THE EFFECTIVENESS OF PROBLEM-BASED LEARNING MODEL TOWARD THE ABILITY OF CONCEPT COMPREHENSION AND STUDENTS CREATIVITIENESS IN SMP N 3 JETIS

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ABSTRACT

The mathematics learning at SMP N 3 Jetis Bantul is still using a direct instructional model. In this model, the teacher plays an important role in providing information about new concepts and demonstrate a pattern or rules. It makes the process of concept comprehension and creativity of students is very low. The study aimed to know the differences between the ability of concept comprehension and students' creativity in the learning which was using problem-based learning models and direct instructional model along compared to the effectiveness of both models toward the ability of concept comprehension and student's creativity. There are four classes of research subjects, they are VIII D, VIII E, VIII F, and VIII G SMP N 3 Jetis Bantul. The researcher used a purposive sampling technique class VIII G chosen as an experimental class and VIII F as a control class. The design of the research was posttest only control design. Data collection technique used to test. Data collection instruments such as concept comprehension in the form of posttest essay questions and essay questions creativity. Test data collection instruments used validity test and reliability test. The Data analysis technique used was the prerequisites test analysis including normality test and homogeneity test continued hypothesis test. The results of experimental class hypothesis test with significance level 5% and showed that: (1) $t = 3{,}780$ and $t_{(0{,}025)} = 2.0055$ so $t > t_{(0{,}025)}$ then there was a significant difference between the ability of concept comprehension which used problem-based learning model and direct instructional model (2) $t = 5{,}02625$ and $t_{(0{,}025)} = 2.0055$ so $t > t_{(0{,}025)}$ then there was a significant difference of student creativity which used problem-based learning model and direct instructional model, (3) $t = 3{,}780$ and $t_{(0{,}05)} = 1.673925$ so $t > t_{(0{,}05)}$ then the results of students mathematics learning used problem-based learning model was better than using direct instructional model, (4) $t = 5{,}02625$ and $t_{(0{,}05)} = 1.673925$ so $t > t_{(0{,}05)}$ then student creativity who used problem-based learning model was better than using the direct instructional model.

Keywords: Effectiveness, Problem Based Learning Model, The Ability of Concept Comprehension, Students Creativeness.

INTRODUCTION

Education is the most important means to help humans develop themselves, so they can become qualified and potentially human beings. Development in the field of education is an effort to realize human resources that master science and technology. Law No. 20 of 2003 concerning the national education system Article 1 Paragraph 1 states that: Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious-spiritual strength, self-control, personality, intelligence, noble character and the skills needed by him, the community, the nation, and the country.

Learning mathematics in schools requires a learning model that is more varied than before. One learning model that is quite varied and can involve the active role of students in teaching and learning activities is the Problem-Based-Learning model or often abbreviated as PBL or also often called the problem-based learning model. In PBL students are faced with a problem first then the teacher will explain and help solve the problems experienced by students.

The choice of a PBL approach is expected that students can be more active in constructing they are own problem-solving. The activeness of students allows the involvement of students and teachers to

optimally realize the learning experience and can improve students' understanding of concepts and creativity.

The identification of problems in this study is 1) Most students still experience difficulties in learning mathematics. 2) Lack of participation from students in the learning process of mathematics in the classroom. 3) Low understanding of students' mathematical concepts in solving problems. This is indicated by the average UTS (midtest) score which is still low and has not yet reached the KKM (minimum completion criteria0. 4) Low student creativity in solving a problem. Students only follow the instructions from the teacher, so in general, learning begins with a brief explanation, writing formulas, examples of questions, and exercises.

The problems in this study are 1) Are there differences in the ability of students to understand the concept of using PBL learning models and direct learning models? 2) Which is more effective between PBL learning models and direct learning models for students' conceptual comprehension abilities? 3) Are there differences in creativity between students who use PBL learning models and direct learning models? 4) Which is more effective between PBL learning models and direct learning models for student creativity?

The objectives of this study are: 1) To find out whether there is a difference in the ability of students to understand concepts between those who use PBL learning models and direct learning models. 2) To determine the effectiveness of PBL learning models and direct learning models on students' conceptual comprehension abilities. 3) To find out whether there is a difference in creativity between students who use PBL learning models and direct learning models. 4) To determine the effectiveness of PBL learning models and direct learning models on student creativity.

