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Improving Problem Solving Ability of 8th Grade Student through The Problem based Learning Model

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Abstract

Mathematics learning motivation and students' capacity for problem-solving are still below expectations. The majority of students have difficulty with mathematical issues that are presented as word problems and non-routine problems. This study sought to ascertain whether the Problem Based Learning model enhanced students' capacity for problem-solving and learning motivation. This research was a classroom action research (CAR). This CAR focused on the students of SMP N 8 Banda Aceh's capacity for problem solving. Researchers in this study applied the Problem Based Learning model to all of the learning tasks from cycle 1 to cycle The result showed that The learning outcomes of students studying fractions in have improved using Problem Based Learning Model.

Keywords : Problem Based Learning, Mathematics, Classroom Action Research

Introduction

Mathematics is a subject taught at all educational levels, from elementary school through university. This is because mathematics is applicable to all aspects of human life (Hodaňová & Nocar, 2016). However, most of the students consider it as difficult subject to learn. Mathematics is a challenging subject to master (Rameli, 2016). This is due to the fact that formal and abstract forms are frequently presented in the learning process. This abstract nature makes it difficult for many students to comprehend the material.

Many teachers have difficulty teaching students how to solve problems so that many students also find it difficult to learn (Gafoor et al., 2015). Typically, this difficulty arises due to the paradigm that the final answer is the goal of learning process (Steenbrugge et al., 2010). Many students apply wrong techniques when solving problems. Nevertheless, we must recognize that the process of problem-solving is far more important and fundamental than the actual solution itself. When final answer is emphasized, students may only learn to solve a single problem, whereas when process is emphasized, they appear to be emphasized, they appear to be learning to solve other problems.

As a mentor, one of the steps a teacher can take is to select the most effective learning model. An inappropriate model used for learning can result in boredom, a failure to comprehend, and ultimately a decrease in the motivation of participants to learn (Kruk & Zawodniak, 2018).

Since the aim of learning mathematics is for students to be able to answer issues they encounter, this condition will either directly or indirectly give rise to the belief that learning mathematics consists only of knowing and then forgetting facts and concepts. As a result, problem solving demands a psychological process that goes beyond just applying previously taught concepts. It also involves high levels of cerebral engagement (Wokoma, 2020).

The information provided indicates that there is still a lack of mathematical proficiency, particularly in terms of the capacity to resolve pupils' arithmetic issues. Low student accomplishment at school will be a result of the kids' poor ability to solve mathematical problems, which will also have an impact on the quality of their education (Bhat, 2014).

Finding a suitable learning formula that can boost students' interest in learning mathematics is crucial to foresee this issue and make it unsustainable (Azmidar et al., 2017). In order to encourage student interest in learning and ensure that the best results are attained, the instructor must be able to make learning enjoyable while simultaneously assigning tasks that will foster a sense of responsibility for the students.

Selecting the appropriate learning model is one of the actions the instructor can do to help the students. The employment of ineffective learning models can result in boredom, a failure to grasp the subject matter being taught, and eventually a decrease in the motivation of students to study (Mauliya et al., 2020). In order to increase student participation in the learning process, an efficient learning model is required. The Problem Based Learning (PBL) model, often known as problem-based learning, is one of the available learning models. Problem Based Learning is a cutting-edge educational strategy that can give students the opportunity for active learning by involving them in problem-solving activities that follow the steps of the scientific method. This allows students to gain knowledge about the issue at hand and develop the skills necessary to solve it (Zaduqisti, 2010).

Students participating in Problem Based Learning model are expected to gather as much information as they can in

order to solve the challenges that are provided. This experience is essential in everyday life since it determines how a person develops his thinking and work habits. Problem Based Learning is, in essence, learning that applies real-world issues that are introduced at the start of the learning process. After that, the issue is looked into further to determine a resolution. The authors' motivation in performing the study "Improving the Problem-Solving Ability of 8th Grade Students of SMPN 8 Banda Aceh in the Material of Numbers through the Application of the Problem-Based Learning Model" is based on the description provided above.

Methods

This research is a classroom action research (CAR). CAR is a problem-solving strategy associated with classroom learning that employs concrete actions and processes to develop the ability to detect and solve problems (Yanuarto, 2020).

This CAR focuses on the problem solving abilities of students at SMP N 8 Banda Aceh. In accordance with the characteristics of Classroom Action Reserach, the research will be carried out in several cycles. Arikunto (2008) define each cycle as having four stages of activities: (1) planning, (2) implementation, (3) observation, and (4) reflection. The diagram depicts the research procedure in greater detail.

