Influence of Problem Based Learning and Problem Solving Learning Combined with Braistorming on the Vocational High School Students' Learning Outcomes

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ABSTRACT

Based on the results of observations made in class X TKJ SMKN 2 Probolinggo, it shows the lack of courage of students in expressing opinions, students' skills in solving problems are less than optimal, and basic programming learning outcomes obtained by 69% of students below the KKM. The problem is the background of this research to determine the learning outcomes (Y) of basic programming because of the influence of the application of the problem-based learning model combined with brainstorming (X1) compared to problem solving learning combined with brainstorming (X2). The learning outcomes in question are knowledge learning outcomes (Y1) and skills learning outcomes (Y2). This study aims to: (1) reveal the significance of the difference in Y1 due to the effect of applying X1 compared to X2; (2) revealing the significance of the difference in Y2 due to the effect of applying X1 compared to X2. This study used a quasi-experimental research design with a pretest posttest design. The subjects of this study were class X TKJ 1 and class X TKJ 3 as. Class X TKJ 1 amounted to 34 students were given X1 treatment. Class X TKJ 3 totaling 32 were given X2 treatment. The results of hypothesis testing using t-test, show Y1 class X TKJ 1 compared to class X TKJ 3 obtained a significance number of 0.012, Y2 class X TKJ 1 compared to class X TKJ 3 obtained a significance number of 0.000. The conclusion from the research is that there is a significant difference between the results of learning basic programming because of the effect of applying the problem-based learning model combined with brainstorming compared to problem solving learning combined with brainstorming.

I. INTRODUCTION

Based on the results of observations made by researchers when carrying out a field practice study within a period of 6 weeks at SMK Negeri 2 Probolinggo and the results of interviews with several students of class X TKJ stated that most of these students were less interested in basic programming subjects. The reason was that basic programming lessons were considered difficult and required logic in solving a problem and the learning process was considered less interesting. This was also supported by the results of the daily test of basic programming for class X TKJ which showed on average that as many as 69% of students had not been able to reach the Minimum Graduation Criteria.

The results of observations of the learning process in class X TKJ SMK Negeri 2 Probolinggo, it had been found that teachers only provided modules for learning without providing a stimulus to stimulate students to be active in the learning process so that students felt bored with what they were doing. In addition, the learning process still took place in one direction, in the sense that the teacher only conveyed information without

any feedback from students, if this continued to happen, it was certain that students would be lazy and bored in following the learning process, the consequences would had an impact on their learning outcomes.

Efforts could be made to support the understanding of learning concepts from learning materials and required students to think critically in solving problems and made the learning process run more interesting. An effective and efficient learning model was needed to help increase motivation [1], creativity and critical thinking in solving a problem [2], so that students were able to understand what had been learned and can improve student learning outcomes themselves.

There were two known models, namely problem-based learning and problem solving. The problem-based learning model was a learning pattern centered on the problem-solving process, students will be faced with a problem by the teacher who was then instructed to identify and found solutions to these problems [3]. Problem based learning had several characteristics, namely: asking questions or problems, focusing on inter-disciplinary linkages, real investigation processes, producing products and exhibiting them, and collaborative [4].

The next model, problem solving learning, had learning steps that involved students to be able to solve problems that existed in the student environment by constructing students' initial knowledge of new knowledge found in groups [5]. The aim was to help develop problem solving skills in students, stimulated students to want to think, analyzed a problem so that they can determine the solution [6].

II. METHODS

This study used a quasi-experimental research method (quasi-experimental) with a pretest-posttest design. This research design used a non-equivalent control group pattern with two class groups, namely the Experimental Class (A) and the Experimental Class (B). The brief procedure of the research designed to be carried out is as follows in Table 1.

TABLE I.   RESEARCH DESIGN

Groups	Pretest	Treatment	Posttest
Experimental Class (A)	P_1	Y_1	P_2
Experimental Class (B)	P_1	Y_2	P_2

The initial process of the study was to conduct a pretest to determine the initial ability before treatment of the two experimental classes, besides that the pretest was used to determine whether the two subjects were homogeneous or not as research subjects. The two class groups used as research subjects were given the same treatment including learning objectives, learning materials and learning media, but in terms of the learning model used would be different between Experimental Class (A) and Experimental Class (B).

