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COMPARISON OF LEARNING OUTCOMES OF 11TH GRADE STUDENTS AFTER BEING TAUGHT USING THE TEAMS GAMES TOURNAMENT (TGT) AND MAKE A MATCH (MAM) LEARNING MODELS ON THE TOPIC OF LIMIT AlGEBRAIC FUNCTIONS

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Abstract

Lately, there has been a decline in students' learning outcomes due to the use of teaching models that are not suitable for the teacher. There are many teaching models that can be used to create the desired interaction. One of them is by implementing cooperative learning models. Some appropriate cooperative learning models to engage students' attention are Teams Games Tournament (TGT) and Make A Match (MAM). The aim of this research is to determine the comparison of learning outcomes of 11th grade students who were taught using the TGT and MAM learning models on the topic of limit of algebraic functions, and to determine which learning model, TGT or MAM, is more effective for 11th grade students. This research is a quantitative study. There are two classes involved in this research, namely Experiment Class 1 (TGT) and Experiment Class 2 (MAM). The subjects of this research are 11th grade students of MA Raudlatul Ulum, Klampis. The data analysis technique used in this research is inferential statistics and n gain score test. The results of this research show that there is a significant difference in learning outcomes between the application of the TGT and MAM learning models on the limit of algebraic functions. The research findings indicate that the MAM learning model is more effective for 11th grade students from a gain score of 78% while the TGT learning models has a gain score of 75%.

Keywords: *Learning Outcomes, TGT, MAM*

Abstrak

Akhir-akhir ini terjadi penurunan pada hasil belajar siswa yang disebabkan oleh model pembelajaran yang kurang tepat digunakan guru. Banyak model pembelajaran yang dapat digunakan sehingga dapat terjadi interaksi yang sebagaimana diharapkan. Salah satunya dengan menerapkan model pembelajaran kooperatif. Beberapa model pembelajaran kooperatif yang tepat digunakan untuk menarik perhatian siswa adalah *Teams Game Tournament* (TGT) dan *Make A Match* (MAM). Tujuan penelitian ini adalah mengetahui perbandingan hasil belajar siswa kelas 11 yang diajar menggunakan model pembelajaran TGT dan MAM pada materi limit fungsi aljabar dan mengetahui model pembelajaran manakah yang lebih efektif antara model pembelajaran TGT dan MAM yang tepat digunakan untuk siswa kelas 11. Penelitian ini merupakan penelitian kuantitatif. Terdapat 2 kelas dalam penelitian ini yaitu, kelas eksperimen 1 (TGT) dan kelas eksperimen 2 (MAM). Subjek uji coba penelitian ini adalah kelas 11 MA Raudlatul Ulum, Klampis. Teknik analisis data pada penelitian ini adalah statistik inferensial dan *n gain score test*. Berdasarkan penelitian diperoleh hasil belajar secara signifikan yang menerapkan model pembelajaran TGT dan MAM pada limit fungsi aljabar. hasil penelitian yang diperoleh menunjukkan bahwa model pembelajaran MAM lebih efektif digunakan kepada siswa kelas 11 dari hasil gain sebesar 78% dibandingkan model pembelajaran TGT dengan hasil gain sebesar 75%.

Kata kunci: *Hasil Belajar, TGT, MAM*

INTRODUCTION

Mathematics is a subject that is less favored by students. This is because mathematics is a difficult subject to understand, as it involves learning abstract concepts. According to Agustina (2016) mathematics has become a subject that is avoided by students.

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Lately, there has been a decline in students' learning outcomes due to the use of teaching models that are not suitable for the teacher. This is in line with the opinion of Santosa (2019) who stated that the teaching model that is most mastered by teachers is the most commonly used model in the classroom. This is a problem because there is no guarantee that the teaching model used by the teacher is appropriately applied to the students.

On the other hand, the use of inappropriate teaching models during the learning process results in students having difficulty grasping the subject matter and feeling bored. Students feel fatigued and lack enthusiasm during the teaching and learning activities. This leads to suboptimal learning outcomes for the students. This is in line with the statement by Sari (2014) that often in schools, teachers have a habit of teaching mathematics through lectures, asking students to read learning materials, and memorizing mathematical formulas. This kind of mathematics teaching model makes the subject less enjoyable, disliked, and consequently leads to low student learning outcomes.