The flow of John Elliot's model is as follows:

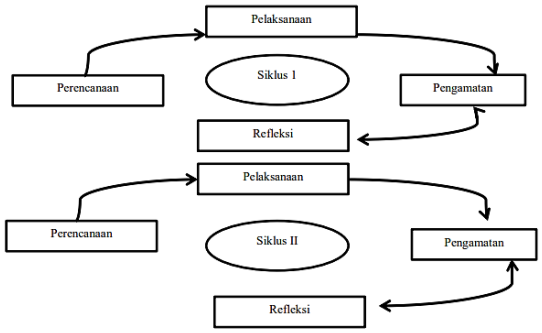

Figure 1. John Elliots' Model

Based on the research focus, the method of data collection consist of tests, interviews, and observations. The research subjects were students of class VII-6 as many as 31 participants students consisting of 17 male students and 14 female students.

Results

Researchers in this study applied the Problem Based Learning model to all of the learning tasks from cycle 1 to cycle 2. According to the description, each action is carried out as follows:

Cycle 1

The material taught in cycle 1 is multiplication and division fraction. The stages carried out in cycle 1 are as follows: Planning Stages; The researcher prepares a number of items, including the Lesson Plan (RPP), Student Worksheets (*Lembar*

Kegiatan Peserta Didik), Tests Cycle 1 Test, student and teacher activity observation sheets in accordance with lesson plans and books; Implementation Cycle; Observation Cycle;

Based on observations of teacher activities, teachers' management of student learning is categorized as good. However, there are still some elements that fall into the "less" category, i.e., researchers are less systematic in effectively communicating perception and motivation, and some perceptions are not delivered. At the following meeting, this will be the subject matter for improvement.

The teacher administered a stage 1 test following the start of cycle 1, and 31 students showed up. The table shows the student learning scores for Lesson Plan 1.

Tabel 1. Problem Solving Ability Indicator Achievement Score (Test Cycle 1)

Aspect	Level Percentage				
	0	1	2	3	4
Understanding the problem	0%	38,89%	61,11%	-	-
Making plan	0%	0%	22,22%	33,33%	44,44%
Doing plan	16,67%	11,11%	38,89%	33,33%	-
Re-check and making conclusion	61,11%	27,78%	11,11%	-	-

Based on the analysis of cycle 1 test results, for the aspect of understanding the problem, there were 38.89%, in category 1 (those who had low ability to understand problems) and 61.11% were in category 2 (those who had moderate ability to understand problems). Thus the aspect of understanding the problem is not in accordance with the desired expectations, because an aspect is said to be in accordance with expectations if there are ≥ 65% of students who are able to reach the good category. To improve the ability to understand 40 students' problems, the teacher must write down all the information contained in the problem, namely known and asked.

Based on the results of the percentage of students seen in the aspect of understanding the problem and re-checking the answers are in the low category because some students have not dared to come up with ideas in solving the problems given. Therefore, action is taken as a corrective step in the implementation of the next cycle of learning.

After the implementation of cycle 1 took place, the teacher gave a cycle 1 test which was followed by 31 students. Based on the value of the test results in cycle 1, 18 students were obtained from 31 students or 58.06% of students had achieved mastery learning individually, namely students who obtained absorption power ≥ 70. In accordance with the learning completeness criteria and 75% of students complete 43 classics. Therefore, it can be concluded that classical learning mastery in cycle 1 has not been achieved. Therefore, the researcher

continued to carry out the 2nd cycle research design so that the research results could be completed both individually and classically.

The closing stage is carried out by the teacher by guiding students in making conclusions about the material that has been learned and reflecting on the learning that day. After the teaching and learning process is complete, the teacher distributes cycle II test sheets to students and asks students to complete them in the allotted time.

Cycle II

Before the lesson begins the teacher announces the acquisition of scores in the previous quiz, for students whose scores are already high the teacher expects to be able to maintain them and for students whose scores are still low the teacher encourages them not to give up trying then students are reminded of the previous material. The initial stage of learning activities begins with apperception where the teacher conducts questions and answers about the material by changing fractions into percent form and then conveying the learning steps and motivating students to learn. Then do the core activities. At this stage students sit in their respective groups that have been distributed heterogeneously.

After that the teacher distributes LKPD and explains the steps for working on LKPD then asks students to discuss and solve problems that exist in LKPD in their respective groups. During the discussion process, if students have difficulty working on the LKPD, the teacher guides them by asking leading questions so that students can solve problems. Each group that is sure of the answers they get can write back their work on the sheets provided.

One of the groups presented the results of their discussion and the other groups responded. After finishing the presentations and student responses, the researcher gave a score to each group based on the answers in the LKPD, then the teacher gave awards to students who were active and accomplished and gave encouragement to students who were less active.

