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Improving the Students' Mathematics Learning Outcomes of SMPN 23 Pekanbaru by Implementing a Problem-Based Learning Model

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ABSTRACT

This study aims to determine the results of learning mathematics for class VIII students of SMP Negeri 23 Pekanbaru in the odd semester of 2022/2023 by applying a problem-based learning paradigm. This particular study is a classroom action study (CAR) focusing on Kemmis and McTaggart's design. The subject of this study was a group of 36 grade VIII students. This research was conducted in two cycles, and each was carried out in 4 meetings. The results of the study show that the development of a problem-based learning model can improve student learning outcomes by doing the following: 1) student organization on problems, namely the teacher will provide the necessary material; 2) guide students to learn, namely the teacher presents math problems; 3) investigate independent, or group investigations, namely students independently or in groups looking for solutions to the questions asked; 4) presentation or presentation of the results obtained; 5) Evaluation requires teachers and students to assess the results of group discussions.

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INTRODUCTION

The learning process must include opportunities for these students to ask questions, provide input, and realize their full potential [1]. According to [2], one of the most important aspects of the learning process is the interaction between teachers and students, as well as between students and teachers and students with the environment itself. Teachers' implementation and improvement methods significantly impact student success rates [3]. According to [2], a teaching teacher must be able to communicate with students using teaching methods and models that have been proven correct.

Learning in the 2013 curriculum is more focused on students or student centers. The 2013 curriculum is a set of plans and agreements regarding objectives, content, and learning materials that guide learning activities. The 2013 curriculum aims to equip Indonesian people as individuals and citizens. Loyal, productive, creative, innovative, emotional, and able to contribute to society, nation, nation, and world civilization [4]. In the revised 2013 curriculum, three areas will be assessed: knowledge and skills assessment and attitudes and behavior (attitudes and habits). In this study, the authors focused on evaluating knowledge and skills competencies.

According to [5], students must be able to solve problems by cooperating efficiently and giving students plenty of room to solve their problems. Students (student center) are the only ones actively involved in the learning process and are not centered on the teacher (teacher center). Endang and

Nuryata argue that the process of a mathematics teacher must maximize students' ability to think critically, systematically, with logic, and with creativity [5]. There is a mathematics learning process that is interactive, inspiring, and creative and motivates students to participate actively, but this is not the case with learning mathematics based on numbers and calculations.

It is said in [6]: "Among the various subjects taught in schools, mathematics is considered the most difficult for non-disabled students and students who experience learning difficulties." The findings [7] show that the learning difficulties experienced by students are understanding, drawing diagrams, reading graphs correctly, understanding formal mathematical concepts, and solving mathematical problems. This observation is appropriate to the research, which states that the students who take integral calculus, it was found that the students are still experiencing an error in solving the problems given [8]. It is also related to the work of [9], that many students consider mathematics the most difficult subject to learn. This is done by presenting mathematics less attractively and tends to be more difficult for students to learn. As a result, students often become bored and less responsive to lessons. Students also believe that mathematics is difficult because it relates to abstract ideas, even though students' perceptions of the subject matter will contribute to academic achievement [10]. Beside that, the error prior understanding of the concept will influence the understanding of the next concept [11]. In addition, teachers' learning methods are not diverse and tend to limit students' ability to express ideas creatively during learning. Students are less interested in learning mathematics, and learning outcomes are not optimal.

The purpose of learning mathematics at school is so that students can better understand and apply the concepts of logic, symmetry, criticality, honesty, carefulness, effectiveness, and efficiency in everyday life and the world. According to [12], students can apply mathematics in everyday life and various fields of study.

Student learning outcomes depend on what they have learned, the goals they have set for themselves, and how those goals affect how they interact with the material they are studying. Learning outcomes are also influenced by students' understanding of the physical and social environment [13].

According to [14], the results of student learning sessions are skills developed by siblings after receiving positive feedback from study sessions. The abilities provided by students are related to their talents in terms of knowledge, skills, and attitudes.

In [15], one of the most important basic junior high school mathematics skills is the ability to "show a logical, critical, analytical, consistent and thorough attitude, be responsible, responsive, and not give up easily." To ensure that students have the necessary skills, it is necessary to implement a series of special procedures that can be used to cultivate the attitudes of these students. One example is the use of a problem-based learning model. However, at this time, the incumbent teacher is the one who has the most control over how the educational model is implemented in the classroom.

Problem-Based Learning [16] is the most popular educational model introduced in 2013. The problem-Based Learning Model can teach students how to use various materials, such as physical and mental materials, for independent or group learning. The problem-Based Learning Model (PBL) is a method for teaching students how to solve problems, think critically and creatively, identify and solve problems, identify and solve problems, evaluate and evaluate the effectiveness of observations, and teach students how to select relevant issues with the world around them.

