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Application of Collaborative Teamwork Learning Model and Guided Note Taking Model and Their Influence on Students' Ability to Understand Mathematical Concepts

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ABSTRACT

The purpose of this study was to determine the ability to understand students' mathematical concepts and the responses of students who applied the collaborative teamwork learning model and guided note-taking model, as well as to find out the differences in understanding the mathematical concepts of students who applied the collaborative teamwork learning model and the guided note taking model. This study uses a quantitative approach with experimental methods and a quasi-experimental research design in the form of a posttest-only design. The population of this study were students of class X MAN 1 Cirebon, Cirebon Regency, then selected samples of class X IIS 3 as experimental class II with guided note-taking model and X IIS 4 as experimental class I with collaborative teamwork learning model. Sampling is done by cluster random sampling technique. Through the prerequisite test, namely the normality and homogeneity test, the research data obtained were normally distributed and had homogeneous variance. After conducting the prerequisite test, the researcher tested the hypothesis using the Independent Sample T-Test with the asymp value. Sig (2-tailed) of 0.000. This value is smaller than 0.05, so Ha is accepted. In other words, there are differences in the understanding of mathematical concepts between classes that apply the collaborative teamwork learning model with guided note-taking models on the subject of the sine and cosine rules in class X IIS MAN Cirebon I Cirebon Regency. The average value of the class that applies the collaborative teamwork learning model is 72.38, with 11 students achieving the KKM (Minimum Completeness Criteria), and the guided note-taking model of 78.52, with 29 students achieving the KKM (Minimum Completeness Criteria). Both models received a good response from students, with a response of 82% for the collaborative teamwork learning model and 76% for the guided note-taking model.

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1. INTRODUCTION

One of the factors in realizing quality human resources in education. According to Winkel [1], education can be interpreted as a process of mentoring or direction given by educators to students so that they learn positive things that can affect their development. The intended direction is for students to gain knowledge, understanding, skills, attitudes, and human values through learning activities.

The learning activities proposed by Rusman [2] are part of the education carried out by two actors: teachers and students. These two actors have different behaviors; namely, the teacher's teaching behavior and the student's behavior is learning. Learning is also inseparable from the teaching and learning process, which is seen as doing so through various experiences interacting between teachers and students. Interaction between teachers and students can occur directly, through face-to-face activities, or indirectly, such as using learning media by seeing, observing, and understanding things to achieve goals.

In the past or even today, few parents think that a student who is successful in mathematics will also succeed in other subjects. Vice versa, someone who has difficulty learning mathematics will also find it difficult in other subjects. In this case, mathematics is used as a measure of student success, as recognized by Cockcroft in Shadiq [3], which explains that mathematics will play an essential role in the 20th century. Evidently, in this era of globalization which emphasizes the advancement of technology, everyone is competing to master and create technology. This rapid development in the field of technology makes mathematics the foundation of technological developments, such as in discrete mathematics, analysis, probability theory, algebra, and number theory. Therefore, it is necessary to master mathematics from an early age [4].

Many students learn mathematics by rote without understanding from the teacher to the students. The teacher actively transfers ready-made knowledge to students' minds, while students are passive and obey what the teacher says, not being critical and even trying to memorize all concepts, formulas, and procedures [5]. As a result, students only become diligent scribes and memorizers who do not understand what has been memorized. Students only become consumers who are less creative and innovative. One of the causes of students being passive is that students do not understand and do not understand what they are learning. In this case, students do not understand the concepts being taught. Concept understanding is an essential factor in learning mathematics because it becomes a

measuring tool for the extent to which students master the material taught by the teacher [6].

According to the learning objectives, learning mathematics can train students to develop skills in understanding concepts, solving problems, being creative, communicating ideas, drawing conclusions, organizing students' thinking, and changing student behavior [7]–[11]. Changes in student behavior can be seen from the level of student success. Student success is also inseparable from the student learning environment [12]–[16]. Understanding the concept is the most crucial part of learning mathematics. Increased understanding of mathematical concepts needs to be pursued for students' learning success. Students studying mathematics must understand mathematical concepts in order to be able to solve the problems given and apply them in the real world. Concepts in mathematics are organized systematically, logically, and hierarchically from the simplest to the most complex [17]–[20]. Understanding mathematical concepts are the basis for meaningful learning of mathematics. However, the importance of understanding is not in line with the ability to understand concepts that students have achieved at this time.