The problem-based learning model combined with brainstorming will be used in the Experimental Class (A) while the Experimental Class (B) will use the problem-solving learning model combined with brainstorming. After the treatment process, both groups were given a posttest to measure the final ability after treatment and to find out the differences in learning outcomes between the experimental classes.

Research Subjects and Objects

Determination of research subjects was used purposive sampling. The subjects used in this study were students of class X TKJ 1 and X TKJ 3 at SMK Negeri 2 Probolinggo. In detail, the research subjects that will be used have been described in Table 2.

TABLE II.   METHOD

No.	Classes	Learning Models	Students
1	Class of X TKJ 1	Problem-based learning combined with brainstorming	34
2	Class of X TKJ 3	Problem-solving learning combined with brainstorming	32

Research Instruments

The treatment instrument was an instrument that was needed to treat the research subject. This instrument was used to support the application of the learning model in the experimental class.

The measurement instrument was the instrument used to measure the research process. This study used measurement instruments in the form of test instruments, job sheets and process observation sheets.

The instrument was validated by experts (expert judgment) and subject teachers. This research used treatment instruments in the form of syllabus, lesson plan (RPP), and teaching materials.

Instrument Tests

The instrument tests were conducted to determine whether the instruments were feasible or not to be used in research. The instrument test carried out was the item validity test, the reliability test, the item difficulty test, and the difference power test.

The results of the item validation test showed that 43 items were declared valid and as many as 7 items were declared invalid. Items that were declared valid will be included in the test instruments while those that were invalid will be discarded.

The number of questions that were tested for reliability was 50 items and got a reliability value of 0.856. So that the test instrument had a very high category reliability level classification and it could be stated that the test instruments were suitable to be used to carry out the research process.

The results of the item difficulty test showed that as many as 13 items had difficult criteria, 29 items had moderate criteria, and as many as 8 items had easy criteria. The results of the

discriminatory test of items showed that as many as 8 items had a poor category, as many as 29 items had a sufficient category, as many as 9 items had a good category, as many as 2 items had a negative category.

Data Analysis Techniques

The data analysis technique used in this research was the similarity test of two averages, normality test, homogeneity test, and hypothesis testing. The data tested were pretest scores, posttest scores and practicum scores.

Hypothesis testing in research was used to determine whether the initial hypothesis of the study was accepted or not. Hypothesis testing was used to determine whether there are differences in learning outcomes of basic programming due to the effect of applying problem-based learning models combined with brainstorming compared to problem solving learning combined with brainstorming.

III. Results and Discussions

Normality test

The results of the normality test of the learning outcomes of basic programming knowledge showed a significance value of 0.128 and 0.113. The results of the normality test of the learning outcomes of basic programming skills showed a significance value of 0.173 and 0.129. Based on the normality test of the data on learning outcomes of basic programming knowledge and learning outcomes of basic programming skills, it was stated that the data was normally distributed because the significance value is greater than 0.05.

Homogeneity Test

The results of the homogeneity test of the learning outcomes of basic programming knowledge showed a significance value of 0.491. The results of the homogeneity test of the data on learning outcomes of basic programming skills showed a significance value of 0.647. Based on the homogeneity test of the data on learning outcomes of basic programming knowledge and learning outcomes of basic programming skills, it was stated that the data is homogeneous because the significance value is greater than 0.05.

Hypothesis Test

The results of hypothesis testing data on learning outcomes of basic programming knowledge showed a significance value of 0.012. The results of hypothesis testing data on learning outcomes of basic programming skills showed a significance value of 0.000. Based on the hypothesis test of the data on learning outcomes of basic programming knowledge and learning outcomes of basic programming skills, it was stated that Ha was accepted and Ho was rejected because the significance value is less than 0.05.

Furthermore, it could be concluded that there was a significant difference between learning outcomes for basic programming knowledge due to the effect of applying problem based learning models combined with brainstorming compared to problem solving learning combined with brainstorming and there were significant differences between learning outcomes for basic programming skills due to the effect of applying problem learning models based learning combined with brainstorming compared to problem solving learning combined with brainstorming.

Discussion

Problem based learning model was a learning that focuses on students as learners whom were faced with authentic or relevant problems and then solved using all the knowledge they had or from relevant sources. In addition to the problem based learning model, one of the learning models that also focused on solving a problem was problem solving learning. Problem solving learning model was a learning model that provided opportunities for students to solve problems given by the teacher independently so that they were able to obtain concepts and then be able to apply the concepts obtained to solve problems in other forms.

