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Improving Student Mathematical Understanding through the Implementation of the STAD Method at STIKOM Tunas Bangsa

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Abstract

One of the factors for the low mathematical understanding of students is the inappropriate learning method. The selection of the STAD method is believed to be able to improve students' mathematical understanding. This research uses a quantitative approach (pre-experiment). This study aims to determine the difference in students' mathematical understanding before and after using the STAD method. The research population consisted of STIKOM Tunas Bangsa students majoring in Information Systems in the 2023-2024 academic year, with 8 classes, and the sample was drawn from class 23S01. Quantitative data analysis using SPSS 25, namely paired sample t-test. The results showed that the correlation value was 0.714, indicating a strong and significant correlation between initial understanding and final understanding. Based on the mean value of initial understanding (pretest) with a value of 70.83, lower than the mean final understanding (Post-test) after using the STAD method of 79.44. The sig. A value of 0.00 or smaller than 0.05 states that mathematical understanding after using the STAD method is higher than before using the STAD method. Thus, it can be concluded that there is a significant and strong increase in mathematical understanding after using the STAD-type cooperative method in higher education, one of which is for STIKOM Tunas Bangsa students.

Keyword: College, Cooperative Method, Mathematical Understanding, STAD

Abstrak

Salah satu faktor rendahnya pemahaman matematis mahasiswa yaitu metode pembelajaran yang kurang tepat. Pemilihan metode STAD diyakini dapat meningkatkan pemahaman matematis mahasiswa. Penelitian ini menggunakan pendekatan kuantitatif (pre-eksperimen). Penelitian ini bertujuan untuk mengetahui perbedaan pemahaman matematis mahasiswa sebelum dan setelah menggunakan metode STAD. Populasi penelitian diambil dari mahasiswa STIKOM Tunas Bangsa jurusan sistem informasi semester genap pada tahun ajaran 2023-2024 sebanyak 8 kelas dan sampelnya yaitu kelas 23S01. Analisis data secara kuantitatif menggunakan spss 25 yaitu paired sample t-test. Hasil penelitian menunjukkan bahwa Nilai *correlation* sebesar 0,714, ini menyatakan bahwa korelasi antara pemahaman awal dan pemahaman akhir kuat dan signifikan. Berdasarkan nilai mean pemahaman awal (pretest) dengan nilai 70,83 lebih rendah dari mean pemahaman akhir (Post-test) setelah menggunakan metode STAD sebesar 79,44. Nilai sig. sebesar 0,00 atau lebih kecil dari 0,05

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menyatakan bahwa pemahaman matematis setelah menggunakan metode STAD lebih tinggi daripada sebelum menggunakan metode STAD. Sehingga, dapat simpulkan bahwa adanya peningkatan yang signifikan dan kuat terhadap pemahaman matematis setelah menggunakan metode kooperatif tipe STAD di perguruan tinggi salah satunya pada mahasiswa STIKOM Tunas Bangsa.

Kata Kunci: Metode Kooperatif, Pemahaman Matematis, Perguruan Tinggi, STAD

Introduction

Mathematics is a basic science that is taught from kindergarten, elementary, junior high, high school, to college level. According Wijaya et al., (2019) Mathematics is a basic science and serves as a benchmark for the success of an education. Mathematics is not only oriented towards counting, but mathematics can provide the ability to think critically, logically, systematically and foster creativity in solving problems. According to Kirana et al., (2023) mathematical ability is related to numeracy and reasoning skills or the ability to think critically in solving the problems provided. One of the problems found in the mathematics learning process is that students' understanding of mathematics material is still low, as seen from the unsatisfactory student learning outcomes. Students still think that math is a very difficult lesson because of its abstract nature. Mathematical understanding is the foundation for thinking in solving problems related to mathematics, and also related to daily life problems (Rochim et al., 2021).

