The Effect Of Ralistic Mathematics Learning Model And Project-Based Learning Model On Problem Solving Ability And Motivation Of Students In Class V Private Sd Markus Medan Helvetia

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Abstract

This study aims to determine: (1) the difference in the average increase in problem solving skills between students who are taught with a realistic mathematics approach and project-based learning ; (2) the difference in the average increase in student motivation between students taught with a realistic mathematics approach and project-based learning ; (3) improving students' problem-solving skills between those taught with realistic mathematics approaches and project-based learning ; (4) increase in student motivation among students who are taught with a realistic mathematics approach and project-based learning . The research is in the form of a Pre Experimental Design with a Two Group Pretest-Posttest research design . The instruments in this research are problem solving ability test and student motivation questionnaire . The data analysis uses t-test and gain scores. The results of the study show: (1) there are differences in problem-solving abilities, students who are taught by project-based learning are better than those with a realistic mathematics approach , this is based on the t - count value (= 0.001) so that there is a difference because sig (2-tailed) < 0.05 and t count is positive ; (2) there is a difference in student motivation taught by project-based learning is better than with a realistic mathematics approach , this is based on the value of t count (= 0.001) so there is a difference because sig (2-tailed) < 0.05 and t count is positive ; (3) The improvement of the problem solving ability of students who are taught by project-based learning is higher than the realistic mathematics approach , this is based on the gain score; (4) the increase in student motivation taught by project-based learning is higher than the realistic mathematics approach , this is based on the gain score.

Keywords: *Realistic mathematics approach, project-based learning, problem solving ability, student motivation.*

I. INTRODUCTION

Mathematics subjects have an important role in human life. one of them is used to help humans in solving problems. A person's success in life can determined by ability problem solving, especially the ability to solve mathematical problems. The role of mathematics in education is in accordance with the purpose of education, namely developing the potential of students to become human beings who believe and fear

God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens. This goal is a provision in Law No. 20 of 2003.

Based on these educational goals, problem solving skills in mathematics are very important. Mathematics will succeed and have an impact if it is based on mathematical power, one of which is mathematics as a medium for communicating ideas (*mathematics as communication*) so that if someone who masters mathematics will be able to communicate ideas and ideas that he understands to others [1] .

Mathematics means learning to understand learning to define and communicate ideas and ideas contained in graphs, diagrams, pictures, variables and symbols [2] . On the other hand, learners are also required to be able to communicate their ideas and ideas using mathematical language. Moving on from the nature of mathematics and the above rules, mathematics learning should be able to develop students' abilities to understand the ideas contained in symbols, diagrams and other media and use them to express ideas, model problems and solve them [2] . Therefore , mathematics is one of the subjects that is a major concern, but mathematics is still a difficult subject for students to learn , even a frightening subject for most students.

Based on the observation of the mathematics learning outcomes of students in grade V private elementary school Markus Hervetia Medan, it shows that 75% of students are not able to solve math problems. So that mathematics learning becomes hampered to apply the concept of further mathematics lessons. In addition, the pattern of working on students' mathematics tests also does not show a variety of solutions. This shows the lack of student motivation in solving mathematical problems.

Therefore, as educators, they must be able to awaken students' thinking abilities. The ability to think is a process that involves one's mind, mind, and thoughts to solve problems. The thought process is an event mix, match, combine, swap and sort concepts, perceptions, and previous experiences [3] . Thinking abilities are relatively specific abilities in thinking about something that someone needs to understand something in the form of information in the form of ideas, concepts, theories and so on [4] .

Learning mathematics also requires motivation. Motivation is the impetus or driving force for achieve a goal or expected wishes. Motivation comes from the word "Motif", meaning as an effort that encourages someone to do something [5] . motivation is conscious drive or effort to influence someone's behavior to be moved to act do something so as to achieve a result or specific purpose [6] . Every activity that humans do is always there motivation, as well as learning. Motivation and learning are two things that influence each other .

In this case, to raise students' problem-solving abilities and student motivation, the application of the learning model will be tested. Research on students' problem solving abilities will be carried out using a realistic mathematical approach and project-based learning to solve mathematical problems. These two models will be compared so

that it can be concluded that which model is better for improving students' problem solving skills and student motivation.

