



Mastery of Mathematics Concepts by Using Cooperative Learning Model Type *Numbered Head Together*

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Abstract

The type of this research is a classroom action research that aims to determine whether applying the cooperative learning type Numbered Head Together (NHT) can improve the mastery of mathematical concepts for class XII students. MIPA.2 at SMAN 2 Sidrap. The subjects of this study were students of class XII.MIPA.2 at SMAN 2 Sidrap. This research is divided into two cycles. Cycles I and II have four meetings each. Data retrieval was carried out by using learning outcomes tests at the end of each cycle and observing student activity. Learning outcomes data were analyzed by quantitative analysis, and observational data were analyzed by qualitative analysis. The results of this study indicate a significant increase marked by an increase in students' mastery of mathematical concepts. Based on the test results at the end of the second cycle, the average value of the second cycle test was 78.0, with classical completeness criteria reaching 83.33% (the average learning achievement test increased by 11.5 and classical completeness criteria increased by 43.33% of the pre-cycle value). The student activity achievement rate is 82% or is in high qualification. From the results of this study, it can be concluded that the application of the cooperative learning type Numbered Head Together (NHT) can increase the mastery of mathematical concepts for students of class XII.MIPA.2 at SMAN 2 Sidrap.

Keywords: *Cooperative Learning; Numbered Head Together; Learning Outcomes.*

PENDAHULUAN

Mathematics is one of the compulsory subjects in schools that does not escape attention and efforts towards improvement in accordance with the development of science and technology. Therefore, mathematics is very basic and necessary to be able to master science and technology. Mathematics is a basic science for all subject matter in various levels of education, where the ability to count is the main characteristic and the ability to write and read.

The reality is that until now, students' mathematics learning outcomes are still low, both at the elementary and secondary levels. The low achievement of student mathematics learning is since teachers generally concentrate too much on problem-solving exercises in the process of learning mathematics. In learning activities, teachers explain concepts informatively, provide examples of questions, and provide practice questions. The teacher is the center of the activity, while the students tend to be passive during the learning activities. Students only listen, record explanations, and work on questions. Thus the learning experience they already have does not develop.

One of the difficulties in mathematics is because learning mathematics is less meaningful, students are still not actively involved in learning activities, so students' understanding of mathematical concepts is very weak. According to Wandini and Sinaga (2019), this happens because



mathematics learning at this time generally students take for granted what the teacher says even though, in general, students have been familiar with mathematical ideas from an early age. Students can develop. Thus, learning in schools will be more meaningful if the teacher relates knowledge to the experiences that students have.

Another problem faced by teachers in learning mathematics besides the lack of understanding of basic concepts is the lack of interest and motivation of students to study indoors. Students who feel their abilities are lacking sometimes pay less attention to lessons, especially mathematics, and are reluctant to ask things that are not known to the teacher or their friends. Students usually do not study effectively because of the lack or absence of friends who can be invited to study together. The low learning outcomes of students' mathematics, apart from being caused by various factors directly involved in the learning process, are also caused by factors of teachers, students, teaching methods, facilities and infrastructure, and subject matter.

Based on the results of observations and observations during a teaching in schools, it was found that low student learning outcomes were caused by a lack of understanding of students' concepts, especially in the algebraic aspect, which is the basis of every mathematics learning. One aspect of mathematics subject matter in class XII SMA which is considered difficult by students is the aspect of probability.

Therefore, a mathematical learning model is needed so that students enjoy learning mathematics. One of the efforts made to overcome the weaknesses of learning mathematics is the selection of appropriate teaching models, methods, and approaches to involve students physically, emotionally, actively, and socially.

Cooperative learning is a learning strategy that prioritizes student group cooperation to achieve learning objectives. The students are divided into small groups and directed to study the subject matter that has been determined. The purpose of forming cooperative groups is to provide opportunities for students to be actively involved in the thinking process and learning activities. In this case, most learning activities are student-centered, namely studying the subject matter and discussing solving problems.

NHT is one type of cooperative learning that emphasizes a special structure designed to influence student interaction patterns and aims to increase academic mastery. Kagan developed this type in Ibrahim (2000: 28) by involving students in reviewing the material covered in a lesson and checking their understanding of the lesson's content.

