



Environmentally Based STAD Type Cooperative Learning Model Improves Mathematics Learning Outcomes

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ABSTRAK

Matematika merupakan salah satu mata pelajaran utama di jenjang pendidikan dasar yang tidak disukai oleh kebanyakan siswa. Matematika dianggap sulit dan banyak rumus-rumus yang harus dihafalkan, juga banyak hitungan yang cukup rumit. Penelitian ini bertujuan untuk mengetahui apakah ada pengaruh model pembelajaran kooperatif tipe STAD berbasis lingkungan terhadap hasil belajar matematika siswa kelas V SD. Penelitian ini merupakan penelitian eksperimen semu (quasi experiment) dengan rancangan nonequivalent post-test only control group design. Populasi dalam penelitian ini berjumlah 263 siswa. Sampel penelitian ini yaitu siswa kelas V SD yang berjumlah 29 sebagai kelas eksperimen dan 25 siswa sebagai kelas kontrol. Pemilihan sampel penelitian ini menggunakan teknik random sampling. Data hasil belajar Matematika diambil dengan menggunakan tes berupa pilihan ganda. Data yang diperoleh dianalisis menggunakan uji-t. Hasil penelitian menunjukkan adanya perbedaan yang signifikan menunjukkan bahwa model pembelajaran STAD berpengaruh terhadap nilai hasil belajar siswa. Perbedaan yang signifikan nilai hasil belajar siswa antara kelompok siswa yang mengikuti pembelajaran dengan model pembelajaran STAD dan kelompok siswa yang mengikuti kegiatan pembelajaran dengan model pembelajaran konvensional. Simpulan penelitian terdapat pengaruh model pembelajaran STAD berbasis lingkungan terhadap hasil belajar matematika. Hasil penelitian membuktikan bahwa model pembelajaran STAD dapat diterapkan di SD sebagai upaya untuk meningkatkan hasil belajar siswa.

ABSTRACT

Mathematics is one of the main subjects at the primary education level, which most dislike does not. Mathematics is considered difficult, and many formulas have to be memorized, as well as many complicated calculations. This research aims to determine whether the STAD environment-based cooperative learning model influences the mathematics learning outcomes of fifth-grade elementary school students. This research is quasi-experimental with a nonequivalent post-test-only control group design. The population in this study was 263 students. The sample for this research was 29 fifth-grade elementary school students in the experimental class and 25 students in the control class. The sample selection for this research used random sampling techniques. Data on mathematics learning outcomes was collected using a multiple-choice test. The data obtained were analyzed using the t-test. The research results show that significant differences indicate that the STAD learning model affects student learning outcomes. There is a significant difference in the value of student learning outcomes between the students who took part in learning using the STAD learning model and those who took part in learning activities using the conventional learning model. The research conclusion is that the environment-based STAD learning model influences mathematics learning outcomes. The research results prove that the STAD learning model can be applied in elementary schools to improve student learning outcomes.

1. INTRODUCTION

Mathematics is a main subject that students must master in addition to other main subjects (Jalal, 2020; Ma'Uliah et al., 2019). The aim of learning mathematics in elementary school is so that students can use mathematics and mathematical thinking patterns in everyday life in studying various sciences, thought

patterns, attitudes and skills obtained from learning mathematics, which are expected to be able to help students overcome various life problems that arise. faced him (Habibullah, 2020; Winda & Dafit, 2021). Teachers need to implement learning models that are able to increase student understanding and student cooperation in mastering the material so that students enjoy learning mathematics (Aprilla, 2020; Suci et al., 2019). This feeling of joy will give rise to a high interest in learning in students so that in the learning process students want to be actively involved (Devi et al., 2020; Maharani et al., 2021). Learning is a process of learning within a person and within him a change occurs from not knowing to knowing, from not understanding to understanding and so on and the results of learning can be seen directly (Suardi, 2018).