Based on the results of observations on student 23S01 in the learning process of Statistics with probability material (Opportunities) shows that students are less enthusiastic in participating in learning. This is shown from the results of the pretest conducted before the learning takes place. Students still find it difficult to distinguish problem solving using the concepts of combination, permutation and the chances of an event being mutually exclusive, mutually independent and conditional. Students also said that chance material is very difficult to understand because the questions are in the form of story problems. Statistics plays an important role in the development of the information systems field (Bina, 2020). Based on the results of these

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observations, it requires researchers need to innovate the learning process through the STAD type cooperative learning method. This research is different from previous studies because the STAD method is used in college, namely, students with statistics courses on probability/chance material.

Comprehension ability is one of the mathematical abilities that students must have to master further mathematical material (Edison. & Suwanto, 2021). Because mathematics learning is declared successful based on students' mathematical understanding ability (Nasution, 2021). In the process of learning mathematics, the ability to understand mathematics is an important goal, where learning mathematics is not only memorizing formulas but students can understand the concept of mathematics lessons themselves. There are three types of mathematical understanding, namely translation, interpretation and extrapolation. translation which means that conveying information in different ways/languages but has the same meaning. Interpretation or giving meaning is formulating ideas from information that is not only focused on words and phrases. Extrapolation is a description or conclusion of information in accordance with the cognitive level (Kartikasari et al., 2019).

The low mathematical understanding of students requires a learning method that can improve students' mathematical understanding. Cooperative learning is a constructivistic learning model. Elements of constructivist learning are freedom and diversity. This freedom means that individuals are free to make decisions based on what they want to do. Diversity means that individuals recognize that they are different from others (Lovez et al., 2023). Cooperative learning methods allow students to work together in groups to achieve learning goals (Safiyana et al., 2022). Through cooperation in groups, students can help each other understand the material, share ideas and foster a sense of mutual help and responsibility. Cooperative learning is a method that not only prioritizes the achievement of students' cognitive quality, but can develop other abilities, namely a sense of responsibility, realizing individual

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abilities, working together and realizing relationships between individuals and the environment (Harahap et al., 2022).

One of the cooperative learning that can improve student understanding is the STAD (Student Team Achievement Division) type. The STAD method was developed by Slavin (1995) and is widely used in various subjects, one of which is mathematics. STAD divides students into several heterogeneous small groups, students are required to work together in doing assignments or looking for problem solving (Suparsawan, 2021). According to Surat & Jayantika (2021) learning is said to be active if the teacher can manage the class by applying various learning models. Teachers who are adept at developing learning models creatively have an impact on student activeness during the learning process. In the STAD method, the teacher divides students into groups of 4 or 5 people who have homogeneous academic abilities, gender and different backgrounds. The six steps of the STAD method are: (1) conveying learning objectives, (2) forming study groups consisting of different genders, backgrounds and academic abilities, (3) a brief explanation of the learning material by the teacher, (3) group discussion, (4) giving questions or worksheets, (5) evaluation and giving rewards (Rachmatia. et al., 2024).

The main idea in STAD is to motivate students to support and help each other among group members to master individual abilities and understand the material taught by the teacher where students are the center of learning activities (Slavin, 2005). This is in line with research (Jayantika et al., 2024) on improving student learning outcomes on determinant and inverse matrix material using the STAD type cooperative learning model in class XI SMA Negeri 1 Mengwi. The results showed that the learning outcomes of students who were complete in cycle I amounted to 39% and in cycle II amounted to 79%. It can be concluded that there is an increase in student learning outcomes using the STAD method.

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Research Ulfa et al., (2021) also describes the application of the STAD type cooperative model to improve the mathematical understanding of grade X students at MAS Darul Ihsan Aceh Besar on the material of equations and inequalities of linear absolute value of one variable, where the understanding of students taught using the STAD type cooperative model is higher than the understanding of students taught with conventional learning models, seen from the N-Gain score of the experimental class 73.29% and the N-Gain Score of the control class 51%.

Based on the above problems, the author wants to see the difference in students' mathematical understanding before and after the implementation of the STAD method on probability material. Whether the application of the STAD method can improve the mathematical understanding of STIKOM Tunas Bangsa students on probability.