This study used a problem based learning model and a problem solving learning model combined with the brainstorming learning method. Brainstorming method was a method of gathering a large number of ideas from a group of people in a short time. This method was often used in creative problem solving and can be used alone or as part of other strategies [7]. The brainstorming method can also be interpreted as a way to get lots of ideas from a group of people in a short time.

The purpose of the application of the problem based learning model combined with brainstorming and the application of the problem solving learning model combined with brainstorming was to help improve the learning outcomes of basic programming knowledge in class X TKJ SMKN 2 Probolinggo. The problem based learning model combined with brainstorming was applied to class X TKJ 1 and the problem solving learning model combined with brainstorming was applied to class X TKJ 3.

Before applying the learning model to each class, a pretest was first conducted to measure the initial ability of each class. The results of the pretest in class X TKJ 1 can be categorized as low, while the results of the pretest in class X TKJ 3 can be categorized as low. After the pretest, the two classes were given different treatment, class X TKJ 1 received treatment in the form of applying a problem based learning model combined with brainstorming, while class X TKJ 3 received treatment in the form of applying a problem solving learning model combined with brainstorming.

The learning process using the problem based learning model combined with brainstorming in class X TKJ 1 ran quite interestingly from beginning to end and shows a significant improvement in the learning process including actively asking questions in the problem solving process and actively expressing opinions when having ideas in solving problems. At first, students were just silent and confused and not used to this new combination of models and methods, but students were enthusiastic and active in participating in the learning process. Students are quite enthusiastic in participating in the learning process because there was continuity between the learning material and the problem to be solved, meaning that when students learned about the learning material, it was immediately followed by the problems that exist in each subject. The

learning process was in line with the problem based learning model used problems as the first step in collecting and developing new knowledge obtained from the learning process [8].

Brainstorming was a very efficient technique in finding ideas [9]. The gathering of a large number of ideas from a group of people in a short period of time, this method was often used in creative problem solving and can be used alone or as part of another strategy. The condition of class X TKJ 1 when given treatment in the form of applying a problem based learning model combined with brainstorming tended to be more active and interactive. Many students who were initially silent in the learning process had started to be active and brave in expressing their opinions in their groups. Many students asked about alternative problem solving and competed in expressing opinions and exchanging ideas in their respective groups. Mastery of the material was able to be mastered by most students evenly, so that when in learning in groups many students did not depend on the other group.

Through problem solving learning, students would be able to solve problems according to the reality [10] that existed in their environment by constructing students' initial knowledge with new knowledge found in groups. The learning process was done by using a problem solving learning model combined with brainstorm.

IV. CONCLUSION

The purpose of this study was to describe and reveal the significance of differences in basic programming learning outcomes due to the effect of applying problem-based learning models combined with brainstorming compared to problem solving learning combined with brainstorming in class X TKJ SMK Negeri 2 Probolinggo. There is a significant difference between learning outcomes for basic programming knowledge because of the effect of applying problem-based learning models combined with brainstorming compared to problem solving learning combined with brainstorming. The average learning outcomes of basic programming knowledge for class X TKJ 1 have a high category, while the average learning outcomes for basic programming knowledge for class X TKJ 3 have a medium category. The difference in learning outcomes of basic programming knowledge due to the influence of the application of problem-based learning models combined with brainstorming compared to problem solving learning combined with brainstorming shows a significance value of 0.012.

There is a significant difference between learning outcomes for basic programming skills because of the effect of applying problem-based learning models combined with brainstorming compared to problem solving learning combined with brainstorming. The average learning outcomes of basic programming skills for class X TKJ 1 have a high category, while the average learning outcomes for basic programming skills for class X TKJ 3 have a medium category. The difference in learning outcomes of basic programming skills due to the influence of the application of problem-based learning models combined with brainstorming compared to problem solving

learning combined with brainstorming shows a significance value of 0.000.

Future researchers are expected to be able to use this research as a reference material to apply learning models that are combined with other learning methods. Determination of competency achievement indicators is further expanded and should be based on things that students often encounter in everyday life. The goal is to increase the variety of learning models so that it becomes an effort to improve the quality of the learning process and create a comfortable and conducive classroom atmosphere in order to obtain maximum learning outcomes and the learning outcomes obtained by students can be applied to everyday life.

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