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IMPLEMENTATION OF COOPERATIVE LEARNING MODEL STAD-TYPE AS AN EFFORT TO IMPROVE STUDENT ACTIVITY AND OUTCOMES IN MATHEMATICS ON FUNCTIONAL LIMITS MATERIAL

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Abstract. This study aims to determine whether learning using the cooperative learning model of Student Team Achievement Division (STAD) type can increase student activity and learning outcomes in limit function material or not. This study is a Classroom Action Research (CAR) conducted at MA Negeri 1 Indramayu. The subjects in this study were 26 students of class XI MIPA 1. The instruments used in this research were observation sheets of student learning activity given each cycle to assess student activity and formative tests given each cycle to measure learning outcomes improvement. The results of processing student activity data obtained the percentage of activity in cycle I 69.23%, cycle II 84.62%, and cycle III 92.31%. Likewise, data on student learning outcomes obtained an average of cycle I 48.08, cycle II 75.96, and cycle III 84.04. Furthermore, it was obtained data on an increase in the number of students who achieved learning mastery, they are in cycle I as many as 5 students out of 26 students or 19% with very low mastery criteria, in cycle II as many as 21 students out of 26 students or 81% with very high mastery criteria, and in cycle III as many as 24 students or 92% with very high mastery criteria.

INTRODUCTION

Mathematics is one of the subjects that must be followed by every student from elementary to high school. Mathematics is usually seen as a difficult subject by students and only certain students think that mathematics is not as complicated as that perceived by other students so that they can solve problems in mathematics given by the teacher (Pane & Dasopang, 2017). One of the problems in learning mathematics is the assumption that mathematics is boring and it is a complicated subject to solve.

In this study, the author took one of the mathematics materials as class action research material that is the functional limits. Functional limits are one of the sub-chapters of mathematics material. Students sometimes still find it difficult to understand material about functional limits because they are considered useless and have no benefit for everyday life. In fact, functional limits are very useful in everyday life and without realizing it; we all have

applied functional limit materials (Syamsudin, 2022). Definition of functional limits in mathematics is a value that uses a function approach when it approaches a certain value. In simple terms, a limit can be said to be a value that goes to a limit, a limit that is usually said to be close but cannot be reached. The functional limit is divided into two, namely the limits of algebraic functions and the limits of trigonometric functions.

Year 2020 is a new beginning in the world of education, with the presence of Covid-19, all teachers and students must carry out an online learning system at home. The online learning process is less effective, because there are many complaints from students where students have difficulty in understanding any material provided online (Sumandya et al., 2022). After running for 2 years, finally learning activities can be done back to normal. It requires a new strategy that starts from online learning, going offline. It doesn't look difficult, but the students' characters are different now when all conditions have changed back to normal, and they are starting to rethink media and effective learning models to use in the teaching process (Kencanawaty et al., 2020).

Learning process requires the right strategy, if an error occurs; the strategy can hinder the achievement of learning objectives and learning outcomes (Ammy, 2021). In fact, the problems experienced by teachers in learning process are student's encouragement, activity, and learning outcomes that is still low especially in functional limits material. Therefore, to solve these problems, researcher applies a cooperative learning model of STAD (Student Team Achievement Division) type to increase student activity and learning outcomes, especially in functional material. This form of learning has been raised by Slavin where in this learning model students are emphasized to cooperate with other students in understanding learning material (Rinjani et al., 2022). Student learning interest is a motivation that must be possessed by each student, because with an interest in learning, it will affect learning outcomes. Thus, if students have low learning interest, then learning outcomes will be low, and if students' learning interest is high, then learning outcomes will be high (Falah, 2017). In this case, when learning mathematics students feel that there is no interest in learning it, resulting in a low interest in learning and affecting learning outcomes (Ricardo & Meilani, 2017).

In the 2013 curriculum, a teacher is only a facilitator. The approach used for students in the learning process is required to be able to think critically and be able to solve problems being studied (Ammy, 2021). Cooperative Learning Model of STAD (Student Team Achievement Division) type is a very interesting learning model because it combines the advantages of cooperative and group teaching so that it emphasizes interaction between students to motivate each other and help each other in mastering the material and achieving maximum learning results. STAD is usually called a group so that students will be free to ask their group mates about material they have not mastered (Latuny & Mataheru, 2020). There are also many teachers who still apply conventional learning models without trying to develop other learning models in order to find the right way of delivering material, so that it can make students less active and do not understand the material that has been delivered in the learning process. With this in mind, the Student Team Achievement Division (STAD) cooperative learning model can be used as an alternative in the learning process in class, in order to increase student activity and learning outcomes (Aprita, 2020). Learning is a complex process that occurs in everyone and lasts a lifetime. When someone learns, it will have a more increased response. Learning can be done anywhere and anytime as long as you have high intentions and motivation to learn. Everyone who learns will definitely have a goal in the learning process, one of which is to increase cognitive and

psychomotor knowledge. In addition, in the learning process, an activity is also needed which will certainly produce good learning objectives (Purwaningsih, 2018).

