THE EFFECT OF PROBLEM BASED LEARNING MODEL IN 2013 CURRICULUM ON LEARNING OUTCOMES AND SKILLS IN VOCATIONAL EDUCATION

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Abstract: This study aims to determine the effect of the problem based learning model on learning outcomes and skills in Motorcycle Engineering courses for D3 Automotive Engineering students, Faculty of Engineering, Padang State University. The research method used is an experiment with a modified pretest-posttest group research design. The sampling technique used is cluster random sampling, with Group 1 as the experimental class and Group 2 as the control class. The analytical technique used is the average difference test, analysis of the influence between variables, and determination of the coefficient of determination. The results of the study obtained that the average learning outcomes and motorcycle engineering skills in the experimental class was 89.56 while the control class was 81.54. The analysis of the influence between variables resulted in a biserial coefficient of 0.59 for learning outcomes and 0.44 for Motorcycle Engineering skills. The calculation of the coefficient of determination shows that the application of the problem based learning model contributes 35.00% to learning outcomes and 19.34% to Motorcycle Engineering skills. The relationship between Motorcycle Engineering skills and learning outcomes in problem based learning model learning is 31.69%. Based on the results of the study, it can be concluded that the application of the problem based learning model affects the learning outcomes and skills of Motorcycle Engineering students of D3 Automotive Engineering, Faculty of Engineering, Padang State University on CVT Maintenance material.

Keywords: learning outcomes, Motorcycle Engineering skills, problem based learning

A. Introduction

The curriculum functions as a guide in the implementation of educational activities in schools for related parties, either directly or indirectly, such as teachers, principals, supervisors, parents, the community and the students themselves, in implementing the 2013 curriculum it is very different from the 2013 curriculum. previously, there are still many obstacles that we know greatly affect learning outcomes, both in terms of the media used, the assessment in the 2013 curriculum is more complicated than the previous curriculum then the method used to deliver the learning material to be taught is not effective or even in accordance with the material which is to be conveyed. (Kurniaman et al., 2013) The curriculum in Indonesia has changed from the Education Unit Level Curriculum (KTSP) to the 2013 Curriculum and changed its name to the National Curriculum in 2017. (Mulyasa, 2014) and (Hadi, 2015) states, that no matter how good a curriculum is (of initial), but the results really depend on what is done by the teacher and also the students in the class (actual). This indicates that the main factor in achieving success in the learning process is strongly influenced by the lecturer, not least in the teaching and learning process.

Learning can be done by giving real, direct, and relevant problems to the student's needs, so that students can obtain relevant information for each particular problem in a lesson that can provide opportunities for students to carry out simple exploration so that they do not just accept and memorize (Janah et al., 2018). The results of observations and interviews with researchers with Motorcycle Engineering Lecturers, Faculty of Engineering, State University of Padang, stated that the final test scores for D3 Automotive Engineering students in the 2020/2021 academic year showed that there were still some students who scored below the KKM, which was 60. because from the beginning, students viewed the CVT treatment material

as difficult to understand and the scope of the material was too much in a short time. These difficulties can have an unfavorable impact on students' understanding of various motorcycle concepts. Mastery of the process in learning CVT Maintenance requires a scientific attitude which is covered in a link called Motorcycle Engineering skills. Motorcycle Engineering Skills are skills that can activate, develop curiosity, responsibility, independent learning, assist students in conducting research, and other process abilities. Students must be able to develop their knowledge so that it gives rise to a deep understanding of concepts. The application of science process skills in learning will obtain optimal learning outcomes (Damayanti et al., 2016).

In connection with the above, one way that can make students active in the learning process is to apply a variety of learning models (Riswati, R., Alpusari, M., & Marhadi, 2018). One of the learning models related to student activity and critical thinking is the Problem Based Learning (PBL) Learning Model, according to Duch, Allen and White (2005) in (Hamruni, 2012) The problem based learning model provides conditions for improving critical thinking and analytical skills as well as solving complex problems in real life so that it will lead to a culture of thinking in students, the problem based learning learning process requires students to play an active role in learning activities that are not only teacher centered with so it can improve student learning outcomes on the subject matter presented. This is in line with (Abidin, 2014) Problem based learning is a learning model that provides authentic experiences that encourage students to learn actively, construct knowledge and integrate learning contexts in school and learn in real life naturally.

