Attempts to Enhance Vehicle Engine Maintenance Learning Outcomes
Lightweight Learning Model that Incorporates Problem-based Learning (PBL)

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ABSTRACT

The purpose of the study is to determine the extent to which the application of the Problem Based Learning (PBL) learning model to class XI students enrolled in the Light Vehicle Engineering Expertise (TKR) program at SMK Muhammadiyah 7 Gondanglegi during the 2019–2020 academic year has improved student learning outcomes in the area of light vehicle engine maintenance. In this kind of research, which is known as classroom action research, a qualitative approach was taken. Two rounds of planning activities, action implementation, observation, and reflection made up the research. The findings demonstrated that the use of problem-based learning increased student learning outcomes in the area of light vehicle engine maintenance (PBL) learning model in class XI students of the Light Vehicle Engineering Expertise (TKR) program at SMK Muhammadiyah 7 Gondanglegi in the 2019/2020 academic year of cycle I the average of 67.89 improved in cycle II to 82.50%. According to the study's findings, PBL can enhance student learning outcomes, particularly for the maintenance of light vehicle engines at SMK Muhammadiyah 7 Gondanglegi.

Keywords: Problem-based learning, Maintenance of light vehicle engines, Learning outcomes.

1. INTRODUCTION

Education is one of the initiatives to boost human intelligence and abilities, and HR is heavily reliant on the level of education received. The 1945 Constitution (Article 31 of the 1945 Constitution), which stipulates that education is a right of every person and aspires to educate the life of the nation, reflects the value of education. It is highly anticipated that there will be institutions that produce Human Resources (HR) who are competent in their fields because raising the quality of human resources through education will result in human resources who can compete in a healthy way in the competitive world and industry competencies. One of them is the Vocational High School (SMK) Creating graduates who are prepared for the workforce and who

have a professional mindset is the goal of formal educational institutions [1]. Programs used to execute education in schools are focused on the long-term objective of learning, which is to enhance students' skills so that they can develop independently and be able to address problems when they leave school.

A formal educational institution with a study program in light vehicle engineering is SMK Muhammadiyah 7 Gondanglegi. Graduates are expected to be competitive in the corporate and industrial sector. Light vehicle engine maintenance is one of the useful disciplines that helps students get a proficient and creative graduation level. SMK graduates must be skilled in and comprehend light vehicle engine maintenance given its significance in the modern industrial environment To ensure that the students'

ultimate outcomes are satisfactory, the teacher's role in choosing the best learning strategy and method is crucial. In order to fulfil the requirements for competence of expertise in meeting the standards of the workplace and to proceed to a higher level of study [2]. The learning outcomes for light vehicle engine repair subjects at SMK Muhammadiyah 7 Gondanglegi were judged to be subpar based on observations and interviews with teachers who teach such subjects. This was because the students' scores did not meet the minimum completeness criterion (KKM). equal to 78, and the learning outcomes acquired by students at SMK Muhammdiyah 7 Gondanglegi in their final year are still quite poor. This is evident from the mid-semester maintenance of light vehicle engines class IX TKR 3 SMK Muhammadiyah 7 Gondanglegi average test results, where as many as 11 students received scores below the KKM, nine students received scores between 7.80 and 7.90, and six students received scores between 8.00 and 8.90. As a result, it is evident that student learning outcomes are still inadequate. This is due to the low levels of student engagement and motivation for active learning that come from employing traditional teacher-centered learning paradigms.

The implementation of a problem-based learning approach that is suited to the subject matter and student skills is one way to involve students as a whole in the learning process, which will later have an impact on enhancing student learning outcomes. For learning activities to be effective and efficient in accordance with the desired aims, teachers must be knowledgeable of good and acceptable teaching approaches and strategies [3]. In order to achieve the ultimate goal of learning, teachers must utilise learning models that are suited to the circumstances and learning settings.

Creating a learning environment that is immediately applicable to daily life is one strategy for overcoming these challenges. The problem-based learning model, often known as PBL, is one of the learning models that may be applied. It is student-centered and is one of the learning models that can be employed. A problem-based learning approach involves using issues as a starting point for obtaining and incorporating new information into reports. The utilisation of problems is a defining feature of the problem-based learning methodology. By directly addressing the difficulties that students experience and learning key problem-oriented concepts, this technique can be utilised to develop and hone critical thinking abilities.

