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The Influence of Contextual Approach to Students' Problem Solving Ability of Class IX of SMP Negeri 1 Bayang

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Abstract

The purpose of this study was to investigate the effect of student's problem solving abilities with contextual approaches. Student'sproblem solving ability is still low because the teacher does not associate mathematics material with student's real world situations. In addition, students are also less active especially to find mathematical concepts. To overcome this problem, a Contextual Approach was applied in mathematics learning. This research is a quasi-experimental research using a quantitative approach. The research population was students of grade IX students at SMPN 1 Bayang. The used technique for sampling is random sampling. The research sample was of class IX.2 as an experimental class and class IX.3 as a control class. The used instrument was a problem solving ability test and questionnaire. Data obtained through tests were analyzed using two-way variance analysis. The results showed that the average test scores of student's problem solving ability in experimental class was higher than the control class for high and low initial abilities. It can be concluded that problem solving abilities can be improved by using contextual learning.

Keywords: problem solving, contextual learning, mathematics, experiment

INTRODUCTION

The purpose of learning mathematics in school (1) helps students solve mathematical problems using their own methods, (2) helps students know the information needed to solve mathematical problems, (3) encourages students to think logically, consistently, systematically and develop documentation systems or notes, (4) encourage student initiative and provide opportunities for thinking differently, (5) encourage curiosity, desire to ask, ability to refute and predict [1].

Mathematics is very instrumental in the provision of knowledge and formation of attitudes and mindsets of students both in terms of understanding concepts, reasoning, communication, and problem solving, and having an attitude of respecting the usefulness of mathematics in their lives. In fact students still have difficulty understanding mathematics learning material. The reason is that teachers do not associate new material with the real world situation [2]. Teachers are still not optimal in providing motivation in the form of usefulness and relevance of mathematical concepts to real situations. The teacher does not facilitate students with the process of finding themselves. Students receive more concepts from the teacher and are given less opportunity to construct their own ideas in finding it. In addition, students also rarely work in groups [3]. As a result, students are not accustomed to discuss or help others in understanding the material. Students acknowledge that they are also rarely asked to show the result of their work [4].

Based on interviewed with several students, it was known that the teacher gave less attention to the results of student work such as giving grades to the exercises given. In addition, the questions given are routine questions [5]. As a result, students feel confused whenasked different forms of questions even with the same concept. Students arenot able to solve applied problem (problem solving) which is related to daily life. Students acknowledge that they are not sure of the answers obtained because they are not familiar with the problem [6, 7, 8].

The approach that is deemed suitable to overcome this problem is a contextual approach. It helps teachers to relate material to student's real world situations. It facylitate students in the process of finding their own concepts. Contextual learning approach encourage student to presents discussion and express their opinions. And all of it relates to student's environment [9, 10].

The contextual approach is a strategy that emphasizes the involvement of students in finding their own material or concepts learned and connecting them in real-world situations[11]. The contextual approach is a strategy in learning that has seven principles or components, they are: Constructivism, Inquiry, Questioning, Learning Community, Modeling, Reflection, and Authentic Assessment [12].

METHODS

The type of research is a quasi-experiment. Experimental class is a class that is treated with the application of a contextual approach, while the control class is a conventional approach [13]. The variables in this study consist of (1) independent variables, which is the application of contextual approaches and conventional approaches (2) dependent variables, problem solving abilities, and (3) moderator variables, student's initial knowledge. The research design used was Treatment by Block 2x2 as shown in Table 1.

Table 1. Research Design for Problem Solving Ability

Initial knowledge (X_2)	Learning Approach(X_1)	
	Contextual (X)	Conventional (Y)
High (X_{21})	$X_{21}X_{11}Y_1$	$X_{21}X_{12}Y_1$
Low (X_{22})	$X_{22}X_{11}Y_1$	$X_{22}X_{12}Y_1$

The population in this study were all students of class IX SMP N 1Bayang which consists of 7 classes. The sample is students IX 2 and IX 3.To find out whether the average mathematics learning outcomes of the experimental class are better than the average learning outcomes of the control class, one-sided testing is carried out with the following hypothesis:

1) First Hypothesis

   H_0: $\mu X_{11}Y_1=\mu X_{12}Y_1$
   H_1: $\mu X_{11}Y_{11}>\mu X_{12}Y_1$

2) Second Hypothesis

   H_0: $\mu X_{21}X_{11}Y_1=\mu X_{21}X_{12}Y_1$
   H_1: $\mu X_{21}X_{11}Y_1>\mu X_{21}X_{12}Y_1$

3) Third Hypothesis

   H_0: $\mu X_{22}X_{11}Y_1=\mu X_{22}X_{12}Y_1$
   H_1: $\mu X_{22}X_{11}Y_1>\mu X_{22}X_{12}Y_1$

The statistical test used to test the first, second and third hypotheses are the t-test with the P value interpretation criteria. If the P value is < real level (α) then reject H_0 and vice versa accept H_0.[14]

4) Fourth Hypothesis

H_0: $\mu X_{21}X_{11}Y_1=\mu X_{21}X_{12}Y_1=\mu X_{22}X_{11}Y_1=\mu X_{22}X_{12}Y_1$

H_1: At least there exist the different mean

To test the fourth hypothesis is used the SPPS software with the criteria Reject H_0 if $F_{count} > F_{table}$ by looking at the degree of freedom and the real level α used.(Irianto, 2010)

RESEARCH RESULTS AND DISCUSSION

Problem Solving ability showed bythe results of the final test given to students in both of the experimental class and the control class. The results of the final test analysis can be seen from Table 2.

Table 2. Problem Solving Ability Scores

Class	Initial Knowledge	N	X	s^2	S	X_{max}	X_{min}
Experiment	High	9	77,00	98,80	9,94	87	55
	Low	17	74,82	77,79	8,82	85	50
	Total	26	75,58	79,21	8,90	87	50
Control	High	10	70,70	71,06	8,43	83	55
	Low	16	63,94	77,44	8,80	73	44
	Total	26	66,54	80,64	8,98	83	44

Based on Table 2, the average value of the experimental class students is higher than the control class. The percentage of completeness in the value of the experimental class students was higher than the control class. In terms of initial knowledge, high group students had an average problem solving ability higher than the control class, as well as in low group students.

To draw conclusions about the data on students' problem solving skills in both sample classes, statistical analysis was carried out. Before the hypothesis test, the normality test and the variance homogeneity test of the two sample classes were first carried out.

From the normality test obtained the value of P = 0,061 for experimental class and P > 0,15 for the control class.The value of P is bigger than α=0,05 for both of sample classes. Based on two result, we can conclude that the data is normally distributed. From the initial knowledge of the students, we got the value of P > 0,15 for both of classes. So we can conclude that the data of the higher and the lower class are normally distributed. From the homogeneity test result we got the value of P = 0,966. Because of the value of P > α = 0,05, so we can conclude that the data of both classes are homogenous.

Hypothesis Test

Because the data of problem solving ability of students in both classes is normally distributed and has a homogeneous variance, to test the first hypothesis to third one-way t-test is used and for the fourth hypothesis two-way variance analysis test.

a) Test of Differences in Students' Problem Solving Abilities

This hypothesis test is used to determine the difference in problem solving ability between the two sample classes, namely the experimental class with the contextual approach and the control class with the conventional approach. The following are the results of statistical tests using the one-way t-test as shown in Table 3.

Table 3. - Test of Student's Problem Solving Skills

Class	Mean	t_{count}	P	Df
Experimental	75,58	3,57	0,000	50
Control	66,54			

In Table 3, obtained $t_{count} = 3{,}57$ and the value of $P = 0{,}00$. By $\alpha = 0{,}05$ obtained $t_{table} = 1{,}677$at df = 50, since $t_{count} > t_{table}$ and the value of $P < \alpha=0{,}05$, can be concluded that H_0 is rejected.This mean that student's problem solving ability by using contextual approach is better that conventional learning.

b) Test of Differences in Students' Problem Solving Abilities with Higher Initial Knowledge

This hypothesis test was used to determine the differences in students' problem solving abilities in the two sample classes, namely the experimental class with contextual approach and control class with the conventional approach of high initial group students. The results of statistical tests using the t-test can be seen in Table 4.

