

# Improvement Students' Problem Solving Ability Through Problem Centered Learning (Pcl)

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**Abstract:** The mathematics learning outcomes of MAS students in the Tanah Datar Regency are still relatively low. This is because students who enter private schools are students who do not pass the selection in public schools, besides learning is still centered on the teacher and the lack of students' critical thinking skills and students' mathematical problem-solving abilities is one of the obstacles that affect the low student learning outcomes. One of the efforts made to overcome this problem is to apply the PCL approach to learning. This study aims to determine the effect of the PCL approach on students' mathematical problem-solving abilities, especially in line and series material. The study was conducted on two classes which were used as the experimental class and the control class. In the experimental class, the treatment of learning was given by applying the PCL approach while the control class was given treatment with conventional learning. The research data were obtained from the results of the final test (post-test) given after the PCL treatment was carried out, whereas for data analysis was done using parametric tests for normally distributed data that had homogeneous. The results of the data analysis show that the average final ability of mathematical problem-solving students in the experimental class is 6.54 while the average in the control class is 3.80 with the sig. 2-tailed value is 0.001 which is smaller than the significant level 5%. So it can be concluded that the mathematical problem-solving ability of students through the PCL approach is better than the mathematical problem-solving abilities of students taught with conventional learning in class XI MAS Salimpaung.

**Index Terms** :Sequences and series, Approach PCL, Problem-Solving Abilities, Senior Private Madrasah, student worksheet

## 1 INTRODUCTION

Mathematics helps organize ways of thinking, shapes abilities in analyzing problems, synthesizes and even evaluates to problem solving abilities. A problem usually contains a situation that can encourage someone to solve it [1]. Problems in mathematics are a problem that he alone is able to solve without using routine methods and procedures. Teaching problem solving to students, allows students to be more analytical in making decisions in their lives [2]. The knowledge obtained by students is expected to be able to help solve mathematical problems faced in everyday life. The main purpose of students attending school is to improve mathematical problem solving skills. Mathematical problem solving abilities have an important role such as (1) the general purpose of mathematics learning is mathematical problem solving, (2) strategies, methods and procedures in the mathematics curriculum are the main processes and the core of problem solving, (3) basic abilities in mathematics learning is mathematical problem solving [3]. One of the important activities in mathematics learning and as the heart of mathematics learning is mathematical problem solving skills, strategies, methods and procedures and other ways in the mathematics curriculum which are the main processes and the core of a problem solving, basic abilities in mathematics learning are mathematical problem solving [3]. Problem solving skills should have received special attention because in mathematics learning students are faced with mathematical questions that must be solved so that students become more careful, critical, creative, logical, systematic and analytical. To solve a problem one must master the things that have been learned before and then use them in new situations. Therefore the problem presented to students must be in accordance with their abilities and readiness and the process of completion is not a routine procedure. Students' mathematical problem solving skills are emphasized in thinking about how to solve problems and process mathematical information. The four steps of the problem solving process, namely: "understanding the problem, designing problem solving, carrying out problem solving and checking again" [4]. So, if the teacher can train students' mathematical problem solving skills, it will make students able to make decisions correctly and correctly. This