1.1. Learning outcomes

The skills that students possess after completing their learning experience are known as learning outcomes. Three categories of learning outcomes are distinguished: (a) skills and habits; (b) information and comprehension; and (c) attitudes and ideals. [4]

1.1.1. Problem Based Learning (PBL) Learning Model

Authentic and meaningful problem situations are presented to students as part of the Problem Basis Learning learning approach, which can act as a launchpad for further research and investigation [5]. By teaching students to use concepts and interaction processes to assess what they already know, identify what they still need to learn, gather information, and collaboratively evaluate their hypotheses based on gathered data, the Problem Base Learning learning model aims to increase student engagement and learning achievement [6].

1.1.2. Steps of the Problem Based Learning Process

The six steps of a problem-based learning strategy were later referred to as "problem base learning," and they are as follows: (1) formulating the problem, or the steps students take to identify the problem to be solved; (2) analysing the problem, or the steps students take to analyse problems critically from various points of view; (3) formulating hypotheses, or the steps students take to formulate problem solving based on their knowledge. (4) gathering information, namely the actions used by students to locate information in an effort to answer problems, (5) formulating conclusions in accordance with the measures pupils take to accept or reject the presented hypothesis. (6) Making suggestions for fixing problems, specifically the steps students take to explain how they formulate their findings from hypothesis testing and how they formulate their [7].

2. METHOD

For the 2019–2020 academic year, this research involved 38 students in class (XI) of the Light Vehicle Engineering Department at Muhammadiyah 7 Gondanglegi Vocational School. This study was carried out throughout the academic year 2019–2020. The study was conducted in two cycles, with two sessions per cycle. The study was a form of classroom action research that combined qualitative and quantitative techniques. One learning principle is covered in each of the cycles used to perform classroom action research, with each cycle consisting of preparing (plan), carrying out activities (act), observing (observe), and reflecting (reflect) (reflect).

For class XI students at SMK Muhammadiyah 7 Gondanglegi, the research data takes the form of observations and documentation of each learning improvement action for light vehicle engine maintenance utilising the problem-based learning model.

The teaching and learning activities for the Electrical Engineering training subject utilising a problem-based learning approach, comprising lesson design, learning implementation that comprises of early activities, core activities, and final activities, are the source of the research data. Activities for evaluating learning, student and instructor conduct during lessons and learning activities. The research subjects, who were instructors and students in class XI at SMK Muhammadiyah 7 Gondanglegi, provided the data. The methods for gathering data are tests, interviews, and observational methods.

2.1. Data Analysis Technique

2.1.1. Learning Outcome Test

Equations are used to evaluate assessments for learning outcomes. (1)

$$Student\ score = \frac{number\ of\ correct\ answers}{number\ of\ questions} \times 100\% \qquad (1)$$

Scoring standard: Score 0-77 = Ineligible (Incomplete) Between 78 and 100, Competent (Complete).

A class is said to have finished learning if 80% of the students have obtained a score of 78 in understanding the information that has been presented. Student indicators are declared to be complete if they receive a score of 78. At SMK Muhammadiyah 7 Gondanglegi, the value of 78 represents the Minimum Completeness Criteria (KKM) value. The equation is used to determine the percentage of student absorption (PDS). (2).

$$PDS = \frac{Sstudent\ acquisition\ score}{max\ score} \times 100\% \qquad (2)$$

With the following criteria: 0% PDS 78%: Students have not completed their studies 78% PDS 100%: Students have completed their coursework.

2.1.2. Classical Mastery

Equations are used to calculate the percentage of pupils who succeeded while learning classically or in groups.(3)

Where: D =
$$\frac{x}{N}x100\% \qquad (3)$$

D : Mastery of classical learning

X : The number of students who scored $\geqslant$ 78

N : Total number of students

3. RESULTS AND DISCUSSION

The teacher created a learning design in the form of a Learning Implementation Plan, according to the findings of research on the implementation of the Problem Based Learning Model in learning Light Vehicle Machine Maintenance in Class XI Students of Muhammadiyah 7 Gondanglegi Vocational School for the 2019/2020 Academic Year (RPP). The syllabus is elaborated into learning activity units for use in class by the Learning Implementation Plan (RPP). The learning implementation plan is a meeting-based operational learning plan that includes a number of associated metrics..

The study's teacher created a lesson plan that included the following elements: competency standards, basic competence, indicators, learning objectives, subject matter, learning activities, media and sources, and evaluation. In order to meet competency standards and fundamental skills for the 2018–2019 academic year, SMK Muhammadiyah 7 Gondanglegi has adopted the 2013 curriculum (KTSP) for Class XI. Researchers and teachers first examine the fundamental competencies that will be taught before creating the lesson plans.