Mathematics learning is the formation of students' mindsets in understanding and reasoning in the relationship between these notions. In learning mathematics, students are accustomed to be able to gain understanding through experience about the characteristics they have and not. Students will be given an experience of using mathematics as a tool to understand or convey information from various forms of questions (Nurfadilah & Hakim, 2019). The activeness of students during the teaching and learning process is an indicator of students' desire or motivation in the learning process. Active learning in its implementation involves all aspects; they are physical, mental and emotional of students which are reflected in cognitive, affective and psychomotor abilities. Students can be said to be active when behavioral characteristics are found such as: often asking the teacher or other students, doing assignments given by the teacher, being able to answer questions when the teacher asks, having a good understanding of learning material and so on (Aseany, 2021).

Learning outcomes are the result of an interaction of learning and teaching actions. Based on that reason, learning outcomes are the obtained results when the teaching and learning process has occurred (Widana & Umam, 2023). The learning outcomes are the abilities possessed by students after receiving experience from the learning that has been done. Learning outcomes can also appear in various types of changes or proof of one's behavior (Khodijah et al., 2021). According to Lestari (2017) student learning outcomes can be influenced by five factors, namely (1) learning aptitude, (2) available time for learning, (3) individual abilities, (4) teaching quality, (5) environment. The cooperative learning model is a learning pattern that can be used to plan and guide learning materials in class, so that teaching and learning activities are student-centered, and to overcome problems found by teachers to activate students in the learning process (Khodijah et al., 2021). STAD learning is a problem-oriented learning design and overall goals. These objectives are made into several objectives to determine the steps of learning activities that refer to teaching materials. The implementation steps in cooperative learning model of STAD type applied in this study are 6, they are as follows: (1) dividing into groups, (2) delivering material, (3) group discussion, (4) giving quizzes/questions, (5) conclusion, (6) awarding (Purwaningsih, 2018).

The existence of problems above, encourages the researcher to improve the process of learning mathematics by using methods that can stimulate students to think and understand the material through Classroom Action Research (CAR) at MAN 1 Indramayu with the title "Implementation of the Cooperative Learning Model of STAD (Student Team Achievement Division) Type as An Effort to Improve Student Activity and Outcomes in Mathematics on Functional Limits Materials"

METHOD
This study used action research methods. Implementation of classroom action research was carried out by the researcher, while the teacher served as an observer during the learning process. After that, researcher acted as a planner, implementer, data collector, data analyzer, researcher and reporter of research results (Prihantoro & Hidayat, 2019). Thus, this research was carried out to provide direct improvements to the problems that occurred at MAN 1 Indramayu and to find new solutions to the problems encountered. In this way,

it is hoped that there will be an increase in the activity and learning outcomes of functional limits by applying the cooperative learning model.

Research implementation was carried out using several cycles in stages. The stages in each cycle were evaluated and analyzed to find out the impact of given method in order to be a comparison for the next cycle. The research stages in this classroom action research were planning, implementation, observation and reflection. The above cycle was carried out continuously until the researcher found a solution to change the learning process in a better way, so that the occurred problems can be corrected and resolved optimally. In addition, researcher also obtained alternative solutions to determine an action plan that will be implemented in the next action.

RESULTS AND DISCUSSION

Based on the results of data processing at the end of each cycle, the following data analysis is obtained.

Table 1. Students Completeness in Learning

Information	Student Test Scores in Each Cycle		
	I	II	III
Average Score of Mathematics Learning Outcomes	48.08	75.96	84.04
Percentage of Completed Students	19%	81%	92%

The learning completeness presented in table 1 shows that the average student test scores in cycle I is 48.08. It can be seen from the table that students who completed their studies in the first action were 5 out of 26 students who took the test in cycle I. So the percentage students who complete their studies are 19%. In this case, the criteria according to the curriculum can be concluded that the action in cycle I is classified as very low. In cycle II, the average student test score is 75.96. The number of students who completed learning in cycle II was 21 of the 26 students who took the test in cycle II. So, the percentage of learning completeness is 81%. In this case the criteria according to the curriculum can be concluded that the action in cycle II is classified as very high. In cycle III, the average student test score is 84.04. The number of students who completed learning in cycle III was 24 of the 26 students who took the test in cycle III. So, the percentage of learning completeness is 92%. In this case the criteria according to the curriculum can be concluded that the action in cycle III is classified as very high.