Methods

The research approach uses a quantitative approach, namely research that uses concrete data, data in the form of numbers / numbers that are measured using statistics as a calculation test tool (Sugiono, 2018). This research design uses pre-experiment (one group pretest-posttest design). In the pre-experiment design only one subject is involved, where the subject will be tested twice, namely before (pretest) and after (posttest) the treatment or method given (Sukarelawan et al., 2024).

Pretest is to know the initial ability of students before being given the STAD method. Teachers must know the initial mathematical abilities of students, because initial ability is a prerequisite for students to follow the learning process (Davita et al., 2020). The six steps of the STAD method applied after the pretest, namely: (1) conveying learning objectives, (2) forming study groups consisting of different gender, background and academic ability, (3) brief explanation of learning material by the teacher, (3) group discussion, (4) giving questions or worksheets, (5) evaluation and rewarding (Rachmatia. et

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al., 2024). After applying the STAD method, students are given a post test as the final test to see if there is an increase in students' mathematical understanding.

The pretest and posttest questions have been assessed by experts in the instrument validation and reliability test. A good instrument is an instrument that has high reliability because it has stable measurement results and can be used in a very broad evaluation (Listiana, 2025). Cronbach's Alpa Coefficient is used to measure the correlation between items in the instrument. Cronbach's alpa value is between 0 and 1 with a good reliability category is a value above 0.7.

The sampling technique in this study is the Convenience sampling technique, namely the sample technique selected because it is in the right place and at the right time (Umriati & Wijaya, 2020). In this case, the researcher directly teaches in class 23S01 students majoring in Information Systems at STIKOM Tunas Bangsa. The research population was all STIKOM Tunas Bangsa students even semester FY 2023-2024 majoring in Information Systems consisting of 8 classes. The research sample was class 23S01 which amounted to 43 students. The data analysis technique is assisted by SPSS 25 software.

Result and Discussion

Research results

Below are the results of the normality test of the pre-test and post-test values

Tabel 1. Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Initial Understanding	.156	43	.011	.949	43	.055
Final Understanding	.063	43	.200*	.984	43	.816

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In the Shapiro-Wilk column, the sig. The value of initial understanding (before using the STAD method) is 0.055, and the sig value of final understanding (after using the STAD method) is 0.816. Data is normally distributed if the sig value. $> 0,05$ (Saragih, 2015). Based on the results that have been tested, it is found that the sig. value of initial understanding 0.055 and final understanding 0.816 is greater than 0.05 so it can be concluded that the data is normally distributed. The normal graph of initial understanding and final understanding can be seen in Figure 1 and Figure 2 below.

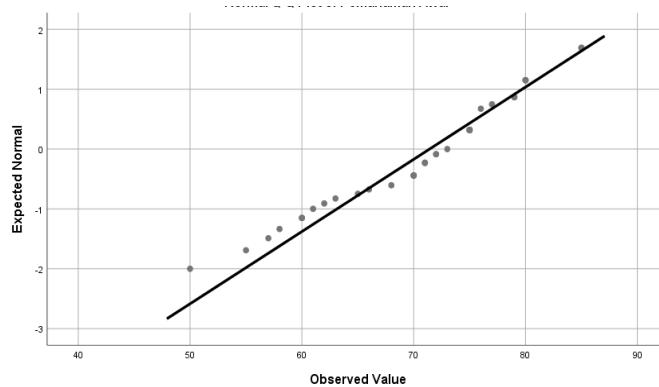


Figure 1. Normal Graph of Initial Understanding

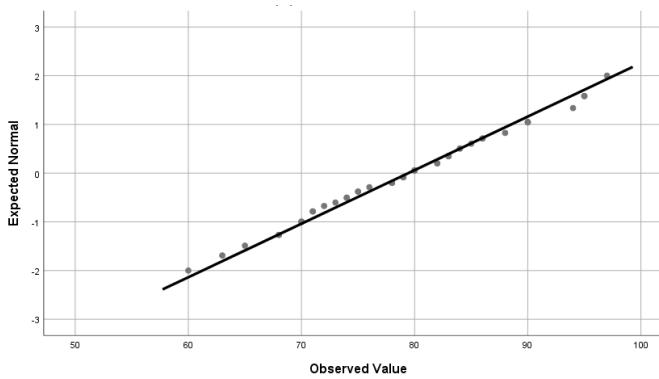


Figure 2. Normal graph of final Understanding

Normality testing can also be seen through Q-Q Plots. It is said that the data is normally distributed if the distribution of data in the form of dots overlaps with a straight line (Kadir, 2015). Based on Figures 1 and 2, we can

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see that the distribution of points overlaps with a straight line. This states that the data is normally distributed.