After the implementation of cycle II took place, the teacher gave a phase II test which was followed by 31 students. Student learning scores in lesson plan 2 can be seen in table 4.6 below:

Tabel 4.6 Skor Pencapaian Indikator Kemampuan Pemecahan Masalah (Tes Siklus II)

Aspect	Level Percentage				
	0	1	2	3	4
Understanding the problem	0%	38,89%	61,11%	-	-
Making plan	0%	0%	22,22%	33,33%	44,44%
Doing plan	16,67%	11,11%	38,89%	33,33%	-
Re-check and making conclusion	61,11%	27,78%	11,11%	-	-

Based on the analysis of cycle II test results, for the aspect of understanding the problem 100% is in category 2 (those who have moderate ability to understand the problem), this means that the achievements at this stage are very good. Based on this, the aspect of understanding the problem is in accordance with the desired expectations.

Based on the results of the student learning test results, there were 28 students or 90.32% who had achieved individual learning completeness, namely students who obtained absorption power ≥ 70 totaling 28 people with 54 percentages of classical learning completeness of 90.32% . In accordance with the criteria for mastery of classical learning at school it is declared complete if 75% of students complete individually, then the classical mastery of students' learning for RPP (*Rencana Pelaksanaan Pembelajaran)* II has been achieved. Based on the learning outcomes of students in cycle I and cycle II, the percentage of learning completeness was 58.06% and 90.32% of the percentage of learning outcomes in cycle I and cycle II, there was an increase in student learning outcomes of 32.26%. This shows that the application of the Problem Based Learning model can improve student learning outcomes.

Discussion

Activity of the teacher in fostering learning

Based on the teacher activity criteria that have been determined and analyzed previously, the data from observations of teacher activity in managing learning using the Problem Based Learning model at each meeting is of good value. In cycle I at the first meeting the teacher's activity in managing learning was quite good, although there were some deficiencies in carrying out learning activities.

Lack of teachers in delivering reflections at the end of learning. Furthermore, in cycle II the teacher's activities in managing learning began to increase from good to very good, seen in aspects of the ability to motivate students or communicate learning objectives, the ability to convey assessment techniques during learning, the ability to ask students to express their group ideas about how to solve existing problems in LKPD it is in the very good category compared to cycle I which is still in the good category. Based on the description above, it can be concluded that the success of teachers in teaching is not only in mastering the material but also supported by other facilities and infrastructure that can support the success of the teaching and learning process.

Student Activities during Learning

Based on the results of observations, the activity of students during the learning process is active. Observation data on students' activities in learning using the Problem Based Learning model, during 4 meetings can be seen from the research results. The results of observations of student activities carried out by two observers in cycle 1, there are student activities that are not active during learning, such as students who have not been able to fully solve problems or find ways to solve problems, some students have not participated in their groups and students does not pay attention to and respond to presentations from other groups.

Therefore, action is taken for corrective steps in the implementation of subsequent learning by means of students having to be more guided in the teaching and learning process so that it is more focused, all students must be given awareness of the importance of working together in groups because working in groups is part of the student assessment. required to pay attention to and respond to the presentation results of other groups by notifying that a plus value will be given to those who pay attention and respond. But in cycle II experienced a change or a good increase. In cycle I, students' activities solve problems or find ways to solve problems in group discussions past the given tolerance time.

For this reason, teachers must focus more on directing students during group discussions because they are not used to learning by addressing problems in a group setting. In cycle II, group talks are included in the active category because the time permitted is running out. According to the findings of this observation analysis, learning occurs when teachers and students follow the Problem Based Learning model, with student activities predominating over teacher activities. According to the standards established for the observational component, it can be said that each category of students' activity is active.

Students' Mathematical Problem Solving Ability

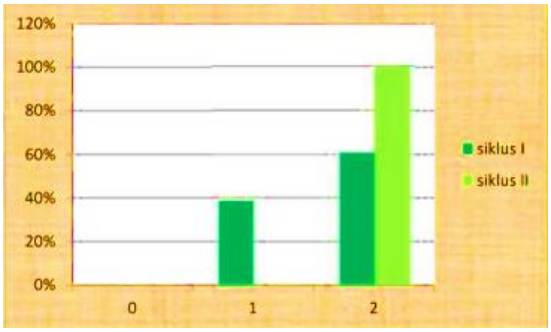

Figure 2. Aspects of Understanding the Problem

Based on the diagram above, it can be seen that there has been an increase in the aspect of understanding the problem. In cycle I it was found that students' problem-

solving abilities in the aspect of understanding the problem were still low, namely 60% of students who could understand the problem as a whole, meaning that there were still many students who could not understand the problem, including they only wrote down what they knew or were asked but not both. After making improvements by guiding students to be able to understand the problem or information from the problem. So that students can write down what is known and what is asked in full. After cycle II was carried out, there was an increase in students' mathematical problem solving abilities in the aspect of understanding the problem. From giving students' mathematical ability tests an increase of 40%, from 60% to 100%.