The students activeness referred to in this study is the use of STAD type cooperative learning model which is applied in every lesson on functional limit material. From the activity data carried out at the end of each cycle, an analysis is carried out aiming at obtaining an overview of student activity effectiveness in learning.

Table 1. Student Activity

Information	Student Activeness in Each Cycle		
	I	II	III
Average Student Activity Score	3.37	3.87	4.08
Percentage of Active Students	69.23%	84.62%	92.31%

The students activeness presented in the table above shows that the average score of activeness in cycle I is 3.37 with a percentage of active students of 69.23% and the number of active students was 18 out of 26 students. In this case, the activity criteria in cycle I can be categorized as less active. In cycle II, the average activeness score is 3.87 with an active percentage of 84.62% and the number of active students was 22 out of 26 students. In this case, the activity criteria in cycle II can be categorized as active. In cycle III, the average activeness score is 4.08 with the percentage of active students is 92.31% and the number was 24 out of 26 students. In this case, the activity criteria in cycle III can be categorized as active.

In the cycle I planning process, after determining the appropriate material for implementation, the researcher determined the discussion of material to be delivered. After that, made a Learning Implementation Plan in accordance with the basic competencies contained in the functional material. Then, the researcher made a grid of question practice instrument that was carried out in cycle I, and then created a question practice instrument that was given to students at the end of the implementation of cycle I. After that, made an observation sheet to examine student activity in cycle I. This observation sheet was only filled in by researcher, so during the learning process, in addition to teaching, researcher also assessed the activity of each individual.

In the process of implementing cycle I, the first lesson was held on Saturday, January 21, 2023 at 3-4 hours 08.20-09.40. In this first lesson, it was guided by the lesson plans that had been prepared previously with indicators defining functional limits, determining how to complete functional limits. At the beginning of learning, the researcher did not need to introduce herself, because the researcher carried out the research at her daily work place, the researcher only explained apperceptions, learning objectives and rules of the STAD type of cooperative learning model. There were some students who were not ready to learn, for this reason the teacher tried to motivate and provide ice breaking before learning began.

During the main activity, the teacher explained the limit of algebraic functions and gave students the opportunity to ask questions about the material that had been explained. Then, the teacher divided students into 5 heterogeneous groups. After that, the teacher gave worksheets to be discussed in groups. After being given time to discuss, the group thought about solving the given problems between students in the group. The teacher observed the discussion progress in the group and gave students the opportunity to ask about the worksheets completion. After that, the teacher gave the opportunity to group representatives to present the obtained results in front of friends, and then the teacher gave appreciation as an award to the group that had presented the results. To find out students' understanding of the given material, students were asked to take formative tests individually then collected and used it as an instrument for measuring student learning outcomes and the teacher filled out observation sheets of student activity during the first cycle of learning.

Student learning outcomes obtained in the first cycle, the use of STAD type of cooperative learning model in the first cycle and starting with the indicator has not been able to improve student learning outcomes, out of 26 students; as many as 5 students achieved learning mastery with an average of 48.08.

The student activity result obtained in cycle I in the use of the STAD type of cooperative learning model, from the observation results reached the active category, with an average of 3.37 > 2.75 from 26 students who took part in cycle I, who were declared inactive were 8 students and active were 18 students or 69.23%, since the target of 75% activity so cycle I had not yet reached the active category.

At the implementation stage, it can be seen from the observation results, the teacher's activities in cycle I did not achieve good results, this was because the introduction or adaptation stage between the teacher and students with the STAD type of cooperative model was still lacking. After the data was obtained from the observation results on the first cycle of action, the problems that become obstacles in learning need to be reflected with the help of observer for further action. From the reflection results carried out by researcher and observer, the effort that must be corrected is the action in cycle II.

In the cycle II planning process, after determining the appropriate material for implementation, the researcher determined the discussion of material to be delivered. After that, made a Learning Implementation Plan in accordance with the basic competencies contained in the functional limit material. Then, the researcher made a grid of question practice instrument that was carried out in cycle II, and then created a question practice instrument that was given to students at the end of cycle II. After that, made an observation sheet to examine student activity in cycle II, this observation sheet is only filled in by the researcher. During the learning process apart from teaching, the researcher also assessed the activity of each individual.

In the implementation stage of cycle II, the second lesson was held on Tuesday 24 January 2023 at 1-2 hours 07.00-08.20. In this second lesson, it was also guided by the lesson plans that had been prepared previously with indicators: solving limit problems of infinite algebraic functions. At the beginning of learning, the researcher explained perceptions, learning objectives and explained the model to be used in learning. When the teacher explained about apperception, learning objectives, and learning media, there was an increase in student enthusiasm because there were already many students who were enthusiastic and interested in solving problems using the STAD type of cooperative learning model.