Achieving students' conceptual understanding of mathematics is difficult because each student has different abilities to understand mathematical concepts [17]–[21]. However, increasing the understanding of mathematical concepts needs to be pursued for the success of student learning [22]. One of the efforts to overcome these problems is that teachers must design mathematics learning with a model, method, theory, or approach that can make students as learning subjects, not as learning objects. The selection of the suitable learning model must pay attention to students, the nature of the teaching materials, student worksheets and others, and the teacher's condition because no learning model is most appropriate for all situations and conditions.

Mathematics teachers can use the group learning model to develop students' ability to understand the material. This model prioritizes cooperation between students in groups to achieve learning objectives. Most of the learning activities are student-centered, namely studying the subject matter and discussing to solve problems. Effective interaction allows all group members to master the material relatively equally. One of the group learning models is the collaborative learning model.

According to Sudarman [23], the collaborative learning model is a group learning process in which each member contributes information, experiences, ideas, attitudes, opinions, abilities, and skills to develop the understanding of all members jointly.

Teamwork is a process that involves two or more students with complementary backgrounds and sharing skills so that the collaborative teamwork learning model is expected to be applied in the teaching and learning process because it allows students to be actively involved in the process, and when they do, they can better understand concepts. Specific knowledge or retain knowledge in long-term memory.

In addition, students also need help from the teacher in group learning, so the learning model used is the guided note-taking model. A guided note-taking model is a learning model that facilitates students to play an active role by using guided notes in the form of handouts, in which there is a space to solve the problems given [24]—based on this, applying the two models in the mathematics learning process in schools both demands active learning of students, making it easy to understand mathematical concepts. The difference between the two models lies in the technicality so that the effects received by students will be different in terms of understanding students' mathematical concepts. In addition, the two models differ based on the steps, so the indicators are different.

Each model has advantages and disadvantages. Based on the results of previous studies, both models can improve students' conceptual understanding skills. Therefore, researchers are interested in comparing the two models and revealing the level of understanding of students' mathematical concepts between those who apply the collaborative teamwork learning model and the guided note-taking model.

2. METHOD

The method used is quasi-experimental (quasi-experimental), which is the development of true experimental. The research design used in this study was posttest-only. The researcher uses collaborative teamwork learning and guided note-taking learning models. The researcher compared students' understanding of mathematical concepts between the two classes: the first class as the experimental class I using the collaborative teamwork learning model and the second class as the experimental class II using the guided note-taking learning model. Data collection in this study was carried out by administering tests and questionnaires.

The test is used to determine the ability of students to master the lessons delivered, mainly covering aspects of knowledge and skills. In this study, the test instrument used was in the form of a description of 10 questions. Preparation of description questions based on indicators of understanding mathematical concepts, namely restating a concept, classifying objects according to specific properties (according to the concept), giving

examples and not examples of concepts, presenting concepts in various forms of mathematical representation, developing necessary or the requirements are sufficient for a concept, using, utilizing and selecting specific procedures or operations, and applying concepts or problem-solving logarithms. At the same time, the questionnaire is made in the form of statements with five alternative answers. The number of statements is 20 for those who apply the collaborative teamwork learning model and 20 for those who apply the guided note-taking model.

3. RESULTS AND DISCUSSION

3.1. The result data of Mathematical Concept Understanding Ability

Based on the study results, data were obtained about the students' ability to understand mathematical concepts through tests. The data aims to determine the level of understanding of students' mathematical concepts after learning using the collaborative teamwork learning model for experimental class I and the guided note-taking model for experimental class II. Data retrieval is done by using a description of 8 questions as the indicators of understanding the concept and the subject matter of the sine and cosine rules. The question is given after applying the model to the two classes. In this study, the post-test was calculated on a scale of 100.

Table 1. Recapitulation of Average Percentage of Students' Understanding of Mathematical Concepts

No	Indicators of understanding mathematical concepts	The average percentage of students	
		CTL	GNT
1	Restate a concept	35%	62%
2	Classify objects according to specific properties according to the concept	0%	85%
3	Give examples and not examples of a concept	41%	64%
4	Presenting concepts in various forms of mathematical representation	63%	64%
5	Develop necessary and sufficient conditions of a concept	41%	41%
6	Using and utilizing and selecting specific procedures and operations	78%	75%
7	Applying concepts or algorithms to problem-solving	76%	77%
The average percentage of concept understanding		52%	67%

Based on the average of students who have understood the above, the ability of students to understand mathematics from the seven indicators in the class that applies the guided note-taking model with the help of handouts and a summary of points by the teacher reaches 67% of students, while the class that applies the collaborative model teamwork learning by discussing with friends reached 52% of students. So, the students' mathematical understanding ability applied to the guided note-taking model was better than the collaborative teamwork learning model on the sine and cosine rule material at MAN Cirebon 1, Cirebon Regency.