However, in reality mathematics is one of the subjects that students do not like. Mathematics is considered difficult and there are many formulas that have to be memorized, as well as many complicated calculations. Only a small number of students enjoy mathematics lessons. The mathematics learning model that the teacher is trying to develop does not get the attention of students. Students are not interested in teachers' traditional or conventional ways of teaching. This situation is in line with the learning outcomes achieved by class V students in Mathematics subjects in Cluster VIII, Gerokgak District, data on mathematics learning outcomes for class V students is still lacking or below the Minimum Completeness Criteria (KKM). There are 40 students at SD Negeri 1 Pejarakan, SD Negeri 2 Pejarakan with a total of 52 students, SD Negeri 3 Pejarakan with a total of 42 students, SD Negeri 4 Pejarakan with a total of 10 students, SD Negeri 5 Pejarakan with a total of 45 students, SD Negeri 6 Pejarakan with a total of 20 students, SD Negeri 1 Sumberklampok has 25 students, and SD Negeri 2 Sumberklampok has 29 students. From this explanation, the average student score is less than the KKM applied in each school. This lack of student understanding is motivated by various aspects, including: learning in schools still uses traditional or conventional approaches, namely lectures, giving assignments, learning is dominated by teachers and very little involves students in learning. In Mathematics learning in elementary schools in cluster VIII Gerokgak sub district. The learning model used by teachers is still conventional and less creative, which makes students less enthusiastic about participating in learning (Nasrulloh & Umardiyah, 2020; Winursiti, 2017). Apart from that, students are not given the opportunity to express ideas and construct their own in answering practice questions given by the teacher. With this method, the concept of the material is not embedded in the students so the teacher has to repeat the material in the next lesson. (Suardiana, 2021).

The efforts applied to overcome students' difficulties in learning mathematics in class V of the Gugus VIII Elementary School, Gerokgak District, are by using a cooperative learning model of the Student Teams Achievement Division (STAD) type. The STAD (Student Team Achievement Division) cooperative learning model is a type of cooperative learning that uses small groups with 4-5 heterogeneous students in each group (Erly, 2020; Marheni et al., 2020; Oktafiani & Setianingsih, 2019). This STAD type cooperative learning model can be used to create interesting learning so that students can actively and easily understand the material presented, learning becomes more fun, and forms students to work together in groups so that they can improve their learning outcomes (Saputra, 2020; Yuniarti et al., 2019). So that the mathematics learning process can run smoothly, educators need to use cooperative learning. There are two reasons why cooperation is an option, first, several research results prove that the use of cooperative learning can improve student learning achievement as well as improve social relationship abilities, foster an attitude of acceptance of one's own and others' shortcomings, and can increase self-esteem. Second, cooperative learning can realize students' needs in learning to think, solve problems, and integrate knowledge with skills. And for these two reasons, cooperative learning is a form of learning that can improve a learning system that so far has weaknesses (Mariani Artini.NN, 2016; Suparsawan, 2021). There are various types of cooperative learning, one of which is the STAD type, where students have sufficient opportunities to optimize their ability to absorb the scientific information they are looking for and can motivate students to play an active role in learning in class and train students' abilities in independent learning while explaining the results of their independent learning to others (Marheni et al., 2020; Mariani Artini.NN, 2016; Rando & Pali, 2021). Apart from using the STAD type cooperative learning model in improving student learning outcomes, the environment also plays an important role in the Mathematics learning process, especially in cluster 8 of the Gerokgak sub-district.

Previous research findings state that the STAD type cooperative learning model can improve learning activities and outcomes (Burengge, 2020; Suparmini, 2021). Implementation of the STAD cooperative learning model can increase learning motivation (Israil, 2019). The STAD Learning Model is effectively used to improve mathematics learning outcomes in geometric material (Syamsu et al., 2019; Wangge & Sariyyah, 2022). This research aims to analyze the STAD type environment-based cooperative learning model on the mathematics learning outcomes of fifth grade elementary school students. The theoretical and practical benefit of this research for students is that it can improve student learning outcomes and eliminate the paradigm that mathematics lessons are difficult and boring, because with the STAD type cooperative learning model, students are given the freedom to discuss with their groups so that

each student has high motivation. To get high learning outcomes, teachers can provide alternative options for teachers regarding how to manage the classroom. Teachers are required to act more as facilitators, so that the learning process is less boring and more enjoyable.

2. METHOD

This type of research is experimental research. "The experimental method is a way of presenting learning material where students carry out experiments by experience to prove for themselves a question or hypothesis that is being studied" (Khaeriyah et al., 2018). "The purpose of experimental research is to find evidence of the truth of the theory of something studied." (Juita 2019). This experimental method was chosen because it is in accordance with one of the research objectives, namely to reveal whether there is a difference between student learning outcomes scores on spatial building materials taught using the STAD type cooperative learning model and those not taught using the STAD type cooperative learning model for class V students. at Gugus VIII Elementary School, Gerokgak District. This research design uses a form of quasi-experimental research (Quasy Experiment), which is an experimental research plan carried out under conditions that do not allow controlling or manipulating all relevant variables (Nugroho, 2018). So in this research it is impossible to completely control external variables that influence the implementation of the experiment. Meanwhile, the experimental design that will be used in this research is Nonequivalent Control Group Design. Nonequivalent Control Group Design is a semi-experimental design that uses an experimental group and a control group (Abraham & Supriyati, 2022).