There are many learning models that can be used to facilitate the desired interaction Safitri (2016). Each learning model has its own advantages and disadvantages. The accuracy in choosing a learning model is supported by learning factors (Lisdayanti, 2019). Patonah (2014) recommends using the cooperative learning model. Cooperative learning is a learning model based on social interaction among students, focusing on teaching methods and techniques where students are formed into small groups and rewarded for their group work.

The appropriate cooperative learning models that can capture students' attention are Teams Game Tournament (TGT) and Make A Match (MAM). Ratnawati & Marviana (2017) argue that the TGT cooperative learning model is considered one of the most engaging cooperative learning models. Learning activities using games developed in collaborative learning with TGT allow students to learn in a relaxed yet responsible manner. It encourages participation in healthy competition and learning. On the other hand, according to Kusuma & Khoirunnisa (2018), the use of the cooperative learning model MAM allows students to expand their knowledge by building on existing knowledge and deepen their understanding of the subject while having fun. The TGT and MAM learning models can be one of the learning models that develop students' enthusiasm and creativity, and are expected to result in maximum student learning outcomes. Students can learn mathematics in an enjoyable way

combined with reinforcing the mathematical concepts through games. This creates a more relaxed, active, and enjoyable learning environment for students.

The TGT Learning Model is a learning model that places students in teams with different abilities and brings them together in a tournament (Safitri, 2016). There are stages in the TGT learning model: material preparation, group learning, games, competitions, and group rewards (Fatmawati & Yuliatin, 2019). The advantage of the TGT learning model is that it introduces competition in the learning process by comparing the abilities of each participant in the tournament. This can encourage active participation and foster individual responsibility within the tournament groups (Syofiana, 2018). The disadvantage of the TGT learning model, according to Fatmawati & Yuliatin (2019), is that the time required for student discussions can exceed the scheduled time. This issue can be overcome if the teacher has full control. On the other hand, for high-achieving students, some may not be accustomed to explaining to other students and may find it difficult to do so.

The MAM learning model is a learning model that can also be used for students. Step of the MAM learning model according to Aliputri (2018), are as follows: (1) teacher instructs students to study a certain material, (2) divide students into 2 groups, (3) Providing group questionnaire and asking group B to provide the answers, (4) group A is asked by the teacher to find the answers in group B , (5) once they find the answers from another group, they report the results to the teacher, and the teacher records the names of the student pairs, (6) when the time is up, the teacher informs the students, (7) teacher asks team to present their group's results in front of the class, while other students can comment on whether the answers are correct or not, (8) the teacher evaluates the group's presentation and assesses the correctness of their answers.

The advantage of this learning model is that it is packaged as a game that matches pairs of cards. In addition, students can search for topics and learn the material on their own based on the questions provided. The MAM learning model trains students' independence and collaboration within a group (Kusuma & Khoirunnisa, 2018). On the other hand, the disadvantage of the MAM learning model is that the teacher takes the cards given to students, shuffles them, and redistributes them, which means students do not ask questions to other students and only focus on their own questions. Additionally, the various answer options can

confuse students. There are many different variations of questions and answers that can trap students in finding the correct answer (Supratiwi, 2015).

Based on the description above, researcher concludes that both learning models enhance students' motivation in the learning process as they are presented as a game where students compete to obtain the highest score. Based on the research conducted by Sari (2014), there is a 4,07% difference in student learning outcomes between the two classes that use different learning models, namely the MAM learning model in experiment class 1 and the TGT learning model in experiment class 2 on the topic of geometric series. The research results show that (1) the mathematics learning outcomes of students using the TGT learning model are higher compared to the MAM learning model, and (2) there is a difference in the effectiveness of using cooperative learning models between TGT and MAM. Therefore, the researcher is interested in implementing the TGT and MAM learning models to compare student learning outcomes with a different topic, which is limits algebraic function for 11^{th} grade students.

On the other hand, researchers are also interested in comparing student learning outcomes after being taught using the TGT and MAM learning models on the topic of limits algebraic functions because the material is too abstract for students to understand. According to the researcher, the material is suitable to be presented as a game.