According to [17], problem-based learning is a teaching model based on solving real-world problems to encourage students to solve problems and improve their writing skills. It was also said by [17] that problem-based learning (PBM) is an educational method and system that focuses on mass

stimulation strategies and the basics of knowledge and skills to empower individuals to take action as part of difficult daily routines to the structure. According to Ibrahim and Nur, problem-based learning occurs in 5 stages, while the stages of problem-based learning are as follows [18].

Table 1. Stages of Problem-Based Learning

Stages	Teacher Activities
Stage 1: Student orientation on the problem	The teacher conveys the problem to be solved related to the material being taught
Stage 2: Group students to study	Help students compose questions to identify and formulate problem-solving.
Stage 3: Guide independent or group investigations	Encourage students to conduct group discussions to gather information from various sources
Stage 4: Presenting works	Assist students in recognizing and utilizing works, such as reports, and enable students to carry out various tasks according to problems.
Stage 5: Evaluate and analyze the problem-solving process	Assist students in reconstructing the problem.

Based on the results of observations, it can be seen that the ability to learn mathematics in class VIII SMP Negeri 23 Pekanbaru is not comparable to what is desired. In addition to the quality of student learning outcomes which is still minimal, the active participation of students during learning is also still minimal. In addition, student learning activities such as asking questions, providing input, and answering teacher questions are rare. Even students are very difficult to understand the teacher's explanation. Students lack confidence in utilizing the potential they have within themselves. Students are still hesitant to ask questions, cannot do so before being instructed further, and may not want to do so. Therefore students will not understand the material because of their reluctance to ask questions.

Observation results also show that students have not had the opportunity to build their knowledge because the learning process carried out in the classroom is still teacher-centered. During the learning process in class, students do not participate actively in class. Smart students still dominate classes. Students can only work on the same questions as given by the teacher. Students find this material less interesting because it is irrelevant to real life.

Based on the description above, to formulate whether the application of problem-based learning models can improve learning outcomes in mathematics relations and functions of students in class VIII-G odd semester of SMP Negeri 23 Pekanbaru? This study aims to enhance mathematics learning outcomes in the subjects of relations and processes of course VIII students in the odd semester of SMP Negri 23 Pekanbaru in the 2022/2023 academic year by applying a problem-based learning model.

METHODS

The survey was conducted at SMP Negeri 23 Pekanbaru and at the VIII grade level for the 2022/2023 academic year, Odd Semester. They chose this school because they had to complete an introduction to schooling field (PLP) course.

The subjects of this research were class VIII-G students of SMP Negeri 23 Pekanbaru in the

2022/2023 academic year, totaling 36 people. This research aims to increase the Mathematics learning outcomes of class VIII-G students of SMP Negeri 23 Pekanbaru by applying a problem-based learning model (PBL). The research period is two months, from September to November 2022. The research is carried out for two weeks.

This research is a Classroom Action Research (PTK) which aims to improve students' mathematics learning outcomes. Classroom action research is studying learning problems in the classroom through self-reflection and efforts to solve them by carrying out various planned actions in real situations and analyzing every effect of these actions [17]. According to [18], Classroom Action Research is a survey conducted through teachers' self-reflection to improve the quality of the learning process in class and student learning outcomes. The procedures in this study were planning, implementing, observing, and reflecting, which consisted of 2 cycles, each of which was carried out in 2 meetings [17].

RESULTS AND DISCUSSION

The first pre-action reflection identified several problems in learning mathematics for class VIII-G. This includes students' low success in achieving teaching and learning activities and low skills in classical learning in the classroom. Teacher participation in the learning process will make the class more interesting. Students often think that mathematics is difficult, even in understanding concepts. It makes students afraid to learn mathematics rather than solve problems. Not all students fully understand the idea of the material. Understand or solve a given problem. The problems found will affect learning outcomes that are less than optimal.

Based on students' final test scores, or the final test for each cycle, their learning outcomes can be determined on the knowledge test. Learning tests are carried out to see the effectiveness of teachers using problem-based learning models in learning. Mathematics learning outcomes have not met the KKM goals. The KKM achieved by students in mathematics was 85. Based on the findings before the action was taken, the first test results were obtained from 36 students, and seven students (19.44%) reached the level of learning completeness. 29 students (80.55%) did not complete the exam. The research test results were based on the four stages of CAR, which are listed below, along with the results of each cycle.

1. Cycle 1

The implementation of class action research in cycle 1 consisted of two meetings. The first meeting was about function or mapping material using a problem-based learning model with LKPD, while the second meeting was about written test results.

Planning Stage. Analysis of KI, KD, indicators, and materials likely to be used form the basis of the activities carried out as part of the research. The analysis used in this case is based on problem-based learning models (RPP), observation methods to determine the level of problems, and teaching materials (end cycle tests) to determine the probability of students' intelligence levels.

