Advances in Social Science, Education and Humanities Research, volume 520
Proceedings of the 6th UPI International Conference on TVET 2020 (TVET 2020)

The Effect of Online Problem Based Learning Model with Google Classroom on Motorcycle Electrical System Maintenance Knowledge of Vocational High School Students

Imam Mahir*, Syamsuir, Brenden Federik Immanuel
Mechanical Engineering Vocational Education
Universitas Negeri Jakarta
Jakarta, Indonesia
*Imam-Mahir@unj.ac.id

***Abstract*—The purpose of this study was to investigate the effect of online problem-based learning (PBL) model with google classroom on Motorcycle Electrical System Maintenance (MESM) Knowledge of Vocational High School (VHS) students. This research used the Participatory Action Research approach of Kemmis and Mc. Taggart on Google classroom tool involved the use of the descriptive, interpretive mode of observation and data collection. The research design used One Groups Pretest-Posttest to analyse quantitative data of students' MESM knowledge. We observed students' activities on five aspects of attitude, including problem-solving skills and converted to quantitative scores 1 – 4 of the criteria scales. We decided on the criteria of attitude observed score of 35 students involved at low, enough, good, and very good categories. The result showed that there were dynamic students' activities in positive on online PBL with google classroom at Cycle I enough category, Cycle II enough category, and Cycle III good category. Moreover, the analysis used t-test showed significant differences between pretest and posttest students' MESM knowledge. The implementation of the online PBL model with google classrooms effectively promoted positive learning activities and high-order thinking skills and enhanced MESM knowledge of VHS students.**

Keywords—e-learning, google classroom, problem based learning model

I. INTRODUCTION

The Covid-19 outbreak impacts revolutionizing the classical learning model [1]. Regarding the dangers of the Covid-19 spread, the government realizes prohibiting face-to-face learning in the classroom and shifting teaching-learning activities into an online model [2]. This Covid-19 pandemic has forced many educators to change the learning environment to the distant learning model. As a result of this pandemic, vocational education has lost its characteristics that focus on developing hands-on skills and learning activities in workplace environments [3]. To minimize the residual effect of the dramatic change of the learning environment, online learning in vocational education must emphasize students' activeness, and learning engagement.

The development of internet-based learning technology is proliferating, which provides convenience, freedom, and flexibility to explore knowledge online. Google for education is the most exciting innovation from Google and has several services that are very helpful in the teaching and learning process, such as Google Classroom. As a learning tool, Google Classroom can allow students to explore knowledge in an active online learning environment [4]. Google Classroom was also significant to improve the better quality of learning [5]. Google Classroom can also be easily linked with YouTube video learning resources to improve vocational learning materials [6].

In the early implementation of the online learning Motorcycle Electrical System Maintenance (MESM) course in observed vocational high schools, students had barriers to comprehend the material; and were less responsive in giving opinions on the discussion. The implementation of Problem Based Learning (PBL) in asynchronous e-learning results in a more conducive learning environment, attracting student interest, and engaging them in discussions [7]. The integration of PBL into google classroom could engage the student in learning activities with enthusiastic and motivated [8]. PBL can also be integrated with a virtual learning environment to improve learning abilities and problem-solving skills [9].

The weakness of the problem-solving process in MESM learning makes student learning activities monotonous. Based on the results of classroom observations, among the causes of low learning activity is the lack of student participation in submitting opinions and the absence of giving problem-solving questions for students. This weakness causes students' critical thinking skills and creativity to stagnate because of the monotonous learning model. Based on observations, the

researcher concluded that teachers need to apply a problem-based learning model. The application of PBL can help improve student problem-solving skills and critical thinking abilities [10]. This study aims to reveal the effect of PBL using Google Classroom's Learning Management System (LMS) toward MESM knowledge to be an alternative in choosing a method applied to the e-learning process.

II. METHODOLOGY

We conducted this classroom action research at Vocational High School (SMK Negeri 39 Jakarta) follows Kemmis and Mc. Taggart model through 4 stages in each cycle. This research acquits during the pandemic Covid-19 from March to June 2020, where the schools start to shift learning models from classical face to face to e-learning. Critical features of participatory action research involved a spiral of self-reflective spiral:

- *planning* a change, *acting,* and *observing* the process and consequences of the change
- *reflecting* on the processes and consequences
- replanning
- acting and observing again
- reflecting again, and so on [11].

Each cycle analyses the data obtained from observations to determine the extent of the problem-based learning model's success. This study involved the participation of 35 students and MESM course teachers. The teacher also acts as a collaborator and as an observer.

We also observed the interaction and changes in student learning behaviour during PBL treatment in Google Classroom. We used the observation sheet to observe the appropriate stages of the PBL syntax (Table I).