Based on the description above, the purpose of this study is to analyze: 1) Is there a difference in the average increase in problem solving abilities between students who are taught using a realistic mathematics approach and students who are taught using project-based learning; 2) Is there a difference in the average increase in students' motivation towards mathematics taught using a realistic mathematics approach with students taught using project-based learning; 3) How to improve problem solving ability after being taught using Realistic Mathematics Approach and Project-Based Learning; 4) How to increase students' motivation towards mathematics after being taught using Realistic Mathematics Approach and Project -Based Learning .

Problem solving is an attempt to find a way out of a goal that is not so easy to achieve immediately [7] . Problem solving is the process of applying previously acquired knowledge to new and different situations. In addition, the NCTM also stated that the objectives of teaching problem solving in general are to (1) build new mathematical knowledge, (2) solve problems that arise in mathematics and in other contexts, (3) apply and adapt various appropriate strategies to solve problems. problems and (4) monitor and reflect on the process of solving mathematical problems [8] .

From the understanding of problem solving stated above, it indicates that obtaining a solution to a problem is a requirement for the problem solving process to be said to be successful. In solving problems, each individual takes a different amount of time. This is due to the motivation and strategies used in solving the problems they are facing. Indicators of learning motivation can be classified, namely 1) the desire and desire to succeed; 2) there is encouragement and integrity to learn; 3) the existence of hopes and aspirations for the future; 4) there is an appreciation in learning; 5) there is an interesting desire in learning; 6) the existence of a conducive learning environment [9] .

The Realistic Mathematics approach is an adaptation of *Realistic Mathematics Education* , a learning theory developed in the Netherlands, particularly the Freudenthal Institute . The realistic mathematics approach incorporates a view of what mathematics is, how students learn mathematics, and how mathematics should be done. Realistic Mathematics Approach is a learning approach that starts from " *real* " things for students, emphasizes the skills of " *process of doing mathematics* ", discusses, collaborates, argues with classmates so that they can find their own and in the end use mathematics to solve problems both individually and collectively. individual or group [10] .

The Realistic Mathematics approach has special characteristics, namely: 1) The introduction of new mathematical concepts is done by giving students *realistic contextual problems* (realistic contextual problems) ; 2) With the help of the teacher or the help of friends, students are welcome to solve realistic contextual problems. Thus,

it is expected that students *re-invent* (find) mathematical concepts or principles or find models ; 3) After finding a solution, students are directed to discuss their solution (which is usually different, both in terms of the way and the result) ; 4) Students are welcome to reflect (rethink) what has been done and what has been produced, both the results of independent work and the results of discussions ; 5) Students are also helped to relate some of the content of mathematics lessons that are related ; 6) Students are invited to develop, or expand, or improve, the results of their work in order to find more complicated mathematical concepts or principles ; 7) Emphasize mathematics as an activity not as a finished product, or ready-to-use results. To learn mathematics as an activity, a suitable way is *learning by doing* . [11] .

Furthermore , the project-based learning model is a learning activity that involves students directly to complete and create an activity that produces a product. based learning project/ Project Based Learning is a learning model that provide opportunities for teachers to manage learning in the classroom involving project work. Through project work learning, creativity and student motivation will increase [12] . Project Based Learning is defined as a teaching that trying to link technology with the problems of everyday life that familiar with students, or with school projects related to mathematics [13].

The project-based learning model has learning steps, (1) Preparing questions or assignments project. This stage is the first step so that students observe more deeply to questions that arise from existing phenomena. (2) Design project planning. As a concrete step to answer the existing questions a project plan can be prepared through experiments. (3) Arrange schedule as a concrete step of a project. Scheduling is very important so that the project is carried out in accordance with the available time and in accordance with the target. (4) Monitor project activities and progress. Teacher does monitoring of project implementation and progress. Learners evaluate ongoing projects. Meanwhile, according to Aria Yulianto, et al (2017: 2) project-based learning syntax has 6 steps, including (1) determining questions base; (2) make project designs; (3) arrange the schedule; (4) monitor project progress; (5) result assessment; (6) experience evaluation . So there are 6 stages of project - based learning that will be used in this research as described [14] .

II. RESEARCH METHODS

This research was conducted in the fifth grade of private elementary school Markus Helvetia, Medan, North Sumatra in the even semester of the academic year 201 9/20 20 . The population in this study were all private elementary school students Markus Helvetia Medan, North Sumatra in the even semester of the academic year 201 9/20 20 and the sample was class V students, which consisted of two classes namely class VA and class VB, with the number of students each -each class (Class VA numbered 21 people consisting of boys = 8 people and girls = 1 3 people, while Class VB numbered 22 people consisting of boys = 10 people and girls = 12 people).