The learning is implemented in accordance with the plans made, which were presented in the first cycle of learning during the course of two meetings. The duration of the first meeting was 2 x 35 minutes, while the duration of the second meeting was 2 x 35 minutes. The Problem Based Learning Model learning strategy was used to carry out the learning in cycle I. These steps are: identifying problems, defining/formulating problems, gathering information, compiling hypotheses/temporary assumptions, investigations, refining problems, concluding problem solving alternatives, and choosing alternative problem solving.

The following was discovered throughout the learning process, according to the researcher's conversation with the Class XI teacher at SMK Muhammadiyah 7 Gondanglegi for the 2019–2020 Academic Year:

a. The Problem Based Learning Model's learning strategy steps follow the plan, but the time utilisation is not adequate.

b. Many students are still not actively engaged in their education, especially when group discussions are being led by only a few pupils.

c. c. Students' lack of sense of ownership in dialogues. Only two or three persons work in groups while the other students chatter.

d. The implementation of learning cannot be carried out in accordance with the scheduled time since there are still a lot of students who do not comprehend the learning phases of the problem-based learning model.

e. The review of the first cycle's findings revealed that not all pupils fully grasped the subject matter..

According to the observations made on the observation sheet and the conversations researchers had with observers, a large portion of the students in cycle I are still not engaged in their education, which is the root of the low student learning outcomes. Following consideration of research findings pertaining to learning evaluation, process evaluation and outcome evaluation are conducted. The teacher evaluates the process at each cycle's end when the students debate, carry out research, and present their findings. The teacher must foster a learning environment during instruction by encouraging collaboration and discussion in both small and large groups.

Direct collaborative learning can help students enhance their cognitive skills by bringing them closer to the idea of the ideal learning environment. Students can practise sharing experiences, developing the confidence to voice their thoughts, and practising being open to hearing what their friends have to say through this activity. The value data that the researcher entered in the assessment was the total number of students, i.e. 38, as there are 38 Class XI pupils at SMK Muhammadiyah 7 Gondanglegi. According to the research analysis of the first cycle, only 26.32% of the student population achieved the learning completion standards demanded by the school, which are 78%, and the average class value was 68.55.

It is intended to improve the subsequent lesson or the learning process in cycle II based on the observations gleaned from the first cycle. The following changes were implemented in cycle II: (a) Learning objectives were delivered with more clarity so that students could comprehend the information being taught. 2) Increase the amount of media (LKS) and give it to every group member so that everyone can read and comprehend the LKS's contents. 3) To ensure that every student is actively engaged in their education, each group member undertakes an experiment for research. 4) Making an effort to use the available time for learning in accordance with the lesson plan. 5) Increase students' motivation so they will take part in group discussions.

Cycle II's Learning Implementation Plan (RPP) is very similar to cycle I's. Cycle II action planning has good success. Cycle II research was conducted using problem-based learning methods, which included the following steps: identifying problems, defining/formulating problems, gathering facts, compiling hypotheses/temporary assumptions, conducting investigations, modifying problems, determining alternative solutions to problems, and selecting alternative solutions to problems. Nonetheless, the investigation's tools are maximised during the material development stage.

According to the researcher's conversation with the Class XI teacher at SMK Muhammadiyah 7 Gondanglegi for the 2019–2020 Academic Year, the following issues were discovered during the implementation of learning:

a. The material is presented according to the planned steps of problem-based learning methodologies.

b. b. The utilisation of time has been done as efficiently as feasible in order to follow the plans that have been created.

c. c. The teacher has done a fantastic job of inspiring cooperation in class discussions and fostering a love of learning by rewarding each student's correct response.

d. The majority of students appeared to be fully engaged in their education, particularly during group discussions.

e. Pupils already feel accountable in group discussions. Nearly all group members take part in discussions related to finishing LKS.

f. Students are already familiar with the methods of problem-based learning, enabling implementation of the lessons to proceed as scheduled.

Cycle II's Problem Based Learning Model learning technique for identifying Maintenance of Light Vehicle Machines is already working well, as seen by the value received by students, which has improved by an average of 83.82. While the percentage of students who were fully enrolled in school was 84.21%. From the teacher's perspective, problem-based learning was successfully implemented 93.75% of the time. The activities of teachers and students have evolved as shown in the following.