THEORY

Some opinions according to experts about the understanding of mathematics in Suherman, Erman et al (2003: 16-17) as follows: 1) According to James said that mathematics is the science of logic regarding the form, arrangement of magnitudes, and concepts that relate to one another a large number is divided into three parts, namely algebra, analysis, and geometry, 2) According to Johnson and Rising said that mathematics is a mindset, an organizing pattern, logical proof, mathematics is a language that uses carefully defined terms, clear, and accurate, representations with symbols and dense, more in the form of symbolic language about ideas than about sounds, 3) According to Reys et al. said that mathematics is the study of patterns and relationships, a way or pattern of thinking, an art, a language, and a tool, and 4) According to Kline said that mathematics is not alone knowledge that can be perfect because of him itself, but the existence of mathematics is primarily to help humans understand and master social, economic and natural problems.

According to Suherman, Erman et al (2003: 55-58), school mathematics is mathematics taught in schools, namely mathematics taught in elementary education (elementary and middle school) and secondary education (high school and vocational school). School mathematics consists of selected parts of mathematics to develop abilities and form a person and combine with the development of science and technology. School mathematics still has characteristics, namely having abstract event objects and consistent deductive mindset. The function of mathematics subjects as tools, mindset, and science. These three functions should be used as references in learning mathematics at school.

According to Ibrahim and Suparni (2008: 64), Learning can be defined as follows: an effort made by someone to obtain a change in behavior consciously from the results of their interaction with the environment. This definition contains two essential things, namely: First, that learning is an attempt to achieve a certain goal, namely to get a change in behavior. Second, changes in behavior that occur must be conscious. Thus, someone is said to learn if after learning activities he realizes that in him there has been a change. According to Suprijono, Agus (2009: 3), Learning is the process of gaining knowledge. Learning as a concept gets a lot of knowledge in practice.

According to Suherman, Erman et al (2003: 298-299), Learning mathematics is a discipline that studies the procedures of thinking and processing logic, both quantitatively and qualitatively. Learning

mathematics is laid the basis of how to develop ways of thinking and acting through rules called propositions (demonstrable) and axioms (without proof). Mathematics learning is expected to end with a comprehensive and holistic understanding of students (across topics even across studies if possible) about the material presented.

According to Winataputra in Hamzah, Ali (2014: 42), Learning refers to all activities that directly influence student learning. The word learning is a term used to indicate teacher and student activities or activities of lecturers and students. Before the term teaching and learning process is known, the word learning can be said to be taken from the word instruction which means a series of activities designed to allow learning to occur in students.

According to Rusman (2013: 144), the learning model is a plan or pattern that can be used to shape the curriculum (long-term learning plan), design learning materials, and guide learning in the classroom or others. While the characteristics of the learning model are: 1) Based on educational theory and learning theories from certain experts, 2) Having certain educational missions and objectives, 3) Can be used as a guide for improving teaching and learning activities in the classroom, 4) Having model parts named: (a) the sequence of learning steps (syntax), (b) the existence of reaction principles, (c) social systems, and (d) support systems, 5) Having an impact as a result of applied learning models, 6) Making teaching preparation (instructional design) with the chosen learning model guidelines.

According to Ngalimun (2012: 90), PBL is a learning model that is oriented to the theoretical framework of constructivism, in the PBL model learning focuses on the chosen problem so that learning not only learns the concepts related to the problem but also the scientific method to solve the problem. According to Rusman (2010: 242), Problem-Based Learning requires the mental activity of students in understanding a concept, principle, and skill through situations or problems presented at the beginning of learning. Students understand the concepts and principles of material starting from working and learning to situations or problems given through investigation, inquiry, and problem-solving. Students develop concepts or principles with their abilities that integrate the skills and knowledge that have been previously understood. According to Suprijono, Agus (2009: 74), the phases of problem-based learning are as follows: 1) Phase 1: Provide orientation about the problem to students. 2) Phase 2: Organizing students to research. 3) Phase 3: Assist independent and group investigations. 4) Phase 4: Develop and present artifacts and exhibits. 5) Phase 5: Analyze and evaluate the problem-solving process.

According to Sanjaya, Vienna (2006: 220-221), the Strengths of Problem Based Learning are as follows: 1) Problem-solving in this learning is a pretty good technique to better understand the content and concepts of the lesson. 2) Problem-solving can challenge students' abilities and give satisfaction to find new knowledge for students. 3) Problem-solving can increase student learning activities. 4) Problem-solving can help students transfer their knowledge to understand problems in real life. 5) Problem-solving can help students develop new knowledge and be responsible for the learning they do. Besides, solving the problem can also be encouraged to carry out self-evaluations of both the results and the learning process. 6) Through problem-solving can show students that each subject (mathematics, science, history, etc.), basically is a way of thinking and something that must be understood by students, not just learning from the teacher or books only 7) Problem solving is considered to be more fun and liked by student.8) Problem-solving can develop their understanding ability to adapt to new knowledge. 9) Problem-can provides opportunities for students to apply the knowledge they have in the real world. 10) Problem-solving can develop students' interest to continuously learn even though learning in formal education has ended.