This study has two types of research variables, namely the independent variables in this study, namely the Realistic Mathematics Approach (X1) and Project - Based Learning (X2) . The dependent variable in this study is problem solving ability (Y 1) and learning motivation (Y 2). This type of research is *Pre-Experimental Designs (Nondesigns)* . The design used is *Two Group Pretest-Posttest Design.*

The instrument used in this research is a test of problem-solving skills and a test of creative thinking skills. Each research instrument was analyzed using descriptive statistics and inferential statistics with the help *of SPSS 22.0 for windows software* . Inferential statistical analysis in this study is the calculation of normality (with *Shapiro-Wilk test*), homogeneity (with *Lavene test*), and hypothesis (with *Independent Samples Test* or one-way t-test).

III. RESULTS AND DISCUSSION

Instruments were given to each student in two experimental classes, namely class VA with a total of 2 1 students who were given *treatment* with a realistic mathematical approach and class VB, which consisted of 22 students, given *treatment* with project-based learning . The results will be presented in the following table:

Table1. Problem Solving Ability Pretest

	N	Minimum	Maximum	Sum	mean	Std. Deviation	Variance
Pretest realistic math approach	22	11	23	396	18.00	3,450	11,905
Project-based Learning Pretest	21	14	24	406	19.33	2,904	8,433
Valid N (listwise)	21						

Table1. shows that the average pretest score of students' problem-solving abilities in the classroom with a realistic mathematics approach namely 1 8 , 00 and in the project-based learning class that is 1 9.33 , the value of each class of the research sample is relatively the same. So based on table 3.1 , it can be concluded that the realistic mathematics approach class and problem-based learning class have relatively the same value , but to find out the equality of scores, the data distribution normality test and data homogeneity test were carried out .

The results of the calculation of normality obtain the value of sig. realistic mathematics approach class (=0,3 73) is greater than the value of (= 0,05) and the value of sig. project-based learning class (= 0.082) is greater than the value of (= 0.05) so H 0 is accepted, in other words both classes come from a normally distributed population. The results of the calculation of homogeneity obtain the value of sig. (=0, 2 62) is greater than the value of (= 0,05) so that H 0 is accepted, in other words the two classes come from populations with homogeneous variance. The results of the calculation of the difference test show that the two pretest data on students' problem

solving abilities have sig. *2-tailed* (=0.1 8 9) is greater than (= 0.05) so that H $_{0\ is}$ accepted. Based on this, it can be concluded that " both classes have the same average problem-solving ability pretest " .

Posttest was conducted to determine the students ' problem solving ability after being given *treatment* . The results of the posttest descriptive statistics are presented in Table 3.2.

Table 2. Description of the Problem Solving Ability Posttest

	N	Minimum	Maximum	Sum	mean	Std. Deviation	Variance
Realistic mathematics approach posttest	22	22	29	549	24.95	1,988	3,950
Project-based learning posttest	21	24	30	571	27.19	2.064	4,262
Valid N (listwise)	21						

Table 3.2 shows that the average post-test score of problem- solving skills students in realistic mathematics approach class namely 2 4.95 and in the project-based learning class that is 2 7.19. Based on table 3.2 , it can be concluded that the realistic mathematics approach class and project-based learning class have relatively different values , but to determine the equality of scores, normality and homogeneity tests are carried out.

The results of the calculation of normality obtain the value of sig. realistic mathematics approach class (=0.060) is greater than the value of (= 0.05) and the value of sig. project-based learning class (= 0.064) is greater than the value of (= 0.05) so H $_0$ is accepted, in other words both classes come from a normally distributed population. The results of the calculation of homogeneity obtain the value of sig. (= 0.661) is greater than the value of (= 0.05) so that H $_0$ is accepted, in other words the two classes come from populations with homogeneous variance. The results of the t-test calculation show that the two post-test data on students' problem- solving abilities have a t - $_{count\ value}$ (= 0.001) so there is a difference because sig (2-tailed) < 0.05 and t $_{count}$ is positive so that H $_{0\ is}$ rejected . Based on this, it can be concluded that " there is a significant difference in problem-solving abilities between students who are taught using a Realistic Mathematics Approach and Project-Based Learning" .

