Differences in Metacognition Ability of Students Who are Given Cooperative Learning Type Think Pair Share (TPS) and Problem Based Learning (PBL) in Class XII SMK

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Abstract. This study was conducted based on low metacognition ability of students. The purpose of this study was to ascertain whether: (1) students using cooperative learning type TPS with PBL had different metacognition abilities; and (2) the process of student answers by TPS is different with PBL. This study is a quasi experimental research. Descriptive analysis is intended to describe the students' answers. Inferential analysis of data was done by ANACOVA. The results showed: (1) The ability of metacognition used TPS is different with PBL with F* = 6,127 is greater than Ftable = 4.05, (2) The process of student answers by TPS is different with PBL.

Keywords: Metacognition Ability, Think Pair Share, Problem Based Learning.

1 Introduction

In order to develop quality students, mathematics, one of the more significant school courses, is crucial. Math is a way of thinking that allows you to analyze situations analytically, critically, rationally, and methodically. In order to maximize their potential and available resources, students can strengthen their problem-solving skills through the application of mathematics. Mathematics can also train students' abilities to get used to solving a problem that is around them so that they can develop their potential and resources owned by students. The fundamental science of math is the development of science (basic of science). In the community environment indirectly already uses mathematics. Like when people calculate land area, electricity costs, salaries, house area, and many others. This is in line with Sujono's (1998) statement that: “Mathematics is a human civilization. The speed of progress and competitiveness in many sectors, including economics, technology, and science, depends in part on mathematics.” Furthermore, according to Cockroft (in Abdurrahman, 2009) [1] that students should be taught mathematics: 1) is always utilized in all facets of life, 2) all academic disciplines demand adequate mathematical abilities, 3) is a powerful, succinct, and clear communication tool, 4) may be used to communicate information in a variety of ways, 5)

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enhances the capacity for accuracy, precision, and spatial awareness, and 6) gives satisfaction to the attempt to solve difficult issues.

From the description above, conclusions can be drawn about the importance of mathematics being studied. Because by studying mathematics, everyone, especially students, can examine things logistically and can improve their abilities, especially solving problems that will be applied in their daily lives. Because of the importance of mathematics, students are highly expected to master mathematics. Therefore, mathematics learning can be continuously improved to a better quality level. Because with the increase in learning outcomes of mathematics is expected to have a positive impact on improving the quality of education in Indonesia.

However, in its implementation in the field, it turns out that mathematics learning has not fully reached the expected quality level. This fact can be seen from the results of learning mathematics obtained by students is still low. According to the 2011 TIMSS (Trends in International Mathematics and Science Study) records, an institution that measures world education, Indonesia's grade 8 students are ranked 38th out of 42 countries. The average score obtained by Indonesian students is 386. This score is still far below the international average score of 500. In addition, when compared to three neighboring countries, namely Singapore, Malaysia and Thailand, the ranking position of our students is far behind. Singapore is ranked 2nd with an average score of 611, Malaysia is ranked 26th with an average score of 440 and Thailand is ranked 28th with an average score of 427 [2]. According to the 2012 Program for International Assessment (PISA), Indonesian students are ranked 64th out of 65 participating. This shows that the mathematical literacy of Indonesian students is still very low. Therefore, mathematics learning should continue to be improved until it reaches a better quality level. Involve students actively in learning by providing specific, student-centered activities to achieve one of the core competencies expected in learning mathematics listed in the 2013 curriculum.

From one of these core competencies, it is expected that learning can involve students' metacognition in solving problems. Flavel (Jonassen, 2000) provides a definition of metacognition as a person's consciousness of how they learn, their capacity to judge a problem's difficulty, their awareness of their level of self-understanding, their capacity to use a variety of information to further their goals, and their capacity to evaluate one's own learning progress. Soedjadi (2007) said that metacognition ability is the same as reflective thinking which is indicated by questions to yourself such as, "what have I done/thought?", "What am I doing/thinking is right?" I do?" Through these dialogues, students control their cognitive activities from planning, implementing, to evaluating the results obtained.

De Corte (in Fauzi, 2011) [3] explains that currently there are still many students in solving a problem still through self-regulation, namely students only look at the problem at a glance, decide quickly what calculations to use to utilize the numbers given in the problem, then continue the calculation. without considering other alternatives, although no progress has been shown in the results of his work. This demonstrates that learners are less capable to examine issues, keep track of how tasks are being completed, and assess the outcomes obtained so that it can be seen that there are still many students who have low metacognitive abilities and have not been able to use their thinking skills.

In addition to the importance of students' metacognitive abilities, as a teacher must strive to optimize students' mathematical connection abilities, which is one aspect that is emphasized in the learning objectives formulated by PSSM (NCTM, 2000) [4], notably learning to communicate (mathematical communication), thinking (mathematical reasoning), solving issues (mathematical problem solving), linking ideas (mathematical conn), and forming toward mathematics.