The problem-based learning model has several advantages, including (1) the problem-based learning model can increase student activity in the learning process, and (2) the problem-based learning model can provide opportunities for students to apply their knowledge in the real world (Damayanti et al., 2016)

B. Research Methodology

The research was carried out in Automotive Engineering, Faculty of Engineering, Padang State University, even semester of the 2021/2022 academic year. The type of research carried out is experimental research. The research design used was a modified pretest-posttest control group design by comparing the learning outcomes and motorcycle engineering skills of students from the two groups after being given different treatments. The sample used is 2 groups using cluster random sampling technique, because the population is normally distributed and homogeneous (Sugiyono, 2007). The independent variable in this study is the learning model. The treatment variations are problem based learning model for the experimental class and lecture learning for the control class. The dependent variable is student learning outcomes and motorcycle engineering skills.

Data collection methods used are test, observation, documentation, and questionnaire methods. Data collection instruments include posttest learning outcomes consisting of 30 items and Motorcycle Engineering skills posttest questions consisting of 10 items, learning outcomes observation sheets for aspects of attitudes and skills, Motorcycle Engineering skills observation sheets, and student responses questionnaires to learning. The data analysis technique used is the one-sided mean test, analysis of the influence between variables, and determination of the coefficient of determination. The results of the observation of cognitive aspects, attitudes, skills, and motorcycle engineering skills were analyzed descriptively.

C. Discussion and Analysis

The results of the study were in the form of learning outcomes data on cognitive aspects, attitudes, skills, Motorcycle Engineering skills, and student response questionnaires to learning. Measurement of the realm of knowledge using multiple choice tests. Measurement of the domain of attitudes and skills using observation sheets. The measurement of Motorcycle Engineering skills uses a description test and observation sheet. The research data were obtained from two sample classes which were part of the Automotive Engineering Students. Group 1 Automotive Engineering as an experimental class consisting of 15 students. Group 2

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Automotive Engineering as a control class consisting of 14 students. The control class uses learning as usual, namely lectures, practicum and discussion, while the experimental class uses the Probem Based Learning model which consists of 5 syntaxes, namely: presenting problems, organizing students to research, assisting student investigations, exhibiting work, and evaluating problem solving. The implementation of problem based learning is applied in study groups. Each study group will be given a problem contained in a problem-based learning worksheet. The worksheet aims to help expedite the course of learning activities consisting of learning objectives, problems, discussion sheets, practicum sheets, independent assignments, analysis and evaluation, and practice questions. Giving problems in the worksheet will stimulate students to develop students' motorcycle engineering skills. PBL-based worksheets must be done together so that learning activities become more structured and can increase student collaboration and responsibility in determining learning concepts.

Students' cognitive learning outcomes were measured using a test, namely the posttest. The results of the posttest can be seen in the results of the average posttest value which shows that the experimental class is superior, namely 89.56 and the control class is 81.54. The analysis used includes the normality test, the two-variance similarity test, the two-average difference test, the biserial correlation coefficient test, and the determination of the coefficient of determination. The biserial correlation coefficient (rb) obtained is then used to calculate the magnitude of the coefficient of determination (KD). The calculation produces a KD of 35%. The problem based learning model only affects the results of Motorcycle Engineering, the subject matter of CVT maintenance by 35%, while 65% of learning outcomes are influenced by other factors not examined in this study. These factors include the level of difficulty of the material, learning media, and facilities and infrastructure (Shah et al., 2015).

The results showed that the application of the problem based learning model on CVT treatment material had an effect on learning outcomes. Study (Usha Adiga and Sachidananda Adiga, 2015) Problem based learning is also more stimulating and challenging students in learning, encouraging students to be independent in setting their learning goals. Student skills learning outcomes are obtained through observations using observation sheets. Based on the analysis of the results of the psychomotor aspect assessment, the results obtained that the proportion of experimental class students who achieved very good and good categories was 0.49 higher than the proportion of control class students, which was 0.40. The average score of each skill aspect of the experimental class and control class can be seen in Table 1.

