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The Effect of Applying PQ4R Strategy with a Scientific Approach on Mathematical Problem Solving Ability

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ABSTRACT

Purpose of the study: This study aims to determine the effect of applying the PQ4R strategy with a scientific approach to the ability to solve mathematical problems in social arithmetic material.

Methodology: This research method is quantitative. The research that will be used is true experimental research. In this study, there were 2 sample class groups, namely the experimental and control classes. The author will provide learning treatment using the PQ4R learning strategy with a scientific approach to the experimental class, while the control class, it remains with the usual expository strategy.

Main Findings: Based on the results of student activity research, it was obtained that 80% of students were active from the total number of students. Then the assessment results of student activity observation sheets are included in the "Very Good" category. The results mentioned above have achieved the criteria for success in a lesson so that the use of the PQ4R learning strategy (Preview, Question, Read, Reflect, Recite, Review) affects the learning process of student activities.

Novelty/Originality of this study: The novelty of this research is the use of PQ4R learning strategies in fostering students' problem-solving abilities in mathematics.

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1. INTRODUCTION

Based on the Minister of National Education of the Republic of Indonesia No. 41 (2007:1) states, "the learning process in each primary and secondary education unit must be interactive, inspiring, fun, challenging, and motivating students to participate actively and provide sufficient space for initiative, creativity and independence in accordance with their talents, interests, and physical and psychological development of students" [1]–[3]. This shows that in learning mathematics should begin with the introduction of problems that are appropriate to everyday life and at the same time involve students' active role in the learning process [4]–[6]. To master mathematics, students do not need to memorize all the formulas in it, but understand how to solve problems.

Problem solving is the heart of mathematics. This means that problem solving is very important and is a general goal of learning mathematics [4], [7], [8]. The thought process requires the ability to organize strategies so as to train people to think critically, logically and creatively. This ability is needed in everyday life [9]–[11]. If someone already has the ability to understand mathematical concepts, then he is able to use them to solve

problems [12]–[14]. Conversely, if someone can solve a problem, then that person must have the ability to understand mathematical concepts that have been studied before.

One of the subjects in mathematics lessons in junior high school (SMP) is social arithmetic. This material is actually not new material for junior high school students, because they have learned the basics of this material in Elementary School (SD) [15]–[17]. Based on the Permendiknas, the basic competence shows that learning social arithmetic is learning that has the characteristics of solving problems with the concepts of everyday life, therefore it is necessary for students to master the concept of material to be able to solve problems. Social arithmetic material places more emphasis on students' abilities in solving contextual mathematical problems that describe everyday life. The questions given require students to be able to solve problems in the form of word problems. However, the reality on the ground shows that there are not a few junior high school students who lack problem-solving skills in this material.

The fact is that many students experience difficulties in learning social arithmetic material. Social arithmetic material is a subject matter that uses a lot of problem solving questions, so that if students have not mastered the concept of social arithmetic material, it is feared that they will experience difficulties in solving problems. The difficulties experienced by students, for example, when determining gains and losses, it is difficult to explain each step in solving the problem being worked on. Most students only limited to answering without giving reasons.

PQ4R with a scientific approach is made in order to make students more active in learning activities and can encourage students to find facts from a phenomenon that exists in the surrounding environment. The selection of PQ4R based on a scientific approach was carried out because it can make students more active in learning activities. Where in PQ4R there is a read stage. Sometimes a teacher forgets to provide an opportunity or give initial motivation to their students to read. Even though reading is their initial means of remembering or forming initial perceptions before learning begins. Reading is one of the weaknesses and shortcomings of students.

Based on this description, the researcher is interested in conducting research with the aim of knowing the effect of applying the PQ4R strategy with a scientific approach to the ability to solve mathematical problems in social arithmetic material.

2. RESEARCH METHOD

This research method is a quantitative method. The research that will be used is true experimental research. In this study there were 2 sample class groups, namely the experimental class and the control class. The author will provide learning treatment using the PQ4R learning strategy with a scientific approach to the experimental class while for the control class it remains with the usual expository strategy. The experimental research design that will be used to examine the problem The effect of applying the PQ4R learning strategy with a scientific approach to the mathematical problem solving abilities of class VII junior high school students is a pretest-posttest control group design.

The population in this study were class VII SMP N 3 Palangka Raya who were enrolled in the 2016/2017 odd semester academic year consisting of 5 classes. The sampling technique used in this study was simple random sampling, namely the sampling technique from the population was carried out randomly without regard to the strata in the population. This way is done when members of the population are considered homogeneous. Data collection can be done in various sources, namely by using primary sources and secondary sources.

Table 1. Category for problem solving students

Interval	Category
0.0 – 25.0	Low
25.1 – 50.0	Enough
50.1 – 75.0	High
75.1 – 100.0	Very High

3. RESULTS AND DISCUSSION

Table 2. The results for problem solving students

Category	Interval	Frequency	
		Experiment	Control
Low	0.0 – 25.0	0	0
Enough	25.1 – 50.0	7	14
High	50.1 – 75.0	15	11
Very High	75.1 – 100.0	7	4
Total		29	29

Based on table 2 above, it is known that in the experimental class the number of students who are in the sufficient category is 7 students with a percentage score between 50% -57.1%, then in the high category there are 15 students with a percentage score between 71.4% -80% and in the very high category as many as 7 students with a percentage score between 90% -97.1% with an average percentage score of 75.14% and included in the high category, this is much higher than the control class, when seen in the class control the number of students who are in the sufficient category as many as 14 students with a percentage score between 45.7% -67.1%, then in the high category there are 10 students with a percentage score between 71.4% -80% and in the very high category as many as 4 students with a percentage score of 90% with an average percentage score of 68.94% and are included in the Enough category. So it can be concluded that the problem solving ability of students in the experimental class is higher than the control class.