Table 2. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Initial	70.8372	43	8.88265	1.35459
	Understanding				
	Final Understanding	79.4419	43	9.09553	1.38706

Based on Table 2, there is a difference between the mean initial understanding of 70.83 and Std. deviation obtained 8.88 with a standard error of 1.35. Mean final understanding after using the STAD method is 79.44. Std. deviation 9.09 with a standard error of 1.38. Based on these results, it can be concluded that mathematical understanding after using the STAD method is higher than before using the STAD method.

Table 3. Paired Samples Correlations

			N	Correlation	Sig.
Pair 1	Initial	Understanding	& 43	.714	.000

Based on Table 3. The correlation value is 0.714, which states that the correlation between initial understanding and final understanding is strong. The correlation range with a strong category is 0.60 - 0.799. While the sig. value is 0.00 or smaller than 0.05. So, we can conclude that understanding before and after using the STAD method has a strong and significant correlation.

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Table 4. Paired Samples Test

		Paired Differences			Confidence Interval of the Difference							
Pair	Initial	Std.	Std. Error	95% Interval of the Difference	t	df	Sig. (2-tailed)					
		Mean	n									
1	Initial Understanding	- 6.80385	1.03758	- -6.51074	-	42	.000					
	Final Understanding	- 8.604	65	10.69857	8.293							

Based on Table 4. Obtained a sig value. (2-tailed) 0.00. The value of 0.00 < 0.05. It can be concluded that there is a significant difference between students' mathematical understanding before and after using the STAD method.

This research is pre-experimental (one-group pretest-posttest design). The research was conducted on one class consisting of 43 students. Students were given a pretest to see their initial ability before using the STAD method. The material taught was about probability. After the pretest, the learning process used the STAD method. Students were divided into several groups, each group consisting of 5 students with different abilities, gender and race. The lecturer explained the material on probability. After that, students discuss with their groupmates, then solve the problems given.

Based on the results of research and statistical tests, there is a difference between the mean initial understanding of 70.83 and the mean final understanding after using the STAD method of 79.44. Based on these results, it can be concluded that mathematical understanding after using the STAD method is higher than before using the STAD method. There is an increase in the mean score after using the STAD method because in the cooperative method students work together, help each other understand the material and are responsible in their groups in order to achieve learning objectives, namely understanding the material of opportunities.

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The correlation value is 0.714, which states that the correlation between initial understanding and final understanding is strong. With a sig. value of 0.00 or smaller than 0.05. So, it can be concluded that understanding before and after using the STAD method has a strong and significant correlation. This research is in line with previous research, namely Research(Ulfa et al., 2021) also explains the application of the STAD type cooperative model to improve the mathematical understanding of class X students at MAS Darul Ihsan Aceh Besar on the material of equations and inequalities of linear absolute value of one variable, where the understanding of students taught using the STAD type cooperative model is higher than the understanding of students taught with conventional learning models, seen from the N-Gain score of the experimental class 73.29% and the N-Gain Score of the control class 51%.

This study has limitations, namely, the sample used is only one pre-experiment class (one group pretest-posttest design), so it is necessary to expand the sample so that the research results are more accurate.

Conclusion

The conclusion obtained from the results of this study is that the use of STAD cooperative methods can improve the mathematical understanding of STIKOM Tunas Bangsa Pematangsiantar students, with the initial mean value is 70.83 and the final mean is 79.44. The use of appropriate methods can improve understanding and make the learning process active. Students are no longer afraid or bored when the mathematics learning process takes place. It is expected that teachers/lecturers can apply other cooperative methods to improve the understanding, activeness and creativity of their students. It is hoped that future researchers will apply the STAD method or other cooperative methods in all types of science fields and be carried out on a wide sample.

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