Researchers observed student activities during PBL treatment in 3 cycles using observation sheets. This sheet has five observable variables and criteria for observing student activity (Table II). Based on these criteria, we made a rubric with a scale of 1 - 4. This scale obtained a total score of 5 variables multiplies the highest score 4 = 20. Overall, the highest attitude score of class means the total students multiply the highest score (35x 4 = 700). We decided the criteria of observable attitude score of 35 students at 175 - 280 = low, 315 - 420 = enough, 455 - 560 = good, and 595 - 700 = very good.

The research design was "One Groups Pretest-Posttest Design." The pretest gave before treatment and posttest after treatment. This research design is more accurate to measure the achievement of mastery of the material because it can compare students' MESM knowledge before being given treatment and afterward. This measurement aims to measure the effectiveness of PBL using LMS-google classrooms against MESM knowledge.

Indicators of student success in participating PBL in google classroom can be seen from the improvement of MESM learning outcomes with the minimum completeness criteria (*KKM*), as many as 80% of students scored ≥ 75. The test used in this research was the objective test in multiple-choice questions about MESM knowledge. It has to analyse the pretest and posttest using the SPSS 16 program for the Paired Sample t-Test.

The instrument has met the requirements of the validity and reliability testing stages. Testing the validity of the instrument contents was carried out by consulting the instrument through expert judgment. It also must check multiple-choice test analysed the level of difficulty and difference power of test.

TABLE I. SYNTAX PROBLEM BASED LEARNING MODEL ON GOOGLE CLASSROOM

Steps	Procedure	Students Activities on PBL
Step 1	Problem Identification	Students know and formulate problems. Students read the material and observe the learning video.
Step 2	Problem review	Students use their knowledge to detail and analyse problems from various points of view.
Step 3	Hypothesis formulation	Students check scope, cause, and effect. Students write down alternative problem solving on the assignment sheet.
Step 4	Collection and classification of data	Students search, organize, and present data.
Step 5	Hypothesis proofing	Students study and discuss data. Students connect data and concepts. Students make decisions and conclusions.
Step 6	Determination of problem-solving options	Students make alternative problem-solving. Students consider the consequences that occur in each choice.

III. RESULTS AND DISCUSSIONS

The MESM pretest leads to an average score of 57.8. The knowledge score of students who have Minimum Completeness Criteria (KKM) of more than 75 as many as ten students (29.00%) while the number of students who have not to accomplish is 25 students (71.00%). It means the percentage of students who have not to get through the predetermined KKM limit is high enough.

Cycle I commence with planning the implementation of PBL in Google Classroom. The results of the pretest become a discourse for intervention. This Cycle can be successful if the students' MESM knowledge score meets the KKM ≥75 as many as ≥55% of the total number of students. The teacher plans problems and questions on the MESM knowledge material. At the action stage, the teacher provides directions and assignments to the student's advert to the PBL syntax in problem-solving. The teacher watches over and retrieves involvement data and student assignment scores in Google

Classroom at the observation stage. The teacher also observes students' problem-solving abilities to do assignments on Google Classroom. In the reflection stage, the teacher reviews and assesses the learning in Cycle I and makes a list of logical solutions to overcome deficiencies and improve learning execution in the next Cycle.

TABLE II. OBSERVATION SHEET OF STUDENT ACTIVITES.

Variable observed	Indicator of Students Activities on Google Classroom
Discipline	- Follow the teacher's instructions - Work on assignments on time - Perform activities that are allowed - Make conducive conditions of Google Classroom
Creativity	- Can spark many ideas, suggest solving problems - Flexible, original, and detailed thinking skills in completing work. - The desire to find out and deepen knowledge - Feel challenged and take risks.
Fair	- Express opinions based on facts - Open-up to mistakes made - Doing tasks on his own - Cite the learning resources referred to
Problem-solving skills	- Carry out assigned tasks regularly - Participate actively in Google Classroom discussions - Proposing problem-solving - Resolve assigned problems
Activeness	- Interact well. - Communicate in the right language. - Be polite - Active in the learning process

The entitled reflection on Cycle I become a deep thought for the intervention of Cycle II. The accomplishment in Cycle II also refers to the KKM, and the stages are correspondent to Cycle I, from planning, acting, observing, and reflecting. The number of students who participated in problem-solving in Cycle I was not satisfactory. The researcher modified several actions in Cycle II, such as providing sincere appreciation on the google classroom's main page for students who achieved the best criteria. The teacher encourages more on student engagement and activeness in doing assignments. The results of this modification are then analysed and become contemplation materials for the next Cycle.

