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Efforts to Improve Mathematics Learning Outcomes through The Implementation of PBL Model on SPLDV Material

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Abstract: *Learning outcomes that match the expected criteria have not been achieved . One of the factors that affect student learning outcomes is the learning process in class. This classroom action research aims to improve learning outcomes of students through the implementation of the problem-based learning model. This research was carried out at the $VIII_1$ class of SMP Negeri 3 Pekanbaru in academic year 2019/2020 on the material of two-variable linear equation systems (SPLDV). The subjects were 39 students consisting of 18 male and 21 female students with heterogenous academic ability. This research was conducted within 2 cycles, namely; the first cycle consisted of two meetings and the second cycle consisted of three meetings. The instruments of this research were learning medias consisting of syllabus, student's worksheet, as well as the data collection instruments consisting of teacher and students' activities sheet and students learning outcomes sheets. According to the results of the analysis of the teacher and student activity data, it shows that there is an improvement in each meeting after the implementation of the PBL model. Student mathematics learning outcomes data on knowledge and skill competencies also indicate an increase in the percentage of students with learning outcomes equal to or more than 75 in accordance with the established minimum passing criteria. The results of this study specify that the implementation of the PBL model is able to improve students learning outcomes of class $VIII_1$ students of SMP Negeri 3 Pekanbaru for the 2019/2020 academic year on SPLDV material.*

Keyword: classroom action research, problem-based learning, SPLDV

INTRODUCTION

Arends (2008) suggests five main characteristics of problem-based learning, namely: (1) posing a problem or question, (2) its relationship with other disciplines, (3) authentic investigation, (4) producing and exhibiting work, and (5) collaboration. Erna, et al (2020) report that the application of the Problem Based Learning (PBL) car has provided opportunities for students to be active in the learning process including responding to perceptions and motivation, LKPD discussions in groups, being trained to solve problem solving problems, and having the courage to ask questions and express opinions. So that's this PBL model is suitable for use in mathematics learning.

Mathematics learning is a learning that accustoms students to gain comprehension through experience about the nature of a set of objects. Assessment of student learning outcomes can be seen from the attainment of student learning outcomes in accordance with the Minimum Passing Criteria (KKM). According to Permendikbud No.23 tahun 2020 of minimum passing criteria is a criterion for learning attainment that is determined by the education unit refering to the graduation competency standards, considering the characteristics of students, subjects and conditions of the educational unit. The minimum passing criteria set by SMP Negeri 3 Pekanbaru for mathematics is 75. The mathematics teacher for Class VIII1 SMP Negeri 3 Pekanbaru stated that the mathematics learning outcomes of students in test I (UH I) and test II (UH II) were still low. The percentage of student learning outcomes who reached the minimum passing criteria at the aspect of knowledge at UH II material Cartesian Coordinates, standard competence 3.2 about

explaining the position of the point in the Cartesian coordinate plane associated with contextual problems in class VIII1, namely 46.15% or 18 of the 39 students who successfully attained the minimum passing criteria. The low learning outcomes of the coordinate system material will affect the material of the two-variable linear equation system. because the material SPLDV requires coordinate system material as a prerequisite. One of the factors that affect student learning outcomes is the learning process in class.

Here in after, the researcher conducted an interview toward the students about the learning process. The results of the interviews obtained during the learning process were: the lack of courage of students to ask questions during the learning process, as a result the passive class situation when the teacher provides the opportunity to ask questions, no students want to ask questions, so that students become passive in the learning process. Based on the results of the interview, the research conducted further observations at the $VIII_1$ class of SMP Negeri 3 Pekanbaru. The researcher revealed a fact that the learning process in the class already implemented to learn in cooperative groups . However, the learning process were not fully in accordance with learning process stated in Permendikbud No. 22 tahun 2016 of learnig proses both in preliminary, core and closing activities. Students also experience difficulties when the teacher requested them to work on questions in textbooks related to everyday life.