The research problem formulation is (1) How is the description of increasing mastery of mathematical concepts with the type NHT of a cooperative learning model for the student of class XII.MIPA.2 at SMAN 2 Sidrap. (2) How is the description of student activity in learning with the Cooperative Learning Model type NHT for the student of class XII of MIPA.2 at SMAN 2 Sidrap.

The objectives of this study were (1) to describe increasing mastery of mathematical concepts with the type NHT of a cooperative learning model for the student of class XII.MIPA.2 at SMAN 2 Sidrap. (2) To find out the description of students' activeness in learning with the type NHT of a cooperative learning model for the student of class XII.MIPA.2 at SMAN 2 Sidrap.



The purpose of cooperative learning differs from traditional groups that apply a competition system, where individual success is oriented to the failure of others. While the purpose of cooperative learning is to create a situation where individual success is determined or influenced by the group's success (Laa, Winata, and Meilani (2017).

According to Ibrahim (2000), the cooperative learning model has at least three important objectives: academic learning outcomes, acceptance of diversity, and development of cooperative skills.

The first objective is to improve academic learning outcomes, where students are required to complete academic tasks. Some experts argue that this model excels in helping students understand difficult concepts. The developers of this model have shown that the cooperative reward structure model has increased students' scores on academic learning and changes in norms related to learning outcomes; cooperative learning can benefit lower and upper group students.

The second objective, cooperative learning, provides opportunities for students from different backgrounds and conditions to work interdependently on common tasks and, through cooperative reward structures, learn to respect each other.

The third objective of cooperative learning is to teach students cooperation and collaboration skills. These skills are very important in social life, where they cooperate in organizations and interact with each other in diverse cultural conditions.

According to Ibrahim (2000), research results that show the benefits of cooperative learning for students with low learning outcomes include:

- (a) Increase the time devoted to the task.
- (b) A higher sense of self-worth.
- (c) Improve attendance.
- (d) Acceptance of individual differences becomes greater.
- (e) Less disruptive behavior.
- (f) Interpersonal conflict is reduced.
- (g) Reduced apathy.
- (h) Greater or increased motivation.
- (i) Higher learning outcomes.
- (j) Increase kindness, sensitivity, and tolerance.

From the statement above, it can be concluded that implementing the cooperative learning model has three important objectives: academic learning outcomes, acceptance of diversity, and development of cooperative or cooperative skills. The success of the group largely determines the success of the individual.

Steps Cooperative Learning Model type NHT

Step 1. Preparation. In this stage, the teacher prepares lesson plans by making Learning Scenarios (RPP), Student Worksheets (LKS) that are in accordance with the NHT-type cooperative learning model.

Step 2. Group formation. The group formation is adjusted to the NHT type of cooperative learning model. The teacher divides the students into groups of 4-5. The teacher gives a number to each student in the group and a different group name. The group formed is a mixture of social background, race,



ethnicity, gender, and learning ability. In group formation, pre-test scores were used to determine each group.

Step 3. Each group must have a textbook or manual. In group formation, each group must have a package book or guidebook to make it easier for students to complete worksheets or problems given by the teacher.

Step 4. Discussion of the problem. In group work, the teacher distributes worksheets to each student as material to be studied. In group work, each student thinks together to describe and ensure that everyone knows the answers to the questions on the worksheet or the questions the teacher has given. Questions may vary from specific to general in nature.

Step 5. Calling the member number or answering. In this stage, the teacher calls one number, and the students from each group with the same number raise their hands and prepare answers for students in XII.MIPA.2.

Step 6. Conclusion. The teacher provides conclusions or final answers to all questions related to the material presented.

There are several benefits to the type NHT of a cooperative learning model for students with low learning outcomes proposed by Ibrahim (2000), including:

- a. Self-esteem becomes higher
- b. Improve attendance
- c. Acceptance of individuals becomes greater
- d. Intrusive behavior becomes smaller
- e. Reduced interpersonal conflict
- f. Deeper understanding
- g. Increase kindness, sensitivity, and tolerance
- h. Higher learning outcomes.

In learning activities with the type *Numbered Head Together* (NHT) of the cooperative learning model, students look for problem-solving from all the problems the teacher gave by utilizing existing learning media and being responsible for the tasks assigned. Therefore we need creativity and independence from students to learn. The activities carried out by students are not entirely the same. Students with high and moderate learning motivation may tend to be more active than those with low learning motivation.