The reflection results in Cycle II stated that student activity and participation step up compared to Cycle I (Figure 1). However, for the achievement of the KKM score, the percentage acquired was not adequate. Therefore, the researcher redesigned the treatment for Cycle III to upgrade the targets. The phases circumvolve the previous Cycle. The emphasis of treatment in Cycle III is on accelerating student participation and giving reinforcement to students who achieve the target and reprimands or punishments for students absent from submitting tasks.

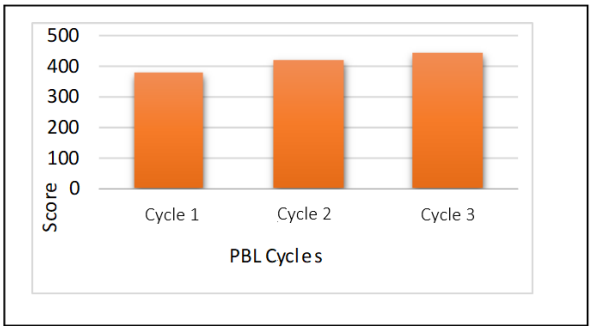

Fig. 1. Student activities observation score in PBL cycles.

The data in Figure 1 explains the effect of encouragement of PBL model given Cycle I to Cycle III to show a satisfactory increase. The activities score was enough category at Cycle I (379) and Cycle II (417), and good category at Cycle III (459). This finding shows that the effort of PBL in google classrooms is proven to increase students' activities in learning and engage the e-learning.

TABLE III. THE PHASES OF STUDENT ACCOMPLISHMENT ON MESM COURSE.

Nu	MESM Knowledge Score		
	Phases		***Phases***
1	Pretest	1	Pretest
2	PBL Cycle I	2	PBL Cycle I
3	PBL Cycle II	3	PBL Cycle II
4	PBL Cycle III	4	PBL Cycle III
5	Posttest	5	Posttest

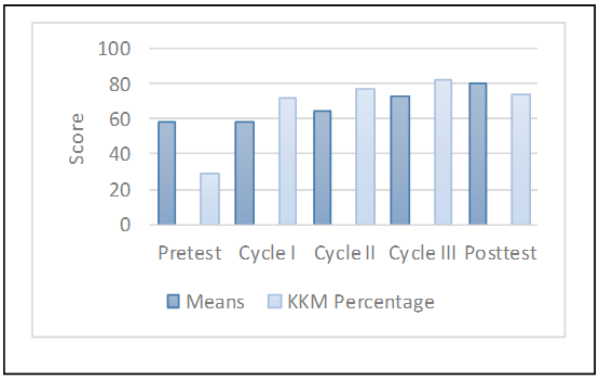

Fig. 2. Means and KKM percentage of student MESM knowledge score.

The table III and Figure 2 describes the actions have given Cycle I to Cycle III to show acceptable increase. This finding designates the number of students reaching the KKM limit increase from Cycle to Cycle. In Cycle I, 25 students (71.42%) growth in Cycle II to 27 students (77.14%) and step up again in Cycle III to 29 students (82.86%). The study ended in Cycle III because it had arrived at the target indicator of success (80%). This finding shows that the effort of PBL in google classrooms is proven to increase students' MESM knowledge.

The findings of this study indicate that PBL pedagogy can improve students' cognitive and social aspects. These findings reinforce that PBL is a pedagogy that can support students in developing cognitive and social abilities [12]. Observed activities show an increase in student activity in the LMS platform, such as interaction, communication, and expressing opinions in the learning process. These students' activeness shows that the online learning environment can allow students to exchange opinions and be independent in learning [13]. The increasing participation of students in learning PBL is shown by the increasing number of students who put forward ideas, suggest solving problems, and discuss each other. The online learning environment can also be set for a cooperative learning model that results in active discussion in groups [14].

In the cognitive aspect, PBL can effectively raise students' MESM knowledge from the increase of students who achieve minimum completeness criteria in each research cycle. The use of integrated technology with PBL can withdraw students' attention [15]. Learning must be designed to attract students' interest and attention. In addition to technology-based learning attracting students' learning interests, PBL is also subsequent millennial generation students' learning characteristics. Current students are generation of full of curiosity, critical thinking, and appreciate practical challenges using the PBL approach [16]. This study's results are expected to be fortify for educators and researchers to further develop the online learning environment by modifying and incorporating with problem-based learning.

IV. CONCLUSION

PBL can effectively encourage students to solve problems independently and make learning more meaningful and apply the knowledge they have or try to find out the necessary knowledge by dealing directly with situations where the concept is applied to be immersed and interpret the student learning process. PBL E-learning with google classroom requires active interaction between teachers and students, which opens opportunities for good learning communication.

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