Improved Troubleshooting Ability

Analysis of increasing relational understanding skills using a *gain score* . *Gain score* calculation results p there is an average *gain score of* Realistic Mathematics Approach (= 6,9) which is greater than the average *gain score* for project-based learning (= 7,9) . presented in Table 6 .

Table 3. Improved Troubleshooting Ability

Note:	Realistic Mathematics Approach	Project Based Learning
Pretest	18	19.3
Postes	24.9	27.2
Gain Score	6.9	7.9

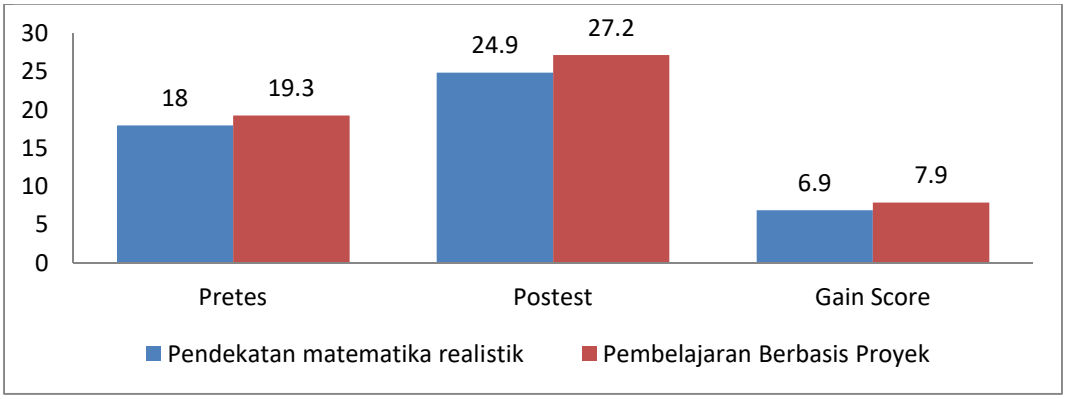

Fig 1. Problem Solving Ability in Classroom Realistic Mathematics Approach and Project-Based Learning

Figure 1 shows that the post -test scores for the realistic mathematics approach on problem-solving abilities are above the post -test scores for project-based learning . The results of the pretest and posttest show that the learning taught by project - based learning is considered to be better than that which is taught with a realistic mathematics approach .

Lifting the motivation to learn is done to determine the motivation of students before and after being given *treatment* . The results of the calculation of the descriptive statistics of the questionnaire are presented in Table 3.4.

Table 4. Description of Learning Motivation Pretest Students towards Mathematics

	N	Minimum	Maximum	Sum	mean	Std. Deviation	Variance
Pre - test Questionnaire Realistic math approach	21	30	60	893	42.52	7,897	62,362
Pre - test Questionnaire Project -based learning	22	30	55	855	38.86	7,292	53,171
Valid N (listwise)	21						

Table 3.4 shows that the mean score of the pretest motivation students in Realistic mathematics approach Class ie 42.52 and in the project-based learning class that is 38.86 . Based on table 7, it can be concluded that the realistic mathematics approach class and project-based learning class have relatively the same value , but to determine the equality of scores, normality test and homogeneity test are carried out.

The results of the calculation of normality obtain the value of sig. class P realistic mathematics approach (=0.708) is greater than the value of (= 0.05) and the value of sig. project-based learning class (= 0.117) is greater than the value of (= 0.05) so H $_0$ is accepted, in other words both classes come from a normally distributed population. The results of the calculation of homogeneity obtain the value of sig. (=0, 852) is greater than the value of (= 0,05) so that H $_0$ is accepted, in other words the two classes come from populations with homogeneous variance. The results of the calculation of the difference test show that the two pretest data on learning motivation The students showed that the two pretest data of students' learning motivation had sig. *2-tailed* (=0.122) is greater than (= 0.05) so that H $_{0\ is}$ accepted. Based on this, it can be concluded that " both classes have the same average pretest of students' motivation towards mathematics " .

Posttest was conducted to determine the students ' problem solving ability after being given *treatment* . The results of the post-test descriptive statistics are presented in Table 3.5.