Table 1. The average value of each aspect of learning outcomes in the realm of skills

Rated aspect	Average of each aspect		Category	
	Experiment	Control	Experiment	Control
Work safety equipment	3,7	3,3	Very high	Tall
Preparation of tools and materials	3,4	3,1	Tall	Tall
Skills in using practical tools and materials	3,4	2,9	Very high	Very high
Mastery of practical procedures	3,5	2,4	Very high	Tall
Group cooperation	3,5	3,4	Very high	Very high
Punctuality in completing the practicum	3,5	3,3	Very high	Tall
Cleanliness of the place and practical tools	3,5	3,4	Very high	Tall
Make a practicum report	3,5	3,2	Very high	Tall

There are three striking differences in Table 1, namely the first aspect (completeness of work safety), the fourth aspect (mastery of practicum procedures), and the eighth aspect (making a practicum report). Aspects of mastery of practicum procedures, the experimental class got a score of 3.6 (high) and the control class got a score of 2.5 (medium). This

difference is due to the experimental class students being given a learning model that requires students to design their own experimental procedures so that each student can prepare tools and materials independently. Meanwhile, control class students were not given an assignment to design their own experimental procedures, so that in preparing experimental tools and materials they still depended on instructions from the lecturer. The activity of designing experiments also makes each student already know how to use tools and materials through library research. This is what causes the skill aspect of using tools in the experimental class to be higher, namely 3.3 (high) compared to the control class, which is 2.8 (high). The experimental class group cooperation achievement was higher than the control class. This difference was caused because the experimental class not only designed the experiment but also did the division of tasks well. Each student gets a share to do the practicum so that each group is required to work well together in order to complete the practicum. Student affective learning outcomes are obtained through observations using observation sheets. Based on the analysis of the results of the assessment of affective aspects, the results obtained that the proportion of experimental class students who achieved very good and good categories was 0.71 which was higher than the proportion of control class students, which was 0.29. The results of the analysis of learning outcomes in the domain of attitudes for each aspect of the experimental and control classes in Motorcycle Engineering learning can be seen in Table 2.

Table 2. The average value of each aspect of learning outcomes in the realm of attitude

Rated aspect	Average of each aspect		Category	
	Experiment	Control	Experiment	Control
Presence	3,9	3,7	Very high	Very high
Discipline	3,5	3,4	Very high	Very high
Self-confident	3,5	3,3	Very high	Tall
Critical	3,4	2,3	Very high	Tall
Responsibility	3,6	3,7	Very high	Very high
Curiosity	3,8	3,5	Very high	Very high
Honesty	3,4	3,3	Very high	Tall
Tolerance	3,5	3,4	Very high	Very high
Mutual cooperation	3,2	3,2	Tall	Tall
Politeness	3,7	3,4	Very high	Tall

The striking difference between the experimental and control classes is seen in the fourth and sixth aspects, namely criticality and curiosity. The application of the problem based learning model in the experimental class accustoms students to think critically in making hypotheses to solve problems, design experiments, find concepts, and relate concepts to everyday life. In every learning process, students are always required to actively think, this is different from the control class where students are passive, so that the achievement of critical aspects of the experimental class is much better than the control class. The curiosity aspect of the experimental class is better than the control class because the problem based learning model has advantages in presenting the problems contained in the worksheet. Students curiously solve problems by looking for references to answer the questions provided in the worksheets so that the hypotheses developed can be proven.

The contribution of the problem based learning model to Motorcycle Engineering skills is obtained from the results of observations and posttest scores. There are 8 aspects of Motorcycle Engineering skills assessed through the posttest, namely the skills (1) observing, (2) grouping, (3) interpreting, (4) predicting, (5) asking questions, (6) hypothesizing, (7) planning experiments, and (8) apply the concept.

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D. Closing

The application of the problem based learning model contributed 35.00% to learning outcomes and 19.34% to Motorcycle Engineering skills. The achievement of learning outcomes in the attitude and skill aspects of the experimental class is better than the control class. The relationship between Motorcycle Engineering skills and learning outcomes in learning using a problem based learning model was 31.69%. Based on the results of the study, it can be concluded that the problem based learning model has an effect on student learning outcomes and motorcycle engineering skills.

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