METHODS

This type of research is a quantitative study using a quasi-experimental method with a non-equivalent control group design pretest-posttest. The researcher chose this design because a group of subjects is selected from a specific population and undergoes a pretest before receiving the treatment. After the treatment, the subjects are given a posttest to determine the results of the treatment. There are two classes in this quasi-experimental study, namely experiment class 1 and experiment class 2. Experiment class 1 is treated with the TGT learning model, while experiment class 2 is treated with the MAM learning model. The population in this study is the 11^{th} grade students at MA Raudlatul Ulum, located in Karang Anyar, Klampis District, Bangkalan Regency. The 11^{th} grade consists of two classes, namely 11 IPA 1 and 11 IPS 1. The sample in this study was taken using saturated random sampling technique. In general, the research design can be described as follows:

Table 1 Non-Equivalent Control Group Design Pretest-Posttest

Class	*Pretest*	Treatment	*Posttest*
E_1	O_{11}	X_1	O_{12}
E_2	O_{21}	X_2	O_{22}

Before being given the treatment, both groups are given a pretest with the same material to determine their initial knowledge. Then, the treatment (X_1 and X_2) is administered to each class. Experiment Class 1 is given the treatment using the TGT learning model (X_1), while Experiment Class 2 is given the treatment using the MAM learning model (X_2). After the treatment is given to each class, a posttest is administered. The posttest aims to obtain scores that will be used for a t-test to compare the learning outcomes of students taught using the TGT and MAM learning models. Additionally, n gain score test will be conducted based on the difference between the pretest and posttest scores to determine which learning model is more effective for 11^{th} grade students. data is obtained through testing . The test in this research are the pretest and posttest. The data analysis techniques used in this research are:

1. Normality Test

The normality test in this study is conducted to determine whether the frequency of the data follows a normal distribution or not. The normality test is conducted on the posttest scores. Before determining the normality, the sample will be tested for its hypothesis to determine whether the sample is from a normally distributed population or not.

a) H_0: The sample is from a normally distributed population.
b) H_1: The sample is not from a normally distributed population.

The normality test is conducted by comparing Shapiro-Wilk with a significance value of 0,05. If the P-value from the Shapiro-Wilk coefficient is ≥ 0,05, then the data is normally distributed. However, if the P-value from Shapiro-Wilk < 0,05, then the data is not normally distributed.

2. Homogenity Test

The homogeneity test in this study is conducted to determine whether the research is homogenous or not. First, determine the hypothesis to make an initial

assumption whether the sample comes from a population with homogeneous variances or not.

a) H_0: $\sigma_1^2 = \sigma_2^2$ The sample is derived from a population with homogeneous variance.
b) H_1: $\sigma_1^2 \neq \sigma_2^2$ The sample is derived from a population without homogeneous variance.

The homogeneity test was conducted on all data results from 11 IPA 1 (TGT learning models) and 11 IPS 1 (MAM learning model). The research results are considered homogeneous if the significance value is $\geq$ 0,05. And they are considered non-homogeneous if the significance value is < 0,05.

3. Hypothesis Test

Hypothesis test in this study was used to determine the difference in learning outcomes of topic of limits algebraic functions using the TGT and MAM learning models. Hypothesis test in this study used the t-test. The t-test was conducted by comparing the learning outcomes of students taught using the TGT and MAM learning models. The t-test calculation in this study used two independent sample groups.

Determine the hypothesis.

a) $H_0 : \mu_1 = \mu_2$ There is a significant difference of learning outcomes of 11^{TH} grade students after being taught using the Teams Games Tournament (TGT) and Make A Match (MAM) learning models on the topic of limit algebraic functions.
b) $H_1 : \mu_1 \neq \mu_2$ There is no significant difference of learning outcomes of 11^{TH} grade students after being taught using the Teams Games Tournament (TGT) and Make A Match (MAM) learning models on the topic of limit algebraic functions.

Based on significance

a) If the significance (P) ≥ 0.05, then H_0 is accepted.
b) If the significance (P) < 0.05, then H_0 is rejected.

4. N Gain Score-test

The effectiveness of the TGT and MAM learning models can be analyzed using the n gain score test. N gain score test is the difference between the pretest and posttest scores.