Table4. Students' Problem Solving Abilities with Higher Initial Knowledge

Class	Mean	T_{count}	P	Df
Experimental	77,00	1,48	0,077	17
Control	70,70			

In Table 4 obtained $t_{count} = 1{,}48$. By $\alpha=0{,}05$ obtained with the value of $t_{table} = 1{,}74$. This mean $t_{count} < t_{table}$ and H_1 be rejected. However, for $\alpha = 0{,}1$ obtained $t_{table} = 1{,}33$, then $t_{count} > t_{table}$. In other word H_1 is accepted. This mean that the student's problem solving skills with higher initial knowledge by using contextual approach is better than the conventional approach, and it can be accepted with level of trust 90 %

c)Test of Differences in Students' Problem Solving Abilities with Lower Initial Knowledge

This hypothesis test is used to determine the difference in problem solving ability of the two sample classes, namely the experimental class with the contextual approach and the control class with the conventional approach of the low group students. The results of statistical tests using the t-test can be seen in Table 5.

Table5. Students' Problem Solving Abilities with Lower Initial Knowledge

Class	Mean	t_{count}	P	Df
Experimental	74,82	3,60	0,001	31
Control	63,94			

Based on Table5, known that t_{count} = 3,60 and the value of P= 0,001. By α = 0,01 obtained the value of t_{table} = 2,457 with df=31, since $t_{count} > t_{table}$ and the value of P < α=0,05, can be concluded that H_0 is rejected. This mean the student's problem solving ability with lower initial knowledge by using contextual approach is better than conventional approach, and can be accepted with level of trust 99 %.

d) Interaction Test Between Learning Approach with Initial Knowledge to Student's Problem Solving Skills.

This hypothesis test is used to determine the interaction between learning approaches and students' initial knowledge of problem solving skills in both sample classes. Statistical test results using the two-way variance analysis test as shown in Table 6.

Table 6. Interaction between Learning Approach with Initial Knowledge to Student's Problem Solving Skills

Source of Variation	Quadratic Sum	Degree of Freedom	Middle Quadratic	F_{count}
Interaction	63,266	1	63,266	0,806
Error	3767,508	48	78,49	

In Table 6 obtained F_{count} = 0,806. By α = 0.05 obtained the value of $F_{table} = F_{(0,05)(1;48)}$= 4,04, since $F_{count} < F_{table}$ can be conclude that H_0 is accepted.This mean that there is not interaction between learning approach with initial knowledge to problem solving skills.

This conclusion can also be seen graphically. Figure shows that the lines on the graph of learning outcomes regarding students' problem solving abilities are almost equal between students who have high knowledge and students who have low knowledge. This means that there is no interaction between the learning approach and the initial knowledge of students' problem solving abilities. In other words, a contextual approach can be used both for students who have high or low initial knowledge.

In terms of the average ability of the experimental class and control students based on the indicators of problem solving, it appears that the first indicator is understanding the problems of students in the control class is superior to the experimental class for Worksheet 1, 5 and 6 as shown in Table 7.

Table 7. Percentage of Students Based on Capability Indicators of the Solution of problem

Indicator	**Worksheet**											
	I		**II**		**III**		**IV**		**V**		**VI**	
	Ex	**Co**	**Ex**	**Co**	**Ex**	**Co**	**Ex**	**Co**	**Ex**	**Co**	**Ex**	**Co**
Understanding the problem	57,7	68,0	46,1	34,6	80,8	73,1	84,0	76,9	80,8	84,6	83,3	84,0
Choosing a strategy	50,0	56,0	38,5	26,9	79,2	68,0	72,0	57,7	73,0	80,8	76,0	72,0
Developing strategy	-	-	38,5	19,2	-	-	-	-	88,5	80,0	87,5	72,0

Based on Table 3, we can see the percentage of control class students are higher in LKS I, II and VIin control class. It happens because the students are trained to understanding the problem by relate it into their daily life. But for the second and third indicators, students should choose and develop a problem solving strategy. Students in experiment class reach better than students in control class. It as a result of train students to develop their ability to relate the problem into daily life situations. It also encourage by the syntax of contextual learning.

If we check student's ability in terms of mastery learning, 21 students in experimental class reach score more than the minimum criteria and in control class, it just due to 10 students. Thus, it can be said that the problem solving ability of the experimental class students in geometry material with the subject matter of the Curved Space is better than the control class. In addition, the problem solving abilities of students in the control class were more diverse than the experimental class. It happens because the contextual approach can meet the needs of each student to develop their problem solving abilities.
.In terms of student's initial abilities, it was found that the average score of students who had high initial knowledge in the experimental class was better than the average score of students who had high initial knowledge in the control class, as well as students who had low initial knowledge. Based on these results, it can be said that the contextual approach can improve the problem solving abilities of students who have high and low initial knowledge, compared to the control class.