Reflecting from situation and condition that has been obtained from the teacher-students interviews and observations at the $VIII_1$ class SMP Negeri 3 Pekanbaru, it is necessary to make improvements. One of the efforts taken is by implementing a learning model that can help students easily comprehend questions related to problems of everyday life (contextual). One alternative learning that is expected to solve these problems is the implementation of the Problem Based Learning (PBL) model , because the BPL model can make students active in learning

Problem solving, according to Maimunah, *et al* (2016), is an intellectual activity to discovers answer by applying a particular knowledge that we already have. Problem solving can also improve academic abilities of students. Problem solving in PBL according to Trianto (2014) is that the teachers hold several roles as facilitator, counselor and motivator. The teacher orientates students to real problems, facilitates/guides in the investigation process, facilitates dialogue among students, provides teaching materials and provides support in an effort to improve the findings and intellectual development of students.

A similar research model by Gema Raufany, *et al* (2017) showed an improvement of students' mathematics learning outcomes class X IPA 1 SMA Negeri 2 Pekanbaru. It was proven from the increase of basic score percentage from 16,7 % to 47,2 % at the first quiz and to 55,6 % at the second quiz. Moreover, a research with the implementation of PBL by Maimunah, et al (2018) on matrix material was proven to increase students' mathematics comprehension of clas XI IPA in SMA Babussalam Pekanbaru. Both researches showed that PBL model can increase mathematics learning outcomes and comprehension of students in Pekanbaru. So that by applying the PBL model it can improve student learning outcomes on SPLDV material

METHOD

The research method used is classroom action research (PTK). The research was conducted in two cycles. Each cycle consists of four steps, namely planning, implementing, observing and reflecting (Suharsini Arikunto, 2012). The research was conducted in class VIII1 SMP Negeri 3 Pekanbaru. The researcher implemented the PBL model on the material of two-variable linear equation systems (SPLDV) at the KD 3.5 and 4.5 SPLDV material was chosen because this material is related to contextual problem

The subjects of this study were the entire students of class VIII1 SMP Negeri 3 Pekanbaru in the odd semester of the 2019/2020 academic year, totaling 39 students consisting of 18 male and 21 female students with heterogeneous abilities. The instruments in this study were learning medias and data collection instruments. The learning tools consisted of a syllabus, lesson plan (RPP) and student worksheets (LKPD). LKPD as as a place to carry out activities for students to understand the SPLDV material

The data collection instruments consisted of observation sheets in the form of teacher activities observation sheets and student activities observation sheets and mathematics learning result test sheets. Data collection techniques in this study were observation techniques and test techniques. The data obtained from the observation sheets to observe teacher activities during the learning process and mathematics learning result test sheet would later be analyzed. Data analyses regarding the teacher and students' activities was obtained from the observation sheets while the analysis of the students learning result was conducted at the end of the cycle to find out the learning outcomes of the students.

The data analyses of this research consisted of 1) achievement analysis of minimum passing criteria, 2) achievement analysis of minimum passing criteria indicators from the knowledge and skill aspects. For the achievement analysis of minimum passing criteria indicators, the knowledge aspect was conducted to revealed the attainment of each indicator by every student. The students can be said to achieve the passing criteria to each indicator if the students achieve score $\geq$ 75. The data of students who had not achieved the minimum passing criteria was suggested to have remedial. The minimum passing criteria achievement for each indicator in the knowledge aspect was calculated using the percentage of the score obtained divided by the maximum score multiplied by 100%..

RESULT AND DISCUSSION

This research aims to improve students' learning outcome of class $VIII_1$ SMP Negeri 3 Pekanbaru in the odd semester of the 2019/2020 academic year on the material of two-variable linear equation systems (SPLDV) through the implementation of problem-based learning. The improvement of students' learning outcomes is measured according to the number of students who achieve the minimum passing criteria by 75 for the knowledges and skills assessment at the first and second cycles. The analysis result of the minimum passing criteria attainment at the first cycle for both assessments is presented in the following Table 1 and Table 2.