The understanding of students' concept mastery can be indicated through the n gain score test. N gain score test is calculated using the following formula:

$$\text{N gain score} = \frac{posttest\ score - pretest\ score}{maximum\ score - pretest\ score}$$

Table 2 Classification Of N Gain Score Test

N gain Score	Category
0,7<g<1	High
0,3≤g≤0,7	Medium
0<g<0,3	Low

Table 3 Effectiveness Interpretation Category Of N Gain Score Test

Percentage (%)	Interpretasion
< 40	Ineffective
40-55	Less Effective
56-75	Quite Effective
> 76	Effective

RESULTS AND DISCUSSION

RESULT

This research produced data in the form of pretest and posttest scores on the topic of limit algebraic functions for 11th grade students at MA Raudlatul Ulum, Klampis. The following are the pretest and posttest results for experiment 1 class (11 IPA 1) and experiment 2 class (11 IPS 1). The minimum mastery criteria (KKM) in this research state that if students obtain a score < 75, they are considered not proficient, and if the score is ≥ 75, they are considered proficient.

1. Experiment Class 1 Pretest-Posttest Data

Table 4 Experiment Class 1 Pretest-Posttest Data

Experiment Class 1 (TGT Learning Models)			
No	**Name**	***Pretest Score***	***Posttest Score***
1	Ibnu Ziyyet	30	85
2	Nurul Huda	53	86
3	Syaif AlFairus	40	84
4	Haikal Insani	45	83
5	Qonita Hanin	37	85
6	Laylatul M.	35	84
7	Nila	30	85
8	Mochammad	40	85
9	Robiatul Dewi	52	87

10	Laili Ningsih	68	88
11	Ahmad Zainol	55	86
12	Muhammat A	30	85
13	Haikal Ambari	26	87
14	Haikal Rabba	20	85
15	Hilyatun N	41	88
16	Subhan M	21	87
	Average	**38,94**	**85,63**

The table above shows the scores obtained by students before and after being given the TGT learning model treatment. We can see from the initial pretest data that none of the students achieved a passing score. However, in the posttest data, where the students have been given the TGT learning model treatment, all students achieved passing scores. One student obtained a score of 83, two students obtained a score of 84, six students obtained a score of 85, two students obtained a score of 86, three students obtained a score of 87, and two students obtained a score of 88.

2. Experiment Class 2 Pretest-Posttest Data

Table 5 Eksperimental Class 1 Pretest-Posttest Data

Experiment Class 2 (MAM Learning Models)			
No	**Name**	***Pretest Score***	***Posttest Score***
1	Nailal M	15	83
2	Nurus	20	85
3	Nufalul A	10	85
4	Siska M.	13	85
5	Kudrotul	20	87
6	Ilham	15	85
7	Faizal	35	83
8	Ulfiyah	15	84
9	Zainal A	30	82
10	Suhadi	15	80
11	Nailus S	17	80
12	Ayu A	25	83
13	Ulfatun N	15	85
14	Aida K	40	83
15	Nailul A	33	80
16	Syamsul	23	79
	Average	**21,31**	**83,06**

The table above shows the scores obtained by students before and after being given the MAM learning model treatment. We can see from the initial pretest data that none of the students achieved a passing score. However, in the posttest data, where the students have been given the MAM learning model treatment, all students achieved passing scores. One student obtained a score of 79, three students obtained a score of 80,

one student obtained a score of 82, four students obtained a score of 83, one student obtained a score of 84, five students obtained a score of 85, and one student obtained a score of 87.