Based on average score of student's problem solving ability, difference between low and high group students are very diverse. It happens because the deviation of student's capability on lower group are significant compare to student's capability in the higher group. As consequence, we have to use 90% significant level for accepting null hypothesis. However, it does not mean that the contextual approach is more suitable for low group students.

In completing the final test problem, students are required to be able to work and provide their own ideas based on indicators of problem solving, they are identify the problem, choosing approach and method to solve the problem, and develop problem solving strategy to solve daily life problem.

In completing the final test problem, students are required to be able to work and give their own ideas based on indicators of problem solving, namely showing understanding of problems, choosing approaches and methods of problem solving appropriately, and developing problem solving strategies, especially problems or problems encountered in daily life - day.

Judging from the results of the problem solving ability test students in the control class showed that for the same problem, namely the number 1 problem, the control class students could understand the problem well. Students can already visualize and apply the concept correctly. Although there are still one or two people who make mistakes, but not as many as students in the experimental class.

The contextual approach is an approach that can motivate students to develop mathematical concepts according to their abilities [16]. Students not only accept it, but also find their own concepts of geometric material that is being studied, while the teacher only acts as a facilitator who guides students in finding the concept. In this way more meaningful learning will be created, namely learning helps students to chronicle mathematical concepts or principles with their own abilities through the process of internalization so that the concept or principle is rebuilt [17]. During the implementation of learning using a contextual approach, students cooperate with each other during group discussion activities. Before that, students are asked to be able to find concepts according to the steps in the worsheet.

The contextual approach is an approach that can facilitate students with problems of daily life because each concept that is obtained is related to the real situation of students so that they can apply the concept to solve problems that are often encountered in their environment [18]. This of course will be able to improve students' problem solving skills, especially problems related to everyday life. If students are able to apply the concept, then automatically the students' beliefs about the usefulness of mathematics in their lives can also be improved.

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Students' confidence in mathematics can be grown if the learning process presents more problems and also connects every concept used in their lives [19]. This gives a view for students that mathematics is not a set of formulas that have no meaning at all but mathematics is part of the lives of students who can give way to problems that are often encountered in everyday life [20]. In other words, the contextual approach can improve problem solving skills so students have confidence in their own abilities, especially in solving everyday problems. In addition, students also have the belief that mathematics is a subject that can be useful for their lives.

In applying a contextual approach, the teacher tries to associate new material or information with students' real world situations. Then students are asked to be able to understand and give ideas (construct) in finding concepts from geometrical material. In group activities, students can work together and share ideas to complete activities in the worsheet. After that, students are asked to present the results of their discussion in front of the class. At first, students are reluctant or lazy to come to the front of the class, so the teacher gets the idea to give a bonus to students who want to answer, respond or give questions. This method is quite successful, because many students want to participate. In class discussions, students are trained to be able to express opinions. This can create good communication between students and teachers and students with other students [21].

Reflection activities are carried out by giving students the opportunity to record or copy the results of the discussion into their notebooks [22, 23]. At first this activity was not going well due to time constraints, so at the next meeting the teacher tried to divide the time so that reflection activities could be carried out. In addition, reflection activities are also carried out by concluding the subject matter, and giving an impression or message about the course of learning.

Based on the description above, it can be concluded that the contextual approach can increase students' activeness and problem solving abilities so that they can use mathematical concepts, especially geometric concepts in solving real world problems so that they can have confidence that mathematics is very useful for their lives. In addition, students also believe that activities or activities that they often do in life are mathematics. This happens because the contextual approach requires not only students to find concepts, but also can connect these concepts to real world situations, especially in solving problems so students can have confidence in the usefulness of mathematics in their lives.

CONCLUSIONS

Based on the results of the study, it can be concluded that the problem solving abilities of students who learn using contextual approaches are better than students who learn using conventional approaches both as a whole and based on initial abilities.Based on the conclusions above, it is recommended that the mathematics teacher of SMP Negeri 1 Bayang be expected to apply a contextual approach in the learning process because it is proven to be able to improve students' problem solving skills and beliefs in mathematics.

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