3.2. Response Data to the Learning Model

The questionnaire distribution was addressed to classes that applied the learning model to determine student responses to the model. Researchers used 20 statement items. The questionnaire was given to 37 students in the class that applied the collaborative teamwork learning model and 39 students in the class that applied the guided note-taking model.

a. Collaborative Teamwork Learning Model

To find out the percentage of student response questionnaires to the collaborative teamwork learning model, the researchers grouped the student response score data as follows:

Table 2. Percentage of Classification of Student Responses to the Collaborative Teamwork Learning Model

classification	Category	Frequency	Percentage
81 – 100	Very good	3	8%
61 – 80	Good	28	76%
41 – 60	Good Enough	6	16%
21 – 40	Not Good	0	0%
0 – 20	Very Not Good	0	0%
Total		37	100%

Based on table 2 above, it can be interpreted that using the collaborative teamwork learning model, three students gave an excellent response with a percentage of 7%, and 28 students gave a good response with a percentage of 76%. As many as six students responded reasonably well, with 16%. This shows that most students respond well to the collaborative teamwork learning model.

b. Model Guided Note Taking

To find out the percentage of student response questionnaires to the guided note-taking model, the researchers grouped the student response score data as follows:

Table 3. Percentage of Classification of Student Responses to the Guided Note-Taking Model

classification	Category	Frequency	Percentage
81 – 100	Very good	1	3%
61 – 80	Good	32	82%
41 – 60	Good Enough	6	15%
21 – 40	Not Good	0	0%
0 – 20	Very Not Good	0	0%
	Total	37	39

Based on the table 3 above, it can be interpreted that by using the guided note-taking model, there is one student who gave an excellent response with a percentage of 3%, 32 students gave a good response with a percentage of 82%, and six students who gave a reasonably good response with a percentage of 15%. This shows that most students respond well to the guided note-taking model.

3.3. Discussion

This research was conducted in class X IIS 3 and 4 Man Cirebon 1. The collaborative teamwork learning model was applied to class X IIS 4 as an experiment I, and the guided note-taking model was applied to class X IIS 3 as experiment II. Class experimental I learned by applying the collaborative teamwork learning model in experimental class, the guided note-taking model, and Class experimental class II for nine meetings. Eight meetings for the application of the model in each class and one meeting for the post-test. The post-test was conducted to determine the ability to understand mathematical concepts after the two models were applied. Students who were declared to understand in experimental class I, which applied the collaborative teamwork learning model, amounted to 19 students, and in experimental class II, which applied the guided note-taking model, totaled 26 students.

The ability to understand concepts in each indicator is different between these two classes. In experimental class I, which applied the collaborative teamwork learning model, students were declared weak in understanding the indicators of restating a concept because it was seen from the percentage that only 35% of students had understood the indicators. In contrast, the students were declared weak in experimental class II, which applied the guided note-taking model. In understanding the indicators, developing the necessary or sufficient conditions for a concept is seen from the percentage that only 41% of students have understood the indicator. In addition, students from classes that apply the collaborative teamwork learning model are stated to have understood the indicators of

applying the concept or logarithm of problem-solving as much as 77% and indicators of using and utilizing and choosing specific procedures and operations as much as 78%. In comparison, students from classes that apply the guided note-taking model stated to have understood the indicators of classifying objects according to specific properties according to the concept as much as 85% and applying the concept or problem-solving logarithm as much as 76%.

Many factors can affect the success of learning; one of them with the motivation to learn in this case is the activity of students while studying [21], [25]–[27]. The learning process for these two classes starts from a randomly selected class considering that the same teacher teaches the sample class taken, gets material with the same curriculum, uses the same math textbook, and students sit at the same grade level and majors as comparisons. There is no superior class because it has the same characteristics and abilities. The curriculum used is the 2013 curriculum with sine and cosine rules.