From the explanation above, it can be concluded that the ability of metacognition is a very important ability for a student to have. Therefore, it is very important for teachers or educators to develop metacognitive abilities. However, in the process of learning mathematics, in addition to the ability of metacognition possessed by students, it is also necessary to create a learning atmosphere that is appropriate to the condition of students. The teaching and learning process, which is the most fundamental activity in the educational process, must be developed in order to improve educational results in general and educational quality in particular. Thus, the effectiveness of the teaching and learning process affects whether educational goals are attained successfully or not. Cooperative learning enables the growth and training of students' mathematical metacognition and connection skills. The goal of the cooperative learning model is to place students in small groups according to their academic proficiency. In order to implement student-centered teaching and learning activities where students solve issues together, a learning model known as "cooperative learning" is currently quite popular. In order to implement student-centered teaching and learning activities where students solve issues together, a learning model known as "cooperative learning" is currently quite popular. Cooperative learning, according to Trianto (2010) [5], can enhance student performance on academic activities, be particularly effective in assisting students in grasping complex ideas, aid in the development of critical thinking abilities, and be advantageous to both lower and upper group students who cooperate to complete academic assignments.

Cooperative learning can take many different forms, one of which is Think Pair Share (TPS). Cooperative learning through Think Pair Share (TPS) allows students to study together, students learn together, help each other, and discuss together in finding and solving problems. The learning steps of Think Pair Share (TPS) type include 5 stages, namely: introduction, thinking (thinking), pairing (pairing), sharing (sharing), and evaluating. The “think-pair-share” activity in Think-Pair-Share (TPS) learning provides many advantages. Individual students can develop their own thinking because of the wait or think time, so that the quality of the answers can also increase.

In addition to Think Pair Share (TPS) cooperative learning, learning that is able to develop and train students' metacognition skills includes Problem Based Learning (PBL). Arends (Trianto, 2010) states that problem-based teaching is a method of instruction in which students work on real-world issues in order to build their own expertise. The problems that the teacher poses are the focal point of this learning, and the students use all of their acquired information and skills to solve these difficulties. Learning that applies the fundamental ideas and concepts of the subject matter to real-world issues in order to teach students how to think critically and solve problems. The five primary steps of problem-based learning (PBL) are: (1) student exposure to problems, (2) gathering students for learning, (3) guiding individual and group explorations, (4) generating and structure is built, and (5) assessing and evaluating the process of problem-solving.

Students are supported in problem-based learning (PBL) to be able to solve problems in real-world settings, to enhance their knowledge through academic experiences, scientific activities occur in students through group work,to gauge their own learning progress, to engage in scientific communication through discussion activities or the presentation of their work, and to overcome individual student learning challenges. The two lessons mentioned above have the ability to help students' metacognition at every learning stage.

2 Method

The method of research used is a quasi-experimental research because the class used has been previously formed. The population in this study were all students of class XII SMK Budi Insani Medan. The research sample was selected randomly (cluster random sampling). Furthermore, from the three randomly selected classes, re-election was carried out randomly so that one class was obtained with Think Pair Share (TPS) cooperative learning and one class with Problem Based Learning (PBL). This research has been carried out by taking the location at the SMK Budi Insani Medan in class XII in the odd semester of the 2021/2022 academic year.

This type of research is a quasi-experimental (quasi-experimental) because the class used has been previously formed. This study was conducted to determine the differences in the ability of metacognition of students who were given cooperative learning type Think Pair Share (TPS) and Problem Based Learning (PBL). The research design used was a pre-test post-test group design with 2 treatments. In this study, there are two experimental classes that will be given a pre-test before being treated with cooperative learning type Think Pair Share (TPS) and Problem Based Learning (PBL).

According to Arikunto (2016) [6], the variable is the object of research or what is the point of attention of a study. So, variables are everything that becomes the object to be studied in research. This study consists of two types of variables, namely the independent variable and the dependent variable. The independent variable in this study is learning mathematics using cooperative learning type Think Pair Share (TPS) and Problem Based Learning (PBL). The dependent variable is students' metacognition.

In this study, the instruments used were tests and observation sheets. The instrument consists of a set of test questions to measure students' metacognitive abilities. The results on the observation sheet were not analyzed statistically as the two other instruments, but were only used as input for researchers in conducting descriptive discussions. Regarding the research questions, the students' activities and the teacher's ability to manage learning and the pattern of students' answers were analyzed by descriptive statistical analysis. Data about learning outcomes were analyzed by inferential statistics.

Ruseffendi (1998) [7] states that descriptive statistics is a level of statistical work that only deals with the collection, processing, analysis and presentation of part or all of the data without drawing conclusions. The data used is the process of student answers in TPS type cooperative learning and PBL learning. From the post-test results, the experimental class students analyzed the student's answer process.

Referring to the formulation of the problem, the data on initial ability and final ability will be analyzed using inferential ANACOVA statistics. This inferential statistical analysis is used to test hypotheses in the research. The data to be analyzed in this study is the pre-test as the accompanying variable and the post-test result as the dependent variable.