Furthermore, the results of the authors' findings based on statistical calculations show that the average mathematics learning outcomes of students who study using the PQ4R learning strategy are better than the average learning outcomes using expository learning strategies. When viewed from the point of view of individual learning completeness, the number of students who have achieved KKM in classes that study with the PQ4R learning strategy (Preview, Question, Read, Reflect, Recite, Review) is 22 people (75.14%) and the class that studied with the expository learning strategy was 14 people (50%). This shows that students who achieve mastery learning in classes that learn using the PQ4R learning strategy are more numerous when compared to classes that learn using expository learning strategies.

In implementing this learning strategy it is proven to be able to train students' readiness in formulating questions based on the material being taught and helping students to remember what they read and can help the teaching and learning process in class which is carried out by reading books [18]-[20]. Skillful reading activities will open up broad knowledge, deep gates of wisdom, and skills in the future. So that students understand and understand more deeply about the subject matter being studied.

In addition, the application of this learning strategy is also proven based on the observation sheet which can be seen in the appendix. The results of the observations showed that students paid attention to the teacher's explanation and followed the learning steps, skimmed quickly so that students could find the main idea of the reading. Recites that ask students to make the essence of the discussion of the lesson are done well because students who don't understand, dare to ask the teacher about the parts that they don't understand, so students look more effective. This is evident in the student observation sheet if the average is 77.37% which is included in the "very good" category, which means that 75-100% of the students as a whole seem active in asking questions to the teacher during the learning process.

The increase in student learning outcomes before and after being treated in the experimental class and control class was measured using Gain Normality (Ngain). The recapitulation of the N-gain calculation results can be seen in table 3 below.

Table 3. N-Gain Calculation Results of Class Students Average pretest Average posttest n-gain

Class	Mean of Pretest	Mean of Posttest	n-gain
Experiment	39.97	75.14	0.58
Control	36.06	68.94	0.51

Based on table 3, it can be seen that the average n-gain value of the experimental class is higher than the average n-gain control class, this means that the application of the PQ4R strategy with a scientific approach has an effect on mathematical problem solving abilities. In the application of the PQ4R learning strategy, many things happened in the experimental class. At the beginning of the meeting students felt confused about the strategy given so the teacher had to guide students patiently. At the second meeting there were also students who were still confused but only a small part, so it wasn't too much of a hassle to direct them. At the next meeting with the PQ4R strategy in learning it could run smoothly.

The expository learning strategy applied in the control class did not really change the way students learn mathematics. Students tend to be passive because the teacher's role is more dominant in this learning

process. Most students are not so enthusiastic about participating in the learning process because the teacher does not innovate in the learning process [21]-[23]. At each meeting, students only learn from the material and examples given by the teacher and do the exercises given. This makes students quickly get bored in learning mathematics because the learning process does not attract students' attention. In the expository learning strategy, learning mathematics is less meaningful for students, the subject matter is delivered directly by the teacher and students are not required to find the material. Teachers are more active in explaining material while most students are passive so students are not motivated and only receive material from the teacher [24]. Students do not ask many questions and are rarely able to answer questions from the teacher, they just follow what is given by the teacher. This causes students to experience difficulties in working on the questions given by the teacher, because when given examples of questions that are different from the examples given by the teacher, students are confused about doing them, so that mathematics learning outcomes are unsatisfactory and maximal.

In carrying out learning activities using this learning strategy the researcher found several obstacles including at the beginning of learning students were still noisy and confused about carrying out these activities because there were students playing around so the teacher's ability was needed to be able to control these students so that they were not too noisy when carrying out these activities. In addition, when the teacher instructs each group to move and sit with their group mates, there is still chaos. Furthermore, at the first meeting of the Read stage, the enthusiasm of students to read was lacking, only some students wanted to read, but this problem could be handled well by the teacher.

4. CONCLUSION

Based on the results of the observation sheet on student activity, it was obtained that 80% of students were active from the total number of students. Then the results of the assessment of student activity observation sheets are included in the "Very Good" category. The results of the observations that have been mentioned have reached the criteria for success in a lesson, so that the use of the PQ4R learning strategy (Preview, Question, Read, Reflect, Recite, Review) has an effect on the learning process of student activities. After the implementation of learning in the experimental class using the PQ4R learning strategy (Preview, Question, Read, Reflect, Recite, Review) and the control class using the expository learning strategy. In the experimental class using the PQ4R learning strategy (Preview, Question, Read, Reflect, Recite, Review) with a total of 29 students, the lowest posttest results were 50, the highest 97.1 with an average count of 75.14 and a standard deviation of 14.17. Whereas in the control class that used an expository learning strategy with a total of 28 students, the lowest posttest result was 45.7, the highest was 90 with an average of 68.94 and a standard deviation of 14.02.

To see the similarity of the two average student mathematics learning outcomes between those applying the PQ4R learning strategy (Preview, Question, Read, Reflect, Recite, Review) using the expository learning strategy used the testing criterion is accept Ho if tcount < ttable At a significant level of 95 % ($\alpha = 0.05$) with degrees of freedom , we get ttable = 1.6825. Because the value of tcount = 1.9855 and the value of ttable = 1.6825, it means that Ho is not fulfilled so that Ho is rejected and accepts H1. Thus, the PQ4R learning strategy (Preview, Question, Read, Reflect, Recite, Review) with a scientific approach has an effect on the ability to solve math problems for class VII SMPN 3 Palangka Raya is accepted at a confidence level of 95%.

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