is because students have been trained so that students are smart in collecting related information, analyzing it and creating self-awareness to check every outcome of their work. The ability to solve math problems by students in Indonesia is still relatively weak, which in general can be said that Indonesian students for aspects of mathematical problem solving abilities are still weak. This is in accordance with the fact that researchers found in the field that there are still many mathematics study teachers who have not yet realized that students are required to have mathematical problem solving skills so that they are able to solve the questions given by the teacher [5]. Private schools are schools that need special attention, based on observations that researchers have found that students in the Tanah Datar district in general are students who do not pass the selection to enter public schools and students who enter purely into the MAS are still categorized as low. This can be seen from the number of students who attend school in one of the MAS in Tanah Datar District namely MAS Salimpaung 2018/2019 Academic Year which amounts to 86 students, besides that the reason students enter MAS Salimpaung is due to the economy of weak parents and demanding students to work home school. This is the reason for the low quality and student learning outcomes, a similar incident also occurred in another MAS in Tanah Datar District. The low quality and learning outcomes obtained by students, can be seen from the UN MAS value data in Tanah Datar District. The mathematics ability of MAS students in Tanah Datar Regency is still relatively low. It can be seen from none of the madrasahs that get the standard average score of 75 for math subjects. Based on the observations of researchers at MAS Tanah Datar Regency on August 1 to 12, 2018, information was obtained about the difficulties experienced by some students in learning mathematics including the inability of students to understand and solve problems given because in the learning process the teacher still dominated. The learning activities carried out by the teacher in general are to provide definitions, to ask students to memorize formulas and provide some examples of questions then ask students to work on the given practice questions. This is the reason why students are not able to

solve the questions given by the teacher when the question editor is changed. In addition, in the learning process students can only wait and receive an explanation from the teacher. Besides that, the experience of the researcher as a mathematics teacher at the Salimpaung MAS that researchers have made improvements to the quality of learning during the learning process in the classroom. Researchers have used several learning methods during the learning process in the classroom such as: question and answer, discussion, peer tutoring and group learning, but the learning outcomes obtained are still not optimal. Based on the tests of students' problem-solving ability at the MAS Salimpaung on 1-12 August 2018 can be seen that students' mathematical problem solving abilities are still relatively low. The same thing was also said by several previous researchers who said that students' mathematical problem solving abilities were still low so further research was needed [6], [7], [8], [9], [10], [11], [12]. Based on interviews conducted by researchers to several students of class XI MAS Salimpaung, Salimpaung Subdistrict, Tanah Datar District, information was obtained that when solving math problems students were still having trouble analyzing questions and did not understand how to solve the problem given. Students assume math lessons are full of formulas and calculations, so it is difficult to memorize the steps to solve the problem. Learning by the teacher still does not use the right learning approach so that it can improve students' mathematical problem solving abilities. There are still many students experiencing difficulties in the process of learning mathematics and are less responsible for the training given so that making mathematics as a subject that is less attractive to most students. Students always consider math lessons to be full of formulas and calculations, so that students have not been able to interpret the usefulness of mathematics in their daily lives. Based on the condition of the problem, it is necessary to learn that is able to improve students' mathematical problem solving abilities optimally. One learning that is able to improve students' mathematical problem solving skills is problem centered learning (PCL). Here students are trained to identify a problem, analyze it, reconstruct an argument, conduct an evaluation so students can solve the problem correctly and correctly. This PCL approach gives students the opportunity to build their knowledge so that students are able to understand the problem given, plan in solving problems and be able to use a well-planned strategy so that when checking again the problem given provides a great confidence for students that the answer is correct [13]. The PCL approach is an approach carried out in learning that is centered on a problem and results in negotiation between students and group friends and classmates as well as between students and teachers. In learning with the PCL approach the teacher must pay attention to three important steps in learning, namely doing assignments, group activities and class discussions (sharing) [14]. First, students work on assignments individually. In this activity the activity of students is that students are asked to conduct an investigation of the problem in order to complete it, in this activity the student worksheet is a reference in its completion. Students will conduct their own investigations and work alone to solve problems through the worksheets of students who are given according to a predetermined time. Second, students carry out group activities. In this activity the student activity is that students communicate the individual answers that have been worked on and continue the work in

groups. In this group activity, students will share with each other or share answers by discussing the problems given so that there is negotiation among fellow students in finding problem solving and taking the results of joint decisions or group agreements. The results of mutual agreement from each group are collected at the teacher and conclusions drawn together after the end of the specified time. Third, proceed to class discussion activities. In this activity the teacher checks the results of the group answers and asks one or two groups to present the results of the answers from the group. The group that was asked to appear and present their answers was the group whose answer was considered correct and the way to solve it was also different.