In the experimental class I applied the collaborative teamwork learning model for eight group learning meetings because, in its understanding, the collaborative teamwork learning model is a group learning process in which each member provides information to jointly improve each student's understanding of solving problems so that all students have an understanding, which is equivalent to one discussion. The subject teacher carries out the division of groups so that each group has the same ability, and there are six groups, each consisting of 6-7 students. These six groups were expected to be able to communicate the results of their discussions at each meeting, but in reality, at the first meeting, there was no group presentation. In the first meeting, there were still many students who were not active in the discussion, and the steps of the collaborative teamwork learning model had not been fulfilled, but for meetings two to six, students had started to be active, and the collaborative teamwork learning model was already running well.

Group learning allows students to work together by observing, identifying, classifying, and answering activity sheets [28]–[30]. However, in this study, active students who understand the material tend to solve their problems. This can be seen from the distribution of questionnaires to determine student responses to the collaborative teamwork learning model on indicators of working together in solving math problems, only reaching 68%. At the stage of presenting the results of group discussions, only 64% were confident in communicating and taking responsibility for the results obtained. In addition, at the collaboration stage, in the difference of opinion between groups, only 68% can follow it.

This collaboration means that each group presents the results of their discussions if they differ from those of the group discussions.

Every meeting of the five groups had different opinions and had succeeded in communicating their opinions even though not all students dared to speak. It also makes researchers provide individual exercises with types of questions for understanding mathematical concepts based on indicators of understanding mathematical concepts. Learning in experimental class I, it can be said that it runs pretty smoothly even though there are still students who do not participate in discussions with their groups. In addition, each meeting should have one presentation, but at the first meeting, there was no presentation. Learning with the guided note-taking model ends with a post-test previously carried out by the last group presentation.

In experimental class II, which applied the guided note-taking model, no group division was given because student discussions were only carried out with their classmates. The guided note-taking model is a development of the lecture model. The difference in this model is that students are given handouts containing the blanks, and students complete the sections after listening and paying attention to the teacher's explanation.

The use of handouts in learning mathematics on the sine and cosine rules obtained a good response of 68%. The handout is completed when the teacher has finished explaining the material points. Therefore students need to listen and pay attention to the teacher's explanation. As many as 64% of students have been good at listening and paying attention to the teacher's explanation so that the handout sections have been filled out correctly. Regarding working together, 68% of students like to work with their classmates even though many are still discussing with other groups. Students' activeness in class is also seen in their confidence in asking questions; only 57% of students already have a confident attitude. In the guided note-taking model, students are not only given handouts but group and individual exercises with the same questions as in the collaborative teamwork learning model. The learning in experimental class II ended with a post-test with eight questions that were the same as the experimental class I.

Based on the results of the research that has been carried out, both the results of the research were obtained in experimental class I and experimental class II. Statistical data for post-test experimental class I, the minimum value is 65, the maximum value is 83, and the total is 2678 with an average of 72.38 and a standard deviation of 4.61. This shows that experimental class I has a pretty good average and almost meets the KKM (Minimum

Completeness Criteria), while the statistical data in experimental class II, the minimum value is 66, the maximum value is 93, and the total is 3062 with an average of 78.51 and standard deviation 5.55. This shows that experimental class I has a good average and has met the KKM (Minimum Completeness Criteria). Students who have met the KKM (Minimum Completeness Criteria) in experimental class I are 11 or 30%, while those who have met the KKM (Minimum Completeness Criteria) in experimental class II are 29 or 74%.

Based on the difference in average scores and the number of students who have met the KKM (Minimum Completeness Criteria) in the two classes, it is clear that the students' ability to understand mathematical concepts is different between those using the collaborative teamwork learning model and those using the guided note taking model. The ability to understand mathematical concepts using the guided note-taking model is better than the collaborative teamwork learning model.

4. CONCLUSION

Based on the results of research that have been processed by researchers about the ability to understand mathematical concepts of class X IIS on the sine and cosine rule material as an answer to the formulation of the problem in chapter I. It can be concluded that the understanding of mathematical concepts of students who apply the collaborative teamwork learning model on the subject of the sine rule and cosine reaches an average of 72.38. Of all students in the class, only 52% understand mathematical concepts. At the same time, the understanding of mathematical concepts of students who applied the guided note-taking model on the subject of the sine and cosine rules reached an average of 78.52. Of the total students in the class, 67% understood mathematical concepts. In addition, the response of students who studied using the collaborative teamwork learning model was 82%, while those who studied using the guided note-taking model were 76%. Based on the interpretation criteria, the response scores for the two models were included in the strong category, meaning that students responded well to both models.

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