Population is a generalized area consisting of objects/subjects that have certain qualities and characteristics determined by the researcher to be studied and then conclusions drawn (Subandriyo, 2019). So the population in this study was class V students at SD Cluster VIII, Gerokgak sub-district, numbering 263 students. The sample is part of the population which is expected to represent the population in the research (Sugiyono, 2018). Because the population is relatively small, the entire population is taken as the data source. This is in accordance with opinion (Roflin & Liberty, 2021) "That as a limitation, research can be population or sample research with the consideration that if there are less than 100 research subjects, it is better to take all of them so that the research is population research." Furthermore, if the subject is large or more than 100 then it can be taken between 10-15% or 20-25% or more. So the sample used in this research was the entire population, namely fifth grade students at SD Negeri 1 Sumberklampok and SD Negeri 2 Sumberklampok. For example, after random sampling was carried out, those selected as the experimental class were class V at SDN 2 Sumberklampok and as the control class were class V at SDN 1 Sumberklampok.

Data collection methods are methods or techniques used to collect research data (Makbul, 2021). The data collection method used in this research is the test method. Data collection using the test method, in relation to research, is a way of obtaining data in the form of questions that must be done by a person or group of people being tested and the test can produce a score (Ndiung & Jediut, 2020). The data collected in this research is data on the Mathematics learning outcomes of class V students in Cluster VIII, Gerokgak District, for the 2022/2023 academic year. Student mathematics learning outcomes are measured using an instrument in the form of a multiple choice test consisting of 20 questions containing the level of students' cognitive abilities from C1-C6, including knowledge (C1), understanding (C2), application (C3), analysis (C4), synthesis (C5), and evaluation (C6). Preparation of research instruments based on the revised Bloom's taxonomy. The learning outcomes test instrument was prepared and developed based on the Syllabus and Basic Competencies (KD) for Mathematics subjects in class V semester II which are described in the Mathematics learning outcomes grid. The left-hand grid of the student Mathematics learning outcomes test instrument can be seen in Table 1.

Table 1. Research Instrument Grid

Basic Competencies	Question Indicator	Cognitive Level	Question No
3.5 Explain and determine the volume of cubes and blocks.	3.5.1 Describe the shape of a given spatial structure	C1	1 and 2
	3.5.2 Distinguish building space from other space structures provided,	C2	3 and 4
	3.5.3 Shows concrete objects in the form of spatial shapes	C3	5, 6 and 7
	3.5.4 Determine the volume of the space provided	C3	8, 9, 10, 11, 12 and 13

Basic Competencies	Question Indicator	Cognitive Level	Question No
3.5.5	Identify the shape of the spatial mesh provided	C4	14 and 15
3.5.6	Solve problems related to the volume of geometric shapes using unit cubes	C4	16 and 17
3.5.7	Categorize the shape of the sides of the space provided	C5	18 and 19
3.5.8	Interpreting the meaning of spatial nets	C6	20

Based on the data collection technique used, the data collection tool in this research is a test. The data collection tool used in the data collection technique is a measuring tool in the form of a test. The questions or tests (instruments) themselves function as a measurement tool for students and a tool for measuring the success of the teaching and learning process in the classroom (Herawati, 2021). In general, tests are classified into several categories, one of which is objective tests (multiple choice). Objective tests are also called "short answer" or "new type" tests. Objective tests consist of items that can be answered by choosing one of the correct alternatives from a number of available alternatives, or by filling in the correct answer with several words or symbols. (Putri et al., 2022). Before the Mathematics learning outcomes test is used to collect research data, the quality level of the test must first be examined. Testing of learning outcomes instruments was carried out using field tests which were tested on class V students at SD N 1 Pejarakan and SD N 2 Pejarakan, totaling 60 respondents. The test that will be used is a multiple choice objective test of 20 questions which is used as a test of student learning outcomes after being tested for quality. To meet the quality of the test content used, a jugdes test was carried out, namely an expert test by an expert in the field of Mathematics, after that a trial of the instrument was carried out on class V students to determine the validity, reliability of the differentiating power of the questions, and the level of difficulty of the questions. Data on student Mathematics learning outcomes were analyzed using descriptive and inferential statistical analysis. Descriptive statistical analysis was carried out by calculating the mean, median and mode. The inferential statistical analysis to test the hypothesis was carried out using an independent sample t-test (uncorrelated). Before testing the hypothesis, assumptions are first tested on the students' Mathematics problem solving ability data which includes testing the normality of data distribution and testing the homogeneity of variance. Once it is known that the data has a normal distribution and homogeneous variance, then in accordance with the provisions, a hypothesis test is carried out using the t-test (polled variance).