Weaknesses of Problem Based Learning are as follows: 1) When students have no interest or do not have the belief that the problem being studied is difficult to solve, they will feel reluctant to try. 2) The success of learning through problem-solving requires enough time to prepare. 3) Without understanding why they are trying to solve the problem being studied, they will not learn what they want to learn.

According to Suprijono, Agus (2009: 46), direct learning or direct instruction is known as active teaching. In the teaching style where the teacher is actively involved in carrying out the contents

of the lesson to students and teaches it directly to the whole class. Direct learning is designed for mastering procedural knowledge, declarative knowledge (factual knowledge) and various skills. Direct learning is intended to complete two learning outcomes, namely the mastery of well-structured knowledge and mastery of skills. With Phases of Direct Learning Models, namely: 1) Phase 1: Establishing Sets (Delivering goals and preparing students), 2) Phase 2: Demonstrating (Demonstrating knowledge or skills), 3) Phase 3: Guided Practice (Guiding training), 4) Phase 4: Feedback (Checking understanding and member feedback), and 5) Phase 5: Extended Practice (Providing opportunities for further training and application).

According to Russeffendi (1991: 138), understanding the concept consists of two senses. First, it is a continuation of learning to plant concepts in a meeting. Second, learning to understand concepts is carried out at different meetings, but is still a continuation of the planting of concepts. Planting concepts is learning a new concept of mathematics when students have never studied the concept.

According to Munandar, Utami (1985: 47-50), creativity is 1) Creativity is the ability to make new combinations, based on data, information, or existing elements, 2) Creativity (creative thinking or divergent thinking) is the ability - based on data or information available - find many possible answers to a problem, where the emphasis is on quantity, usefulness, and diversity of answers and 3) Operationally creativity can formulate as "capabilities that reflect fluency, flexibility (flexibility), and originality in thinking, and the ability to elaborate (develop, enrich, detail) an idea.

The characteristics of creativity according to Guilford (Munandar, Utami, 1985: 88-93) are divided into two, namely aptitude (cognitive thinking) and non-aptitude (affective thinking). Cognitive thinking includes: 1) Smooth thinking skills, 2) Flexible thinking skills (flexible), 3) Original thinking skills, 4) Detailed skills (elaboration), and 5) Skills to assess (evaluation), while effective thinking includes: 1) Sense curious, 2) Imaginative, 3) Feel challenged by pluralism, 4) The nature of courage to take risks, and 5) Respectful nature.

METHODS

The type of research in this study is quasi-experimental design in the form of Posttest Only Control Design by taking place in SMP N 3 Jetis, Bantul in the even semester of the 2015/2016 school year. The population in this study were VIII grade students of SMP N 3 Jetis, Bantul which had almost the same average scores from 7 classes taken by 4 classes namely VIII D, VIII E, VIII F, and VIII G totaling 119 students. A sample class has taken class VIII G as many as 28 students using a purposive sampling technique. In this study, the data collection techniques used were test techniques. The test technique to obtain data on the ability to understand the concept and creativity of students using the Problem Based Learning model in the form of item description items. The test used is the analysis prerequisite test by testing the normality of the Chi-square formula and the homogeneity test of the Barttet - test formula. The research hypothesis test uses the t-test. The t-test was conducted to determine whether there were differences in the results of the conceptual comprehension ability (posttest) and students' creativity between the control class and the experimental class.

RESULTS AND DISCUSSION

1. Test Prerequisites

a. Normality test

The summary of the results of the posttest normality test concept comprehension ability can be seen in Table 1.

Table 1. Summary of Data Normality Test Results Concept Understanding Ability

Parameter	PBL	Direct Learning
	Posttest	
X^2_{cal}	1,6389	0,1784
X^2_{table}	5,99	5,99
α	5%	5%
df	2	2
Test criteria	Samples are normally distributed if $X^2_{cal} < X^2_{table}$	
Information	Normal	Normal

The summary of the results of the normality test of creativity can be seen in Table 2.

Table 2. Summary of the Normality Test Results of Student Creativity Data

Parameter	PBL	Direct Learning
	Posttest creativity	
X^2_{cal}	1,5660	1,39803
X^2_{table}	5,99	5,99
α	5%	5%
df	2	2
Test criteria	Samples are normally distributed if $X^2_{cal} < X^2_{table}$	
Information	Normal	Normal

b. Homogeneity Test

The summary of the posttest homogeneity test results in students' ability to understand concepts and creativity.