Table 1 Percentage of minimum passing criteria in the knowledge aspect at the test -1

Basic competence	IPK	Number of students	Percentage
3.5 Explaining two-variable linear equations systems and their solutions related to contextual problems	3.5.1 Explaining the concept of a two-variable linear equations system	38	97,4 %
	3.5.2 Creating a mathematical model of a two-variable linear equation systems	20	51,3%

In the knowledge aspect for the first IPK> 75% of students succeeded well, but on the second IPK <75%. This shows that students are still low in making mathematical models from the contextual period.

Tabel 2 Percentage of minimum passing criteria in the skill aspect at the test I.

Basic competence	IPK	Number of students	Percentage
4.5 Solving problem related to two-variable linear equation systems	4.5.1 Solving problem related to two-variable linear equation systems by drawing graphic	17	43,6 %

Table 2 shows that students are still low in problem solving activities. After doing the reflection on the results from the first test, the implementation of cycle II is carried out. The results of the analysis of the minimum passing criteria attainment in cycle II are presented in Table 3 and Table 4 below.

Tabel 3 Percentage of minimum passing criteria in the knowledge indicator at the test II.

Basic competence	IPK	Number of students	Percentage
3.5 Explaining two-variable linear equations systems and their solutions related to contextual problems	3.5.3 Explaining the solution of two-variable linear equation systems using the substitution and elimination methods	37	94,9 %

Table 3 shows that students have been able to determine the completion of SPLDV using substitution and elimination methods well, because there are 37 students who have reached the minimum passing criteria set. Table 5 shows the learning outcomes of students in cycle II for aspects of skills

Tabel 4 Percentage of minimum passing criteria attainment in the skill indicator at the test II.

Basic competence	IPK	Number of students	Percentage
4.5 Solving problem related to two-variable linear equation systems	4.5.2 Solve everyday problems related to two-variable linear equation systems using the elimination method	39	100%
	4.5.3 Solve everyday problems related to two-variable linear equation systems using mixed methods	30	76,9%

Based on the data analysis of the research results, there was an increase in the number of students who reached the minimum passing criteria on the knowledge aspect at the end of each cycle compared to the basic score, namely from 18 people (46.15%) increased to 22 people (56.4%) in cycle I, and there was an increase again to 33 people (84.6%) in cycle II. While the skills of 17 people (43.6%) in the first cycle increased to 30 people (76.9%) in the second cycle. In addition, based on data analysis about the activities of teachers and students, the implementation of the PBL model has gone according to planning.

Based on the results of the basic score, cycle I and cycle II, a presentation in the form of a frequency distribution table is used.The goal is to illustrate the improvement of students' mathematics learning outcomes as presented in

Table 5 Frequency of $VIII_1$ Class Students of SMP Negeri 3 Pekanbaru on the basic score, test I and test II

Predicate	Score Interval	Frequency of Students		
		Basic score	Test I	Test II
A	93 – 101	0	2	13
	84 – 92	5	15	16
	75 – 83	13	5	4
B	66 – 74	13	15	6
	57 – 65	5	2	0
	48 – 56	3	0	0

Table 6 shows that there is an increase for predicate A (Very Good) from the basic score, daily test I and daily test II. This result is also reflected in the predicate B, there is a decrease in the number of students in cycle II. This result is supported by the learning process from cycle I and cycle II, which looks getting better with the improvements that have been made in each cycle. However, there are still weaknesses in its implementation.