3. RESULT AND DISCUSSION

Result

Based on the results of the data analysis that has been carried out, a recapitulation of data on the mathematical problem solving abilities of experimental group and control group students is presented in Table 2.

Table 2. Description of Mathematics Learning Outcome Data

Group	Mean (M)	Median (MD)	Mode (Mo)
Experiment	74.06	74.10	81.6
Control	55.2	53.9	47.6

Data on Mathematics learning outcomes for groups of students who were taught using the STAD environment-based cooperative learning model obtained through post-tests on 29 students showed that the highest score was 88 and the lowest score was 58. Based on Table 2, it can be described as mean (M) = 74.06, median (Md) = 74.10 mode (Mo) = 81.6 variance = 13.09, and standard deviation (s) = 18. So we get that the mode is greater than the median and the median is greater than the mean (Modus = 81.6 > Median = 74.10 > Mean = 74.06). Thus, the curve in the experimental group is a negative squint curve, which means that most of the scores tend to be high. Meanwhile, data on mathematics learning outcomes for groups of students taught using the conventional learning model obtained through post-tests on 25 students showed that the highest score was 70 and the lowest score was 40. Based on Table 2, it can be described as mean (M) = 55.2, median (Md) = 53.9, mode (Mo) = 47.6, variance = 14.2, and standard deviation (s) = 18.8. So we get that the Mean is greater than the median and the median is greater than the Mode (Mean = 55.2 > Median = 53.9 > Mode = 47.6). Thus, the curve above is a positive squint curve, meaning most of the scores tend to

be low. Furthermore, based on the results of hypothesis testing, it can be seen that it is 3.60 while $(dk = 52 (29 + 25 - 2))$ at the 5% significance level is 2.01. This means it is greater than the table ($>$) so it is rejected and, Thus, it can be interpreted that there is a significant difference in Mathematics learning outcomes between fifth grade students who study using the STAD learning model and fifth grade students who study following the conventional learning model at Gugus VIII Elementary School, Gerokgak District, Academic Year 2022/2023.

Discussion

Based on the description of the research data, the group of students who took part in learning using the STAD learning model received higher learning outcomes compared to the group of students who took part in the conventional learning model. Descriptively, the learning outcomes of experimental group students were higher than those of control group students. This review is based on the average value of student learning outcomes. The average learning scores of experimental group students were in the very high category, while the learning scores of control group students were in the low category. If the learning outcomes scores of experimental group students are depicted in a polygon curve, it appears that the data distribution curve is a negative squint, which means that the majority of students' scores tend to be high. In the control group, if the student learning outcomes scores are depicted in a polygon curve, it appears that the data distribution curve is a positive squint, which means that most of the students' scores tend to be low. Based on data analysis using the t-test, information was obtained that there was a significant difference in student learning outcomes between the group of students taught through the STAD learning model and the group of students taught through the conventional learning model. The existence of significant differences shows that the STAD learning model has an effect on student learning outcomes. The significant difference in student learning outcome scores between the group of students who took part in learning using the STAD learning model and the group of students who took part in learning activities with the conventional learning model was caused by differences in syntax/steps in the learning process. The learning steps in the STAD learning model include problem solving, discussing problem solving ideas, then sharing the results of the discussion with friends.