In learning mathematics with the type *Numbered Head Together* (NHT) cooperative learning model, the teacher acts as a facilitator for students. Thus the teacher involves students in reviewing the material covered in a lesson and checks their understanding of the lesson's content so that student activity is further increased and can increase students' mastery of the concept of the subject matter.

The learning motivation of each student is very influential on the intensity of students in learning mathematics. Students with high motivation tend to be more enthusiastic about learning compared to students with low learning motivation.

Students who study with the type *Numbered Head Together* (NHT) cooperative learning model have a higher readiness and sense of responsibility towards the given role or task to improve their mastery of concepts and learning outcomes.

The framework of this research can be described as follows:

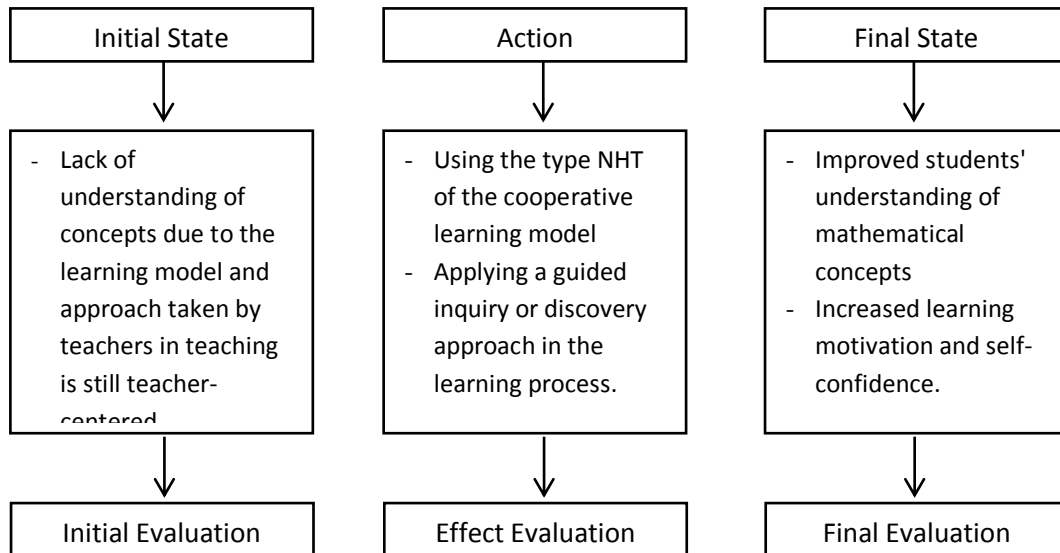


Figure 1. The flow of the Framework

Based on the theoretical study and framework of thinking above, the hypotheses in this study are as follows (1) Using the type *Numbered Head Together* of cooperative learning model will improve the understanding of mathematical concepts in class XII students.MIPA.2 at SMAN 2 Sidrap. (2) Student activity increases by using the type *Numbered Head Together* of the cooperative learning model.

METHOD

This research is a *Classroom Action Research* which consists of planning, action, observation, reflection, re-planning, and so on. The research subjects were students of class XII.MIPA.2 at SMAN 2 Sidrap. The student factor was studied to see the increased conceptual understanding and student motivation in learning mathematics. At the same time, it will also be seen to what extent students can apply the type *Numbered Head Together* (NHT) cooperative learning model in learning activities.

This classroom action research is divided into two cycles. Cycle I was carried out for three meetings plus one exam, and Cycle II was carried out for three meetings plus one exam as well. Each cycle is carried out according to the changes to be achieved, as designed in the investigated factors.

The data collection techniques carried out in this study were: (1) The data sources of this study were students of class XII.MIPA.2 at SMAN 2 Sidrap, totaling 30 people. (2) This type of data is quantitative and qualitative data consisting of learning outcomes and observation sheets.

Methods of data collection: (1) Learning outcomes data obtained by giving a test at the end of cycles I and II. (2) Data on the learning situation during the implementation of the action was obtained through observation sheets.

The data collected were analyzed quantitatively and qualitatively. Data regarding the problem-solving ability test results were analyzed quantitatively, while the data from the observations were analyzed qualitatively.