Regarding the results of observations in cycle I, the desired learning process has not been achieved optimally. Researcher have not been able to organize her time well. There is still a waste of time for several stages of learning, such as at the stage of organizing students in groups, working on students' worksheet, and making discussion reports so that other learning activities must be reduced in time or there are even learning stages that are not implemented. Students have difficulty in working on students' worksheet because students are not familiar with the PBL learning model. The active role of students in building their own knowledge is still not visible and researchers also have not empowered students so that the learning process is not student-centered. In addition, students are also not serious in working on students' worksheet and are more likely to work individually. This is supported by the research results of Novianti, et al. (2020) which state that in cycle I they still work individually. Thus, researchers have fixed the weaknesses and constraints that occur based on the reflection of cycle I. Researchers are more assertive in disciplining students to make good use of time in each learning activity. Researchers invite students to be more active in the process of discussion, problem solving, and all stages in the learning process. Researchers have provided more equitable guidance to all groups in working on students' worksheet and preparing discussion reports.

In the learning process in cycle II, the stages of the PBL learning model have been carried out according to planning and run better at each meeting. Students are increasingly accustomed to the learning model applied so that students are more active in the learning process and researchers act as facilitators. So that the learning process in cycle II is centered on students. This shows that in this study there has been an improvement in the learning process.

Although some obstacles occur, it can be said that the implementation of the PBL model can provide a positive impact on the implementation of the learning process in $VIII_1$ class of SMP Negeri 3 Pekanbaru. Students become more active in learning activities, especially in group discussion activities and complete all activities at the students' worksheet. Students are also good at presenting the results of their discussions, and are increasingly active in providing responses during group presentations and delivering

lesson conclusions so that learning is not teacher-centered. Students are trained in expressing ideas in solving problems and directed to be active in building their own knowledge so that learning becomes more meaningful and more attached to students' memories also has an influence on improving student learning outcomes. This is also related to constructivism theory which states that, in order for students to truly understand and be able to apply their knowledge, they must work to solve problems, find everything themselves, and try hard with their own ideas (Trianto, 2007).

The results of the analysis of the minimum passing criteria achievement indicators show that not all students reach the minimum passing criteria for every indicator. Overall, the mistakes that students make are misconceptions and procedures. These mistakes include students who do not understand the concept of material that has been studied properly, students are not careful in understanding and solving problems, and students make mistakes in calculation procedures or operations. The mistakes made by students on daily test I and daily test II are summarized. Then, the researcher planned ideas for improvement in learning to overcome students who had not reached the minimum passing criteria indicators. The improvement plan is recommended to the teacher in implementing remedial or further learning processes.

Based on the analysis of student learning outcomes, this is indicated by an increase in the number of students who reach the minimum passing criteria or the number of students who score ≥ 75 on daily tests I and daily tests II. Then the results of test I and test II are compared with the number of students who reach the minimum passing criteria on the basic score. Student learning outcomes, it can be said to increase if viewed based on the presentation in the frequency distribution table from the basic score to daily test I and the basic score to daily test II. Based on the results obtained by these students, it can be seen that the application of the PBL model has a good effect on student learning outcomes compared to before using the PBL model. Problem-based learning in improving mathematical problem solving skills according to the research results of Erna, et al (2020). Problem-based learning is also influential in improving the students' mathematical problem-solving abilities (KPMM) class VII on Social Arithmetic material in terms of all students at State Junior High Schools in Kuantan Singingi Regency according to the research results of Erpina, et al. (2020)

The results of the learning process and student learning outcomes above, show that the research objective is to improve the learning process and improve the mathematics learning outcomes of students in $VIII_1$ class SMP Negeri 3 Pekanbaru in the odd semester of the 2019/2020 academic year through the implementation of the PBL model has been achieved even though there are deficiencies in the implementation. This deficiency will be used by researchers as a benchmark for making improvements to a better direction. Therefore, it can be concluded that the implementation of the PBL model can improve the learning process and improve the mathematics learning outcomes of class VIII1 students of SMP Negeri 3 Pekanbaru in the odd semester of the 2019/2020 academic year on the material of the Two-Variable Linear Equation System.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the implementation of the PBL model can improve the learning process and mathematics learning outcomes. This can be seen from students increasingly participating in the learning process, such as being active in group discussions and expressing ideas in solving contextual problems at the students' worksheet, presenting group discussion results, responding to group presentations and providing learning conclusions.

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