The learning stage in this model begins with thinking activities, namely the teacher asks questions or issues related to learning, then students are directed to look for answers. At this stage, students are directed to be able to think independently and have their own concept of problem solving. At this stage, students' problem solving abilities are also trained so that it has an impact on students' level of understanding of the material. Then the learning activities continued with the pairing stage. At this stage, students are directed to discuss with their partners to discuss the results of investigations and thoughts. In this step, students reflect, organize and test ideas in group discussion activities. In the final stage, it continues with sharing. At this stage, students are directed to present the results of their discussion to the front of the class (Mariani Artini.NN, 2016; Sekarini, 2022). These three stages are able to help students realize the knowledge they have acquired to apply it to new situations. This process guides students to acquire new knowledge and discover for themselves the concepts they have learned. Learning activities become student-centered (Chen, 2020; Herwin et al., 2021). The STAD learning model uses sequential completion steps that are easy for students to understand during the learning process, which will make the learning process more interesting, making students active and creative (Wulandari, 2022).

This is different from learning with conventional learning models which are characterized by teacher-centered learning. In the conventional learning model the teacher dominates the learning activities. Information in conventional learning is mostly obtained from the teacher's knowledge. This causes teachers to control thinking in conventional learning (Liu et al., 2016; Novelni & Sukma, 2021; Zuhriyah, 2017). This information is conveyed using various expository learning techniques (direct transfer of knowledge from teacher to students, for example through lectures, demonstrations and questions and answers) involving the entire class. This makes students passive and only take notes, listening according to the teacher's instructions without trying to discover the concepts being studied themselves. Students act as listeners and do what the teacher orders and do it according to the example. Such learning does not provide new experiences and challenges for students so that students quickly feel bored, and reduces students' motivation and interest in learning. In the end, it will result in student learning outcomes being less than optimal. The increase in student learning outcomes is because the STAD learning model applied can change learning situations that were previously teacher-centered into learning that is not only teacher-centered but also student-centered (Rando & Pali, 2021; IP A Sudana & Wesnawa, 2017). Students can learn more freely by thinking about the problems discussed independently first, then discussing their thoughts with a group and finally sharing them with their classmates.

The differences in learning between the STAD learning model and the conventional learning model will certainly have a different impact on the value of student learning outcomes. The application of the STAD

learning model in learning allows students to be active in learning activities, gain new knowledge and discover the concepts they are learning for themselves without having to always depend on the teacher, able to develop students' oral abilities. Students become more challenged to learn to enrich the ideas they have. Thus, the learning outcomes of students who take part in learning using the STAD learning model will be better when compared to students who take part in learning activities using the conventional learning model. The impact of implementing this model includes being able to form cooperation between students in solving a problem, increasing self-confidence, courage and generating interesting ideas. and be able to discover concepts related to learning material independently or in groups without always depending on the teacher (Burengge, 2020; Rizal et al., 2021). Students are also given the opportunity to convey ideas, opinions and knowledge related to learning material through collaboration in groups which also creates and develops creative elements in students (Marheni et al., 2020). Apart from that, the use of the STAD type of environment-based cooperative learning model can foster an attitude of cooperation and responsibility among students in working on assignments in groups as well as an attitude of mutual respect for the opinions of their friends when discussing. This model can also foster curiosity, mutual respect and increase students' self-confidence. The learning outcomes obtained by students are also better by using this model compared to the model usually used by teachers in class.

The findings above are strengthened by previous research stating that students' mathematics learning outcomes have increased with the implementation of the STAD learning model (I Putu Ari Sudana & Wesnawa, 2017). STAD type cooperative learning model to improve activities and learning outcomes (Burengge, 2020; Suparmini, 2021). Implementation of the STAD cooperative learning model can increase learning motivation (Israil, 2019). The STAD Learning Model is effectively used to improve mathematics learning outcomes in geometric material (Syamsu et al., 2019; Wangge & Sariyyah, 2022). Apart from that, the implication of this research is that teachers can think more creatively and gain new insights and experiences regarding the implementation of innovative learning in the classroom which is useful for developing students' critical thinking patterns. Teachers are also able to develop their experience regarding the use of the STAD type environmentally based cooperative learning model in other learning activities.

4. CONCLUSION

The environmentally based STAD type cooperative learning model influences the mathematics learning outcomes of class V students at Gugus VIII Elementary School, Gerokgak sub district for the 2022/2023 academic year. This research can contribute to knowledge about innovation in learning theory. It is recommended for students to learn cooperatively in order to have a more interesting and enjoyable mathematics learning experience so that students can improve learning outcomes and eliminate the paradigm that mathematics lessons are difficult and boring. One alternative learning strategy that can be applied in carrying out the learning process in the classroom is an effort to improve student learning outcomes. The results of this research can be used as an alternative in preparing an educational program, so that it is useful for improving the quality of learning which has an impact on the school principal as the holder of responsibility in the school.

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