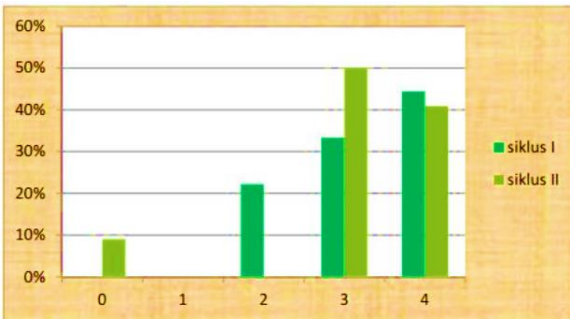

Figure 3. Aspects of Making a Problem Plan

Based on the diagram above, it can be seen that there has been an increase in the aspect of making a problem plan. In cycle 1, it was found that 77.77% of students were able to plan problems, this meant that the problem solving abilities of students in the aspect of making problem plans were in accordance with what was expected.

After making improvements by guiding students to maintain and improve the ability of students to plan problems. After cycle II was carried out, there was an increase in students' mathematical problem solving abilities in the aspect of making a problem plan. From the giving of students' mathematical ability tests experienced an increase of 32.26%, from 58.06% to 90.32%.

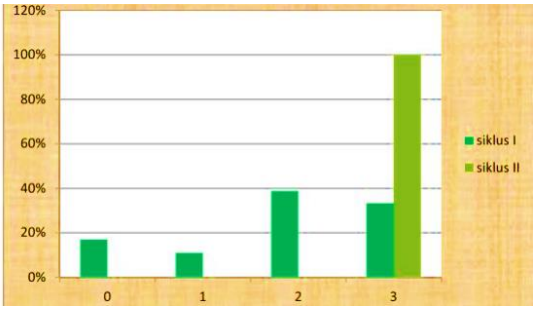

Figure 4. Aspects of Doing the Problem Plan

Based on the diagram above, it can be seen that there has been an increase in the aspect of making a problem plan. In cycle I, it was found that 72.22% of students were able to plan problems, this means that the problem solving abilities of students in the aspect of making problem plans were as expected. Follow-up from the researcher is to maintain and improve the ability of students to plan problems. After cycle II was carried out, there was an increase in students' mathematical problem

solving abilities in the aspect of making problem plans. From giving students' mathematical ability tests an increase of 27.78%, from 72.22% to 100%.

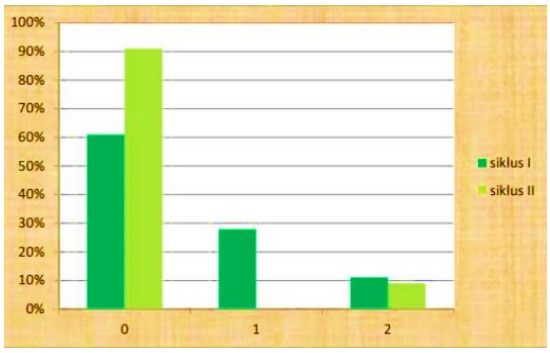

Figure 5. Aspects of Checking Back and Drawing Conclusions

Based on the diagram above, it can be seen that students who can re-examine and draw conclusions are still low, namely 11.11% of students who can re-examine and draw conclusions as a whole, meaning that there are still many students who cannot re-examine and draw conclusions.

After making improvements by guiding students to inform students that re-examining and drawing conclusions is very important to do, because it could be that the last answer they got was wrong in the calculation. Of course, in a different way can get the correct result. However, after the problem-solving ability test was given, many students were still unable to check again and draw conclusions. With the reason that students do not have enough time to check again and draw conclusions.

According to them, re-examining and drawing conclusions is not important because they think the answers they get are correct. After cycle II was carried out, students' mathematical problem solving abilities in the aspect of re-examining and drawing conclusions decreased. From the giving test students' mathematical abilities decreased by 2.02%, from 11.11% to 9.09%.

Conclusion

Based on the results of research conducted on learning mathematics by using the Problem Based Learning model on the material fractions in class VII SMP Negeri 8 Banda Aceh, it can be concluded as follows;

The learning outcomes of students through learning with the Problem Based Learning model in fraction material in class VII SMP Negeri 8 Banda Aceh have increased.

In cycle I, only 18 students completed with a percentage of 58.06%, while in cycle II, 28 students completed with a percentage of 90.32%. Mastery learning increased by 32.26% .

The teacher's ability to manage the class using the Problem Based Learning model is very good. Student activities during Problem Based Learning model are in the effective category.

The Problem Based Learning model can be applied to fractional material because from the learning outcomes obtained the students have achieved learning mastery, the teacher's ability to manage learning is already in a very good category and student activities are also in the effective category for learning mathematics using the learning model this.

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