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Table 1. Data Analysis for ANAKOVA

	TPS Type Cooperative Learning Group		**PBL Group**	
	Pre-test	**Post-test**	**Pre-test**	**Post-test**
	X_{11}	Y_{11}	X_{12}	Y_{12}
	X_{21}	Y_{21}	X_{22}	Y_{22}
	.....	.....	.....	.....
	.....	.....	.....	.....
	X_{N11}	Y_{N11}	X_{N22}	Y_{N22}
Means	X_1	Y_1	X_2	Y_2

Information :

X_1:The average score of students' initial abilities as a accompanying variable in the TPS type cooperative learning group.

X_2:Average score of students' initial abilities as a companion variable in the PBL learning group.

Y_1:The average final ability score of students as the dependent variable in the TPS type cooperative learning group.

Y_2:The average final ability score of students as the dependent variable in the PBL learning group.

N_1: Large sample in TPS type cooperative learning group.

N_2: Large sample in the PBL learning group.

Adaptation of Fergusen (1989:360) [8]

3 Results and Discussion

The data analyzed in this study were the results of the metacognitive ability test to mathematics. The results of the metacognition ability test test on mathematics provide information about students' abilities before and after the learning process, both in experimental class 1 which is given cooperative learning type Think Pair Share (TPS) and in experimental class 2 which is given cooperative learning type Problem Based Learning (PBL). The pretest and posttest tests for the experimental class 1 were followed by 24 students and the experimental class 2 was attended by 24 students.

3.1 Inferential Statistical Analysis of Metacognitive Ability

The students' metacognitive ability test was conducted twice, namely pretest and posttest. The pretest and posttest were attended by 24 people in each class so that in the data analysis the subjects of this study were 24 students, namely students who took the pretest and posttest.

Table 2. Completeness Recapitulation of Students' Metacognitive Ability Test Results

Test Type	Aspect	Group	
		Experimental 1	Experimental 2
Metacognitive Ability	Average *pretest* score	34,45	46,94
	Average *posttest* score	68,89	85,00
	The number of students who completed in *posttest*	13	23
	% Completeness	54,17	95,83

Descriptively, it can be seen that the average posttest result of the metacognitive ability of the experimental class 1 is 68.89, while the average posttest result of the metacognitive ability of the experimental class 2 is 85.00. This means that students' metacognitive abilities given Problem Based Learning (PBL) are higher than those given Think Pair Share (TPS) cooperative learning.

The experimental class 1's regression model for metacognitive ability is $Y_{E1} = 38{,}212 + 0{,}899X_{E1}$ and the experimental class 2's is $Y_{E2} = 59{,}885 + 0{,}391X_{E2}$. Additionally, the geometric regression line for the experimental class 1 is lower than the linear regression for the experimental class because the two regressions for both homogeneous classes and the linear regression equation stable for the metacognitive ability of the experimental class 1, which is 38,212, are smaller than the linear regression equation stable for the experimental class 2, which is 59,885. This suggests that there is a considerable difference, and the aforementioned hypothesis states that the regression constant affects the height of the two regression lines. The regression line's height describes student learning outcomes, namely when X = 0 then the regression equation for the metacognitive ability of the experimental class 1 is Y = 38.212 and the regression equation for the experimental class 2 is Y = 59.885. It means that it can be concluded that the metacognitive ability of students given Think Pair Share (TPS) cooperative learning is different from those given Problem Based Learning (PBL). The metacognitive ability of students who are taught with Problem Based Learning (PBL) is said to be classified as good. Students can solve problems in various ways because when students discuss in groups there are various ways of solving each member of the group. This is consistent with Vygotsky's concept, which states that before higher mental functions are absorbed into a person, they typically manifest in dialogue and cooperative behavior amongst individuals.

According to the description, the PBL-based mathematics module is utilized well in the learning process. Effective in this study means that students' metacognition can be enhanced by the PBL-based mathematics module. The findings of this study are consistent with those of Mulyono and Hadiyanti R's (2018) [9] study, which found that PBL-based teaching materials can enhance metacognition. PBL enables students to learn to solve problems, attempt to plan, evaluate, and manage the application of their strategies in addressing problems; it is a task that can enhance metacognition. Barokah, I (2020) [10]states, the use of PBL-based mathematics modules in mathematics learning provides excellent benefits for students' metacognition. This is because PBL-based mathematics modules can instill conceptual understanding in students

based on their awareness of why and how concepts are constructed and can then use this awareness to solve mathematical problems.

3.2 Student Answer Process Analysis Metacognitive Ability Test

From the results of the student problem solving process for the metacognitive ability test from item 1 to item 4, it can be concluded that students still have difficulty in solving metacognition questions, especially aspects of explaining procedures, there are some students who are able to apply concepts but explain strategies correctly. students still have difficulty, this is because students are only used to answering the results, not giving reasons.

4 Conclusion

Based on the analysis of research data and research discussions in using Think Pair Share (TPS) and Problem Based Learning (PBL) cooperative learning by emphasizing students' metacognition, the researchers obtained the following conclusions: Metacognition ability in the application of Problem Based Learning (PBL) learning is higher than Think Pair Share (TPS) learning and the process of completing student answers by using Think Pair Share (TPS) and Problem Based Learning (PBL) cooperative learning is more diverse.

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