Table 3. Summary of Homogeneity Test Results

Parameter	Ability to understand concepts	Student creativity
X^2_{cal}	0,1382	3,2465
X^2_{table}	3,841	3,841
Test criteria	Homogeneous sample if $X^2_{cal} < X^2_{table}$	Homogeneous sample if $X^2_{cal} < X^2_{table}$
Information	Homogeneous	Homogeneous

2. Test the Hypothesis

The summary of the results of the first hypothesis test posttest the ability to understand the concept and creativity of students.

Table 4. Summary of First Hypothesis Test Results

Instrument	t_{cal}	t_{table}	Information
Understanding of concepts	3,780	2,0055	H_0 is rejected
Student Creativity	5,02629	2,0055	H_0 is rejected.

Based on the results of the analysis carried out on the first hypothesis test with a significant level of 5% and degrees of freedom = 55, the values obtained t_{cal}= 3,780 and t_{table} = 2,0055. Because $t_{cal} > t_{table}$, then H_0 rejected and H_1 accepted which means that there is a difference in the ability of students to understand concepts between those who use the Problem Based Learning (PBL) model and those who use the direct learning model for students in class VIII SMP N 3 Jetis in the 2015/2016 academic year. Earned value t_{cal}= 5,02629 and t_{table} = 2,0055. because $t_{cal} > t_{table}$, then

H_0 rejected and H_1 accepted which means that there is a difference in the creativity of students who use the Problem Based Learning (PBL) model with those who use the direct learning model in class VIII SMP N 3 Jetis in the 2015/2016 academic year. The summary results of the second hypothesis test posttest the ability to understand concepts and creativity.

Table 5. Summary of the Results of the Second Hypothesis Test

Instrument	T_{cal}	t_{table}	Information
Understanding of concepts	**3,780**	**1,6739**	H_0 is rejected
Student Creativity	**5,02629**	**1,6739**	H_0 is rejected.

Based on the results of the analysis carried out on the second hypothesis test with a significant level of 5% and degrees of freedom = 55, the values obtained t_{cal}= 3,780 and t_{table} = 1,673925. Because t_{cal}> t_{table} , then H_0 rejected and H_1 accepted which means that the Problem Based Learning (PBL) learning model is more effective than the direct learning model on the conceptual comprehension ability of students in class VIII SMP N 3 Jetis in the 2015/2016 academic year. Earned value t_{calt}=5,02629 and t_{table} = 1,673925.Because t_{cal}> t_{table} , then H_0 rejected and H_1 accepted which means that the Problem Based Learning (PBL) learning model is more effective than the direct learning model for the creativity students in class VIII SMP N 3 Jetis in the 2015/2016 academic year.

Based on the value of conceptual comprehension ability, the maximum value of the experimental class is higher than the value of the control class and the average value of the comprehension ability of the experimental class concept is higher than the control class. After analyzing the data on the value of the ability to understand the concept, it can be concluded that students who get learning using the problem-based learning model are more effective than the direct learning model. This can be seen in the results of the second hypothesis test at a significant level of 5% and the degree of freedom = 55, which is obtained by the value t_{stat}= 3,780 and t_{table} = 1,673925. So the results t_{stat}> t_{table} .

Based on the value of student creativity, the maximum value of the experimental class was higher than the value of the control class and the average value of the creativity of the experimental class was higher than the control class. After analyzing the data on the value of student creativity, it can be concluded that students who get learning using the problem-based learning model are more effective than the direct learning model. This can be seen in the results of the second hypothesis test at a significant level of 5% and the degree of freedom = 55, which is obtained by the value t_{cal}= 5,02625 dan t_{table} = 1,673925. So the results t_{cal}> t_{table}.

Students who get learning using the problem-based learning model have more ability to understand concepts and be more creative than students who use the direct learning model. This is because in the problem-based learning model students are trained to find their concepts from the material provided so that students better understand the concepts of the material. Preferred lessons on the subject matter of building cubes and blocks.

CONCLUSION

1. There are differences in students' ability to understand concepts in learning using the Problem Based Learning model and the direct learning model in class VIII SMP N 3 Jetis Bantul in the 2015/2016 academic year
2. Learning using the Problem Based Learning model is more effective than learning using direct learning models on the ability to understand concepts in class VIII SMP N 3 Jetis Bantul in the 2015/2016 academic year
3. There are differences in the creativity of students in learning using the Problem Based Learning model and direct learning models in class VIII SMP N 3 Jetis Bantul in the 2015/2016 academic year
4. Learning using the Problem Based Learning model is more effective than learning using direct learning models on student creativity in class VIII SMP N 3 Jetis Bantul in the 2015/2016 academic year

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