018 school year. Hypothesis test results / two-way variance analysis test with unequal cells with a significance level of 5% and F_A= 5.05 while $F_{0,05;1,59}$= 4.004 means $F_A > F_{table}$. So H_0 is rejected, and H_1 is accepted.
2. There is no influence of the problem-posing learning model and Missouri mathematics project (MMP) learning model on learning outcomes in students of class VIII SMP N 1 Kasihan Bantul even semester of 2017/2018 school year. Hypothesis test results / two-way variance analysis test with unequal cells with a significance level of 5% and F_B= 3.70 while $F_{0,05;1,59}$= 4.004 means $F_B > F_{table}$, then H_{0B} is accepted H_{1B} is rejected.
3. There is an interaction between cognitive style and learning models on learning outcomes in class VIII SMP N 1 Kasihan Bantul, even semester 2017/2018 school year. Hypothesis test results / two-way variance analysis test with unequal cells with a significance level of 5% and F_{AB}= 4.40 while F0.05; 1.59 = 4.004 means $F_{AB} > F_{table}$ H_{0AB} is rejected H_{1AB} is accepted.

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