Just as before, during the core activities, the teacher explained material about the limits of infinite algebraic functions and gave students the opportunity to ask questions about the material that had been explained. After that, the teacher divided students into 5 heterogeneous groups, and then the teacher gave worksheets to be discussed in groups. After being given time to discuss, the group, thought about solving the problems given between students in the group. The teacher observed the discussion progress in the group and gave students the opportunity to ask about the obtained worksheets completion. After that, the teacher gave the opportunity to group representatives to present the obtained results in front of friends, and then the teacher gave appreciation as an award to the group that had presented the results.

To find out students' understanding of the given material, students were asked to take formative tests individually then collected and used it as an instrument for measuring student learning outcomes and the teacher filled out observation sheets of student activity during the second cycle of learning. Student learning outcomes obtained in cycle II in the use of the STAD type of cooperative learning model in cycle II with indicators, by

reflection and actions have shown improvement and can improve students' mathematics learning outcomes, it is out of 26, 21 students have achieved learning mastery with a class average of 75.96.

The results of student activity obtained in cycle II in the use of STAD type of cooperative learning model have reached the active category, with an average of 3.87> 2.75 from 26 students who took part in learning in cycle II can be seen in table 4.2, 4 students were inactive and 22 students or 84.62% were active, because the target of 75% activity so in cycle II has reached the active category. At the implementation stage, it can be seen from the observations assessed by the observer; the teacher's activity in cycle II had increased, but had not achieved good results. It was because the teacher paid more attention to and fixed the problems in the reflection results that occurred in cycle I.

Activities in the second cycle of action were better than those of cycle I, although there were things to pay attention to for further learning. From the results of the reflection carried out by researcher and observer, the efforts that must be corrected were the actions in cycle III. In the planning process of cycle III, after determining the appropriate material for implementation, the researcher determined the discussion of material to be delivered. After that, made a Learning Implementation Plan (RPP) in accordance with the basic competencies contained in the functional limit material. Then, the researcher made a grid of question practice instrument that was carried out in cycle III, and then created a question practice instrument that was given to students at the end of cycle III. After that, made an observation sheet to examine student activity in cycle III, this observation sheet was only filled in by the researcher, so during the learning process apart from teaching, the researcher also assessed the activity of each individual.

The third lesson was held on Saturday 28 January 2023 at 3-4 hours 08.20-09.40. In this third lesson, it is also guided by the lesson plans that had been prepared previously with indicators of solving functional limit problems using methods, properties, and infinite forms. In this third stage, there was an increase in student activity compared to before, when the teacher explained apperception, learning objectives there was an increase in student enthusiasm compared to the actions of previous cycle.

As same as previous cycle, during the core activities the teacher re-explained material about limits of algebraic functions (Methods, Properties, and infinite forms) and gave students the opportunity to ask questions about the material that had been explained. After that, the teacher divided students into 5 heterogeneous groups, and then the teacher gave worksheets to be discussed in groups (Sena, 2022). After being given time to discuss, the group thought about solving the given problems between students in the group. The teacher observed the progress of discussion in group and gave students the opportunity to ask about the worksheets completion. After that, the teacher gave the opportunity to group representatives to present the obtained results in front of friends, and then the teacher gave appreciation as an award to the group that had presented the results.

To find out students' understanding of the given material, students were asked to take formative tests individually then collected and used it as an instrument for measuring student learning outcomes and the teacher filled out observation sheets of student activity during the third cycle of learning. The use of STAD type of cooperative learning model in cycle III with indicators, as well as by reflection and actions had shown improvement from cycle II. This result can be seen from the increase in student mathematics learning

outcomes, out of 26, 24 students have achieved learning mastery with average 84.04 or above minimum completeness criteria.

From the observation results in cycle III, the students had reached the active category, with an average of 4.08 > 2.75 of 26 students who took part in learning in cycle III, 2 students were inactive and 24 students were active or 92.31%, because the target of 75% activeness so in the third cycle has reached the active category. At the implementation stage, it can be seen from the observations assessed by the observer, the teacher's activity in cycle III had increased from the previous one, in cycle III it had also achieved perfect results, this happened because the teacher paid more attention to and fixed problems in the reflection results that occurred in cycle II as well as problems that had not been resolved in cycle II. Activity in cycle III was better than cycle II, although there were things that were considered for the sake of further learning. From the reflection results carried out by researcher and observer, efforts must be improved in further research.

CONCLUSION

Based on the observation and data processing results during the study which included data analysis to find out the increase of student mathematics learning outcomes and observational analysis to determine student activity, it is found that the use of STAD type of cooperative learning model could increase student activity in learning, the use of STAD type of cooperative learning model effective for increasing student activity in lessons. The use of STAD type of cooperative learning model can improve student mathematics learning outcomes through tests at the end of each cycle (post test), and the use of STAD type of cooperative learning model is effective for improving student learning outcomes.

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