Implementation Stage

a. The First Meeting

The first meeting was held for 3×45 minutes (3 JP). The material at the first meeting Functions with the learning process using LKPD. Preliminary activities include: 1) The teacher starts learning by greeting and continues with prayer together; 2) The teacher greets students, checks attendance, and conditions the class to be conducive; 3) The teacher conveys the topics to be studied, namely Functions; 4) Students listen to the learning objectives that will be achieved; 5) students recall the

prerequisite material that needs to be remembered, namely relations; 6) students are divided into seven groups, each group consisting of 5 people; 7) students sit based on the group that has been divided; 8) The teacher gives LKPD to each group.

The core activities include Stage 1, student orientation to the problem; the teacher asks students to read and observe the problems in the LKPD and ask questions about the problems. Some students are still confused about working on the LKPD. In stage 2, grouping students for learning; namely the teacher directs students to discuss with their groups. Students identify problems in the LKPD, and the teacher encourages students to ask questions about the problems in the LKPD. Stage 3 guides independent and group investigations, namely, the teacher going around observing students working, finding various difficulties experienced by students, and providing opportunities for students to ask questions that are not understood. Several groups still had difficulty solving the questions in the LKPD.

In Stage 4, presenting the work results, the teacher asks students to determine group representatives by deliberation to present the results of their discussions systematically, politely, and time-savingly. Stage 5, Evaluating the problem-solving process, namely, the teacher provides opportunities for students from other groups to respond politely to the results of the presenter group discussion. Some students ask questions to the facilitator group, and the facilitator group continues to answer questions. The teacher then asked the students if anyone had a different answer, and all gave the same answer. In addition, the teacher and other students applauded the group for presenting their discussion results in front of the class. The teacher then gives a conclusion about the learning outcomes of today's meeting. Teachers cannot give students formative tests because the class time change is near.

Closing Activities include: Together with students, the teacher reflects on the activities that have been carried out. Afterward, the teacher is given homework related to function material in the package book, pages 81-86. Students are asked to study the material for the next meeting, namely the one-to-one correspondence function. Then the teacher closed the lesson by greeting them and continued by praying together.

b. 2nd meeting

The learning process was carried out at this meeting for 2×45 minutes (2 JP). The implementation of this class action begins with greetings, students are asked to pray together, and the teacher checks the presence of students. The teacher then asks students to prepare equipment to implement written test questions on learning outcomes. After distributing the questionnaires to the students, the teacher reminded the students that they had to complete them individually within 60 minutes.

Observation Stage

In cycle I, students carry out learning actions using a problem-based learning model (Problem-Based Learning), followed by a learning achievement test in class VIII-G. It was found that 13 students achieved the expected learning mastery, while the other 23 did not achieve the learning mastery level with an average score. The average value of class VIII-G achieves 36.11% classical completeness. During this cycle, some students did not reach academic prowess because they were not very active during the learning process. Of course, if done correctly, the benefits of the problem-based learning model described in Chapter III above will be achieved. But on the contrary, the researcher found the following deficiencies: The concept was not found, and it took a long time, so the researcher could not fulfill the time specified in the lesson plan.

This result is not expected, and the teacher needs to improve learning, which increases students' learning outcomes when solving questions on Functions material. In addition, learning with problem-solving learning models based on Cycle I considerations goes according to the planned procedures.

Even so, there are still some problems that must be resolved to improve cycle II. These problems include: 1) some students are still confused in working on the questions in the LKPD; 2) teachers prepare to learn media that are more diverse to motivate students to learn; 3) the support given by the teacher in carrying out learning is more directed; 4) students who have low abilities are given special attention in discussions and presentations; 5) students are encouraged to participate more actively in group discussions in class.

Cycle 1 reflection

The results of the first cycle of observations included: (1) the teacher led the lesson by following the steps of a problem-based learning model similar to lesson plans, (2) the learning activities of students began to increase, but not all groups were active; (3) The presentation of the results of the discussion is not maximized, students are still shy and are not used to speaking in front of their friends.

2. Cycle 2

Cycle 2 was the same as cycle 1, with two meetings for 3×45 minutes (3 JP). The third meeting with one-to-one correspondence function materials used LKPD, while the fourth used written test questions.

Implementation Stage

The KD used in cycle two is to describe, and state relations and functions using various representations (words, tables, graphs, diagrams, and equations) and solve problems related to relations and functions using various representations.