Table 1. Increasing Teacher and Student Activities

No	Activity	Cycle I	Cycle II	Enhancement
1	Teacher	73.44%	93.75%	20.31%
2	Students	70.31%	90.63%	20.32

It is clear from table 5 above that there has been an increase in both teacher and student-led learning activities. Students become more passionate and eager to participate in the problem-based learning model learning process as a result. A solid way to enhance student learning outcomes is to increase teacher and student learning activities. This is demonstrated in Table 6.

Table 2. Improved Learning Outcomes from Cycle I to Cycle II

Description	Cycle I	Cycle II
Students taking the test	38	38
Students who complete learning	10	32
Students who do not complete learning	28	6

Completeness percentage	26.31%	84.21%
Average cycle value I	68.55	83.82

From the preceding table, it can be inferred that student learning results increased from cycle I to cycle II. This is evident from the average student learning outcomes in cycle I, which were 68.55, and cycle II, which were 83.82. Also, this has an effect on raising the value of student completion from cycle I, where up to 10 people were completed, to cycle II, where 32 people were completed.

The motivation, maturity, student-teacher relationship, verbal ability, level of freedom, sense of security, and the teacher's communication skills are some of the variables that affect learning. So, in addition to improving the lesson ideas, the teacher also needs to improve how learning is put into practise. Instructors must have the ability to inspire kids to learn.

According to the analysis of the second cycle of research, pupils' and teachers' skills have performed admirably. This is demonstrated by improved student learning outcomes compared to the first cycle, which shows that conducting experiments at the investigation stage of the learning process can increase student motivation and activity to learn. Students will easily understand the learning material, be able to absorb it well, and find it easy to remember for a long time. This study demonstrates how problem-based learning (PBL) learning models can enhance student learning outcomes and help students build their skills..

According to the study's findings, using the Problem Based Learning (PBL) instructional approach can increase students' interest in and motivation for learning. This indicates that teachers can use the Problem Based Learning (PBL) learning model as a viable method to be employed in the learning process in order to attain the intended goals and to create a comfortable learning environment for students.

According to the research study of cycle II, the value of using the problem-based learning model in planning, implementing, and evaluating processes and outcomes has reached 82.50% (very good success). Based on the cycle II results, it can be concluded that cycle II implementation was successful and that the researchers were successful in putting the problem-based learning (PBL) instructional model into practise for class XI at SMK Muhammadiyah 7 Gondanglegi for the 2019–2020 academic year. Consequently, it can be concluded that the PBL method used at SMK Muhammadiyah 7 Gondanglegi can enhance student learning results, particularly for maintenance of light vehicle engines.

4. CONCLUSION

4.1. Conclusion

The researchers can draw the following conclusions from their findings and analysis: The adoption of the Problem Based Learning (PBL) learning model in class XI students of the Light Vehicle Engineering Expertise Program (TKR) SMK Muhammadiyah 7 Gondanglegi 2019/2020 academic year has improved student learning results in the area of maintenance of light vehicle engines. The following percentage score of student learning activity indicators illustrates this: (1) Improving student learning results in the light vehicle engine maintenance course among class XI students enrolled in the Light Vehicle Engineering Expertise (TKR) programme by implementing the Problem Based Learning (PBL) The average at SMK Muhammadiyah 7 Gondanglegi for the 2019–2020 academic year was 68.55 in cycle I and 83.82% in cycle II. (2) Using the Problem Based Learning (PBL) learning model, class XI students in the Light Vehicle Engineering Expertise (TKR) programme at SMK Muhammadiyah 7 Gondanglegi increased their participation in the course on maintaining light vehicle engines from an average of 70.31 percent in cycle I to 90.63% in cycle II (3) The class XI students in the Light Vehicle Engineering Expertise (TKR) programme at SMK Muhammadiyah 7 Gondanglegi for the 2019–2020 academic year saw an average increase in teacher activity in the topic of maintenance of light vehicle engines through the use of the Problem Based Learning (PBL) learning model of 73.44 increased to 93.75% in cycle II.

4.2. Suggestion

Several recommendations are made for consideration based on the findings of this study. (1) The Principal should be able to encourage and motivate teachers to adopt the Problem Based Learning (PBL) learning model in classroom instruction and oversee the implementation process. (2). For the 2018–19 academic year, instructors can adopt the Problem Based Learning (PBL) learning model as an alternative in the Class XI curriculum at SMK Muhammadiyah 7 Gondanglegi and as a strategy to enhance student learning results.

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