## 2 RESEARCH METHODS

This type of research, when viewed from the problem under study, is quasi-experimental research (quasi-experiment). The population of this study was class XI MAS Tanah Datar District 2018/2019 Academic Year where each school had homogeneous learning. The researcher used the Purposive Sampling technique to determine the school, the selected school was MAS Salimpaung with certain considerations and paid attention to specific characteristics to solve the problem in MAS, namely consideration of researchers teaching in the MAS Salimpaung and its special characteristics were MAS Salimpaung homogeneous with other MAS in Tanah Datar District [15]. To determine the experimental class and the control class, the researcher used the Random Sampling technique so that the XI IS class was selected as the experimental class and XI GPA as the control class. The instrument that the researcher used was the student's final ability test instrument, giving the final test was done by giving the same questions to both classes namely the experimental class and the control class. The question includes indicators of the ability seen, namely mathematical problem solving abilities. The test in this study uses questions in the form of essays with subject matter in the sequence and series. The questions given were first validated by 5 validators and conducted a trial at the MA Private Plus Barulak school in Tanjung Baru District, Tanah Datar District. After that, a validity analysis, problem differentiation analysis, difficulty index and reliability of questions were carried out. Based on the results of the analysis it was concluded that the final ability test questions of students used to test students' mathematical problem solving skills could be used as a data collection tool. The data analysis technique used is the normality test, homogeneity test and hypothesis testing of the final ability test results of the experimental class and the control class to test the students' mathematical problem solving abilities. Testing the hypothesis to see the effect of the PCL approach on mathematical problem solving skills and to see whether learning with the PCL approach is better than conventional learning students of class XI MAS Salimpaung use the t test. The t test is used because the data is normally distributed and homogeneous.

## 3 RESULTS AND DISCUSSION

After conducting research in both sample classes, data obtained from the test results of students' mathematical problem solving abilities. The data collected is shown in table 1 about the average value, the highest value, the lowest value, the standard deviation of the final test of students' mathematical problem solving abilities can be seen in table 1.

**Table 1. Average Value, Highest Value, Lowest Value, Standard Deviation of Problem-Solving Ability**

Data	Number of Student	Maks score	Min score	Mean	Std. deviation
Eksperiment class	13	10	4	6.54	1.664
Conventional class	15	8	0	3.80	2.007

To test hypotheses statistically, it must first carry out normality tests and homogeneity tests. This is because the hypothesis test is done with the help of SPSS software that uses the Kolmogorov-Smirnov test to see whether the data is normally distributed or not and the homogeneity test with the help of SPSS software that uses the Levene test to see whether the

data variance is homogeneous or not a requirement to perform a t test. The criteria in the test are  $H_0$  accepted if the value of Sig. > real level ( $\alpha = 0.05$ ) and  $H_0$  are rejected if the opposite happens. The result can be seen in table 2 and table 3.

**Table 2. Normality test with Kolmogorov-Smirnov for students' Problem-Solving Ability**

Data	Kolmogoroc-Smirnov statistic	df	Sig.	Decision
Eksperiment class	0.160	13	0.200	Data was normal
Conventional class	0.206	15	0.085	Data was normal

**Table 3. Levene's test for equality of variances for Problem-Solving Ability**

Data	Levene-statistic	df1	df2	Sig.	Decision
Eksperiment class vs Conventional class	1,177	1	26	0.288	variance was homogeneous.

To find out whether or not there was an effect of learning using the PCL approach to mathematical problem solving abilities of the XI class of MAS Salimpaung students using post-test data on students' mathematical problem solving

abilities carried out in the experimental class and the control class. Hypothesis testing is calculated with the help of SPSS 21 software which uses a Independent sample t Test, the result can be seen in table 4.