The research was conducted in the syntax of a problem-based learning model. Improvements made during the implementation stage of these steps include: (a) teacher supervision is more focused on student activities in conducting learning; (b) the teacher supervises individually in group discussions; and (c) special attention to students who have low abilities. (d) Encouraging more active participation in group and class discussions by students who are less able and pay less attention to discussions and presentations; These improvements are expected to minimize the limitations encountered during the learning process.

a. 3rd meeting

The cycle II learning process begins with preliminary activities. These activities include: Starting the lesson by greeting students, inviting them to pray, and confirming the presence of students. All or a maximum of 33 students participate in cycle II of the third session. The teacher then tests their assumptions of knowledge by asking oral and written questions about the material. In Cycle II, teachers tested their prior knowledge of the prerequisite material. The teacher then strengthens the basic knowledge of students. In addition, teachers provide information about what they learn and what learning goals they have to achieve. The teacher then motivates the students by teaching them the benefits of learning one-to-one correspondence functions.

The core activities are Stage 1, student orientation to the problem. The teacher asks students to read and observe LKPD-2 questions and ask questions about these problems. Some students are still confused when working on LKPD-2. Stage-2 is grouping students to study. That is, the teacher asks students to discuss in groups. Students then identify the problems in LKPD-2, and the teacher

asks students to ask questions about the problems in LKPD-2. Stage 3: Conduct an independent group survey. That is, allowing the teacher to go around and observe students, find out the various difficulties students experience, and ask questions that students do not understand.

In stage 4 of presenting the work results, the teacher asks students to consciously appoint group representatives to present the results of their discussions in front of the class in a systematic, polite, and time-saving manner. Stage 5, Evaluate the problem-solving process. In other words, the teacher allows the facilitator group to respond politely to the discussion results by different groups of students. Some students will ask questions to the facilitator group, and the facilitator group will continue to answer questions. The teacher and other students applauded the group for presenting their discussion results to the class. Next, the teacher summarizes the learning outcomes of today's meeting.

Closing activities include: Together with students. The teacher reviews the activities carried out. The teacher is then given homework on functional material on page 114 of the textbook, and students are asked to study the material for the next meeting. Then the teacher ended the lesson by greeting and continuing to pray.

b. 4th meeting

The meeting lasts for 2×45 minutes (2 JP). The learning process begins with students greeting and praying, and the teacher checks the presence of students. The teacher then asked the students to prepare the equipment to carry out the questionnaire and notified the students that the questionnaire would be done within 60 minutes.

Observation Stage

After implementing Cycle II actions in class VIII-G, students were given a learning achievement test, 23 students had achieved the expected learning abilities, and the remaining 13 had not yet reached their learning ability level. Not. In Cycle II, students seemed more involved in learning after adding PowerPoint media. Class VIII-G has an average score of 63.88% completeness in Classics. In Cycle I and Cycle II, students have a moderate learning value of classical completeness increased by 27.77%.

Cycle 2 Reflection

After the RPP was revised in Cycle II, development material also included matters related to learning mathematics. Based on the results of completing or answering questions on the Learning Outcomes Test cycle II, students' weaknesses in problem-based learning mode and learning activities have been resolved, but there are still repeated errors. From Cycle I and Cycle II, the average score of the student's mastery of classical learning increased from 36.11% to 68.88%, meaning that 29 students who did not complete their studies became 13 students who did not complete their learning outcomes. Thus, an increase of 23 students who complete independent learning.

A problem-based learning model can successfully permit the submission of mathematics teaching materials on relations and functions material. Therefore, this study shows that learning with a Problem-Based Learning Model Can Improve Mathematics Learning Outcomes of Class VIII Students of SMP Negeri 23 Pekanbaru in the Academic Year 2022/2023.

CONCLUSIONS AND SUGGESTIONS

Based on the results of research and discussion, an increase in learning outcomes can be achieved by applying a problem-based learning model that can improve student learning outcomes in the material Relations and functions of Class VIII SMP Negeri 23 Pekanbaru has been gradually achieved. For problem-based learning models, namely: (1) problem orientation of students, (2)

grouping students for learning, (3) guiding independent and group research, (4) making and presenting the results of problem-solving, (5) analysis and evaluation of the process solution to the problem. In student orientation activities, the teacher presents problems at the beginning of learning.

Implementing the problem-based learning model (PBL), which is planned to implement the learning process steps, mostly follows the RPP. Based on the analysis of teacher and student activity data in the application of problem-based learning models, learning planning and the learning process have also been improved. Most students are more active at each stage of problem-solving. The application of problem-based learning models by researchers has a positive impact on implementing the learning process. This means that learning becomes less teacher-centered as students become more involved in learning activities. Students are also trained to build their knowledge so that learning becomes more meaningful and embedded in students memories. This affects student learning outcomes.

Classroom action research proves that the PBL learning model can improve students' mathematics learning outcomes in class VIII. For this reason, some suggestions can be put forward: For teachers who want to apply their PBL learning model to learning processes that have the same problems as those faced by researchers. For other researchers, different levels/classes can use their PBL learning model to develop their research. Schools can use the results of this research as a reference to improve their teaching and learning processes.

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