For quantitative descriptive analysis, using a scale of five (Tegeh, 2006), as follows:

Table 1. Conversion of achievement level with a scale of five

Qualification	Achievement Level	Description
90% – 100%	Very good	No need to revise
75% – 89%	Well	No need to revise
65% – 74%	Enough	Revised
55% – 64%	Not enough	Revised
0% – 54%	Very less	Revised

The criteria for the success of this classroom action research are (1) increasing the learning outcomes of each student of class XII.MIPA.2 at SMAN 2 Sidrap in mathematics, with a minimum completeness criteria of 70 (seventy) around 80%. (2) An increase in student activity and thinking skills is marked by the courage of students in asking/answering questions. There is no passive group of students, around 80%. The criteria for completeness of the percentage of student activity are: average < 60% (low), $60\% \leq \text{average} \leq 75\%$ (medium) and average > 75% (high).

Cycle I was carried out for three meetings, the students were divided into several groups with five student members, but each group had the same task to discuss and present the results of their group discussions.

RESULT AND DISCUSSION

Result

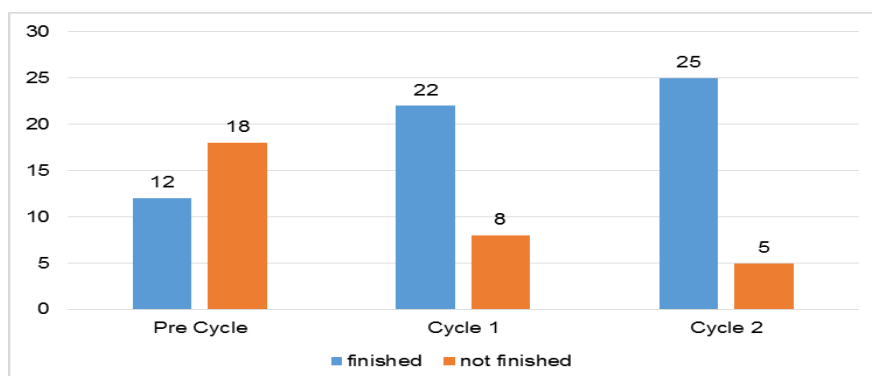


Figure 2. Classical completeness graph for each cycle

.Cycle I

In this section, the researcher describes the first cycle from the planning, action, and observation stages to the reflection stage.

Researchers and observers carried out observation activities at each meeting. Observations focused more on six components, namely:

- (1) The level of group cooperation in solving problems,
- (2) Students' skills in asking/answering questions,
- (3) Students' abilities in analyzing problems or questions to find solutions,
- (4) Students' enthusiasm/seriousness during the cooperative learning model type *Numbered Head Together* (NHT) takes place,
- (5) Students' responsibilities in making presentations in front of the class are based on their respective numbers,
- (6) Punctuality in completing/doing worksheets

The observation of the average student activity in the first cycle quantitatively amounted to 69%. The average student activity in the first cycle is qualified in the medium category.

Based on the results of the first cycle test, it can be concluded as follows:

- (1) The average test score is 77.3. The percentage of classical completeness obtained is 73.33% and has not reached the minimum classical completeness criteria, which is 80%.
- (2) 22 students achieved learning completeness or 73.33%, while 8 students did not achieve learning completeness or 26.67%.
- (3) 5 students achieved the highest score of 89, and 1 had the lowest score of 56.

Reflection is done to assess the effect of treatment in cycle I. It can be concluded as follows:

- a. The average value of the results of observations of student activity is in the medium category.
- b. The percentage of classical completeness of the cycle I test has not reached the minimum completeness criteria of 80%.

Based on these results, it is necessary to take further action. The failure in the first cycle was caused, among others:

- a. Students are not familiar with the cooperative learning model.
- b. NHT-type cooperative learning has not been known in general by students.
- c. The NHT type of cooperative learning model has not been implemented optimally.
- d. Mastery of the basic concepts of algebra students is still lacking.

In implementing the action in the first cycle, the researcher divided the groups by considering the results of the pre-cycle daily test. Students are grouped heterogeneously based on test scores with high, medium criteria and separate the formation of pre-existing groups. So in one group, there are smart, moderate, and less, and equally divided according to gender.