**Table 4. Two independent sample t-test for students' Problem-Solving Ability**

Data	t-statistic	df	Sig. (2-tailed)	Decision
Eksperiment class vs Conventional class	3,89	26	0.001	mean score was different significantly

In table 4 above, it is known that the sig (2-tailed) value is  $0.001 < 0.05$ , then  $H_0$  is rejected or  $H_1$  is accepted. This means that the average mathematical problem solving ability of students of class XI MAS Salimpaung in the experimental class (PCL approach) is higher than the average mathematical problem solving ability of students in the control class (conventional learning). In the table also shows that there are differences in the average value in the experimental class with the average value in the control class. This can also be seen from the statistical group data of the independent sample T-test which shows the difference in the average experimental class post-test (PCL) which is 6.54 with the control post-test class of 3.80. The cause is that there is a difference in the average mathematical problem solving ability of the XI MAS Salimpaung class students between the experimental class and the control class. The PCL approach involves three components, namely doing assignments, group activities and sharing [13]. Group work can also provide opportunities for students to think about solving problems with different approaches and train students to accept the opinions of others [15]. The PCL approach teaches students about three important learning abilities, namely: (a) To find concepts and solve problems including being able to read facts, answer questions and work on assignments/ worksheets, (b) To think not just to remember, (c) To can work with small groups, not only compete with others [19]. With the mathematical problem solving abilities obtained by students through the PCL approach makes students able to design and do problem solving well. This can be seen with the enthusiasm of students in working on the Student Worksheet (LKPD) given, students are more challenged to solve the problems that exist in the LKPD. The LKPD that students work on every time the meeting is able to guide and guide students to solve problems

with the steps that lead to the material students are learning. According to Triyanto [20], LKPD is a student guide that is used to carry out investigation or problem solving activities and the use of LKPD can improve student's achievement in mathematics [21]. There are many other learning approaches that can be used to improve achievement in mathematics, for example: APOS theory approach [22], constructivism approach [23], realistics mathematics education approach [24] and discovery learning model [25]. In the control class with conventional learning, the teacher still teaches in the form of lectures, provides practice questions and asks students to do the exercises in the group and appoints one of the students to work ahead. Learning is still one-way with students waiting for more explanations from the teacher, which results in students becoming lazy in learning their own subject matter. Most students are not able to solve the problems given and tend to wait for a smart friend to solve them, when the teacher appoints one of the students to work forward what happens is the student brings a friend's answer book that is smart to copy on the writing board. This was revealed after the researcher asked the student to explain what was done in front of the writing, apparently the student was unable to explain it and after being asked where the answer came from it was revealed that it was a group friend's book that was considered smart by his group friends. Based on the elaboration above, it can be concluded that the mathematical problem solving ability of class XI MAS Salimpaung students in the experimental class (PCL approach) is better than the average mathematical problem solving ability of students in the control class (conventional learning) for row and series material.

## 4 CONCLUSIONS AND SUGGESTIONS

Based on the explanation of the results of the research carried out in the XI class of MAS (Private Islamic Senior High School) in Salimpaung and the discussion can be taken it was concluded that: (1) There is a significant influence on the mathematical problem solving ability of students of class XI MAS Salimpaung after being treated with the PCL approach, (2) The mathematical problem solving ability of class XI MAS Salimpaung students who use the PCL approach in learning is better than students with conventional learning. Thus learning that uses the PCL approach can be used as a solution to the problems of mathematics education, especially to improve students' mathematics learning outcomes, namely on students' mathematical problem solving abilities. Based on the results of the research obtained, the researcher can put forward the following suggestions: (1) For the mathematics teacher MAS (Private Islamic Senior High School) in Salimpaung as an alternative to improve student learning outcomes in school. The PCL approach can be used in line and series material especially in improving students' mathematical problem solving abilities. In addition, in the learning process using the PCL approach, the teacher must pay attention to the suitability of the time with the implementation of the PCL approach. (2) For further researchers, for further researchers who are interested can continue this research on other material by covering students' mathematical problem solving abilities and can develop with other abilities on mathematics subjects.

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