Table 5. Description Study Motivation Posttest Students towards Mathematics

	N	Minimum	Maximum	Sum	mean	Std. Deviation	Variance
Test post Questionnaire realistic approach to mathematics	22	35	75	1219	55.41	10,680	114,063
Questionnaire test post Project -based learning	21	50	88	1413	67.29	11,010	121,214
Valid N (listwise)	21						

Table 3.5 shows that the average posttest score of learning motivation students in Class P realistic mathematics approach that is 55.41 and in class P project-based learning is 67.29 . Based on table 3.5 , it can be concluded that the realistic mathematics approach class and project-based learning class have relatively different values , but to determine the equality of scores, normality and homogeneity tests are carried out.

The results of the calculation of normality obtain the value of sig. realistic mathematics approach class (=0.722) is greater than the value of (= 0.05) and the

value of sig. project-based learning class P (= 0.909) is greater than the value of (= 0.05) so that H $_0$ is accepted, in other words both classes come from a normally distributed population. The results of the calculation of homogeneity obtain the value of sig. (= 0, 682) is greater than the value of (= 0,05) so that H $_0$ is accepted, in other words the two classes come from populations with homogeneous variance. The results of the t-test calculation show that the two posttest data on students' learning motivation have a t - $_{\text{count value}}$ (= 0.001) so there is a difference because sig (2-tailed) <0.05 and t - $_{\text{count}}$ is positive so that H0 $_{\text{is}}$ rejected . Based on this, it can be concluded that " theoretical studies " project-based learning is better than realistic mathematics approach to learning motivation students to mathematics " .

Increasing Students' Motivation to Learn Mathematics

Analysis of increasing students' motivation to learn mathematics using a *gain score* . The average *gain score* for project-based learning (= 24.77) is greater than the average *gain score* realistic mathematical approach (=16.55). As contained in table 3.6 , namely:

Table 6. Increased Learning Motivation Students Against Mathematics

Note:	Realistic math approach	Project -based learning
Study motivation questionnaire Pretest	38.86	42.52
Posttest learning motivation questionnaire	55.41	67.29
Gain Score	16.55	24.77

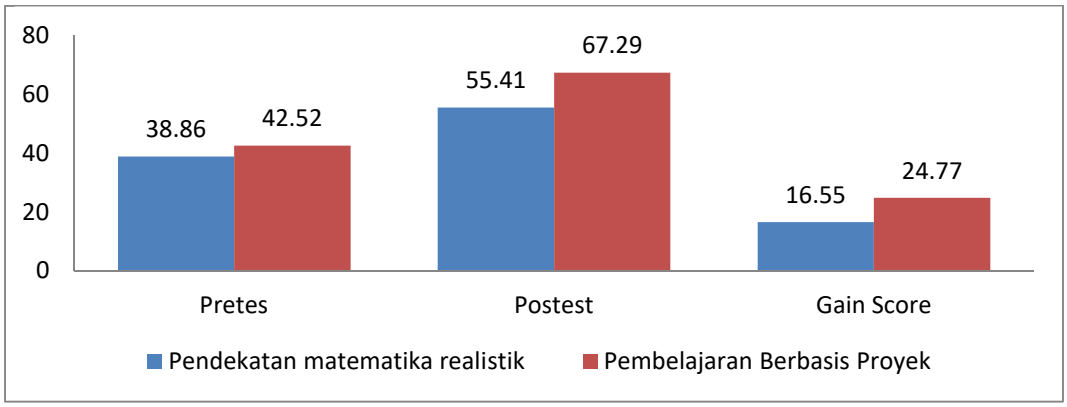

Fig 2. Increasing Student *Belief* in Mathematics

Figure 2 shows that the post - test score column for project-based learning on learning motivation students towards mathematics is at the top of the posttest value column . Realistic mathematics approach . The results of the pretest and posttest showed that the learning taught with project-based learning was considered to be better than that taught with a realistic mathematics approach.

IV. Conclusion

Based on the problem formulation, research objectives, and research results as stated in the previous chapter , the following conclusions are obtained:

1) There are differences in problem - solving abilities between students who are given project - based learning compared to students who are given a realistic mathematics approach . Students who are given project-based learning have higher problem solving abilities than students who are given a realistic mathematics approach .
2) There is a difference in students' learning motivation between students who are given project-based learning compared to students who are given a realistic mathematics approach .
3) In general, the improvement of the problem solving ability of students who are given project-based learning higher than compared to students who were given a realistic mathematical approach .
4) Increased learning motivation students who are given project-based learning higher than compared to students who were given a realistic mathematical approach.

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