Cycle II

In this section, the researcher describes cycle II from the planning, action, observation/observation stages to the reflection stage. Cycle II was held in 4 meetings.

Researchers and observers carried out observation activities at each meeting. Observations focused more on six components, namely:

- (1) The level of group cooperation in solving problems,
- (2) Students' skills in asking/answering questions,
- (3) Students' abilities in analyzing problems or questions to find solutions,
- (4) Students' enthusiasm/seriousness during the cooperative learning model type *Numbered Head Together* (NHT) takes place,
- (5) Students' responsibilities in making presentations in front of the class are based on their respective numbers,
- (6) Punctuality in completing/doing worksheets

The observation of the average student activity in the second cycle quantitatively amounted to 82%. If it is qualified, the average student activity in the first cycle is qualified in the high category.

Based on the results of the second cycle test, it can be concluded as follows:

- (1) The average test score is 78.0. The percentage of classical completeness obtained is 83.33% and has not reached the minimum classical completeness criteria, which is 80%.
- (2) 25 students achieved learning completeness or 83.33%, while 5 students did not achieve learning completeness or 16.67%.
- (3) 1 student achieved the highest score of 100, and 1 student achieved the lowest score of 53.

Reflection is done to assess the effect of treatment in cycle II. It can be concluded as follows:

- a. The average value of the results of observations of student activity is classified as a high category.
- b. The percentage of classical completeness of cycle II tests has reached the minimum completeness criteria of 80%.

Discussion

By comparing the data obtained during the research, which took place in 2 cycles, it can be said that the learning process has achieved the desired goal.

In the first cycle of learning activities with the type *Numbered Head Together* (NHT) cooperative learning model, many students did not want to discuss with their friends because there was no match due to the formation of new groups that had not been able to adapt to each other, were noisy themselves, and ignored the teacher's instructions. Students are still doing activities outside of learning. This is because students are not ready to accept learning that is not as usual. Teachers still play a full role in learning.

In cycle II, cooperative learning activities with the type *Numbered Head Together* (NHT) have improved and got the expected results because students are used to it, even very enthusiastic and happy to use the type *Numbered Head Together* (NHT) of cooperative learning model, it can be seen that students are already active. In group discussions, students collaborated with group members so that student activity sheets could be completed in accordance with the allotted time. Smart students have started to share their knowledge with their friends, actively asking questions with their group friends and the teacher, and are very enthusiastic when their number is called. They, without hesitation, answer questions from the teacher. Students dare to write their answers on the blackboard. In this case, students have carried out activities toward learning.



CONCLUSIONS AND SUGGESTIONS

Conclusion

The description of increasing students' activeness and mastery of mathematical concepts with the application of the type *Numbered Head Together* (NHT) cooperative learning model is as follows:

1. At the end of each cycle, a test is held. In the pre-cycle, the average test score for learning outcomes is 66.5. In the first cycle, the average test score for learning outcomes increased to 77.3. In the second cycle, the average test score increased to 78.0, so the average student achievement increased by 11.5. Early classical completeness was 40.0%. In the first cycle, classical mastery increased to 73.33%, and in the second cycle, classical mastery increased to 83.33%, so the class completeness increased by 43.33%.
2. Students' activeness in learning has increased, namely, in the first cycle, student activity was 69%, and in the second cycle, student activity increased to 82%, so student activity increased by 13%. If the students' activeness in learning from process I to cycle II is qualified, it has increased from the medium to the high category.

Suggestion

Based on the results of this study, several suggestions can be submitted, including:

1. Mathematics teachers must be able to package learning processes that are fun but still challenging.
2. Teachers must be creative and innovative and always improve their professionalism.
3. One of the innovations in the learning process in improving students' ability to solve mathematical problems is applying the type *Numbered Head Together* (NHT) of the cooperative learning model.
4. In applying the type *Numbered Head Together* (NHT) cooperative learning model, the teacher must pay attention to students' readiness and look for materials in accordance with the method.
5. In the mathematics learning process with the type *Numbered Head Together* (NHT) of the cooperative learning model, the teacher's role is very important, especially the motivator and facilitator.
6. Appreciation for students who actively participate in the learning process is very necessary because it can motivate students to increase student activity in learning.

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