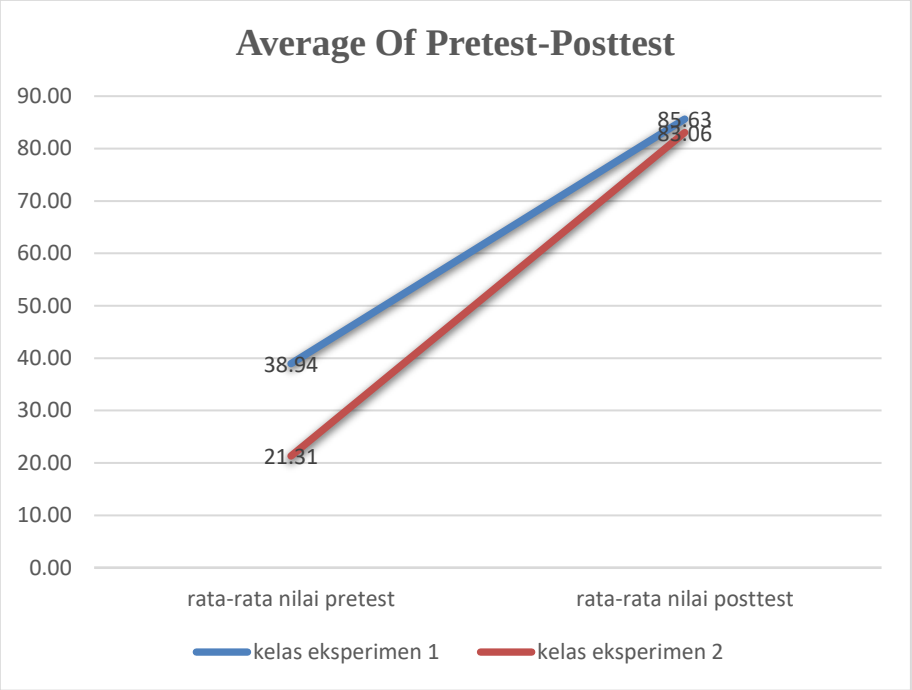

Figure 1 Average Of Pretest-Posttest

From the students' learning outcomes, it is found that experiment class 1 has an average pretest score of 38,94 and an average posttest score of 85.63. Meanwhile, experiment class 2 has an average pretest score of 2131 and an average posttest score of 83,06. From the graph, we can see that the average pretest scores of experiment class 1 and experiment class 2 are quite far apart, with a difference of 17,63. However, looking at the endpoints of the lines that are almost touching, the average posttest scores of the students in experiment class 1 and experiment class 2 are not too far apart, with only a difference of 2,57.

Learning Outcomes

1. Normality test

Normality test using SPSS version 23. The data used is the posttest results of both classes. The basis for making decisions on normality test is that if the sig value ≥ 0,05, then the data is normally distributed, but if the sig value < 0,05, then the data is not normally distributed. Learning outcomes of the normality test are as follows:

Table 6 Normality Test

Tests of Normality

	Class	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Learning Outcomes	Experiment Class 1 Posttest	,229	16	,075	,931	16	,255
	Experiment Class 2 Posttest	,177	16	,195	,917	16	,149

a. Lilliefors Significance Correction

Based on learning outcomes in the table above, the sig value obtained for the experiment class 1 data is 0,225, indicating that the data is normally distributed because 0,225 > 0,05. Similarly, for experiment class 2, it has a sig value of 0,149, it can be concluded that both data is normally distributed because a sig value of 0,149 > 0,05.

2. Homogenity Test

Data used in this test are the posttest results of both classes. The calculations were done using SPSS version 23. The basis for making decisions on homogeneity test is that if the sig value ≥ 0,05, then it is considered homogeneous, but if the sig value < 0,05, then the data is not homogeneous. Learning outcomes of the homogeneity test are as follows:

Table 7 Homogenity Test

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Learning Outcomes	Based on Mean	2,504	1	30	,124
	Based on Median	2,456	1	30	,128
	Based on Median and with adjusted df	2,456	1	28,475	,128
	Based on trimmed mean	2,505	1	30	,124

Based on the calculations in the table above, the sig value for the posttest of experiment class 1 and experiment class 2 is 0,124. Since the sig value of 0,124 > 0,05, it can be concluded that both data have homogeneous variances.

3. **Hypothesis Test**

The purpose of this research is to conduct a hypothesis test to know comparison of learning outcomes of 11^{TH} grade students after being taught using the Teams Games Tournament (TGT) and Make A Match (MAM) learning models on the topic of limit algebraic functions . The data used in this test are the posttest results of both classes.

Determine the hypothesis.

a) $H_0 : \mu_1 = \mu_2$ There is a significant difference of learning outcomes of 11^{TH} grade students after being taught using the Teams Games Tournament (TGT) and Make A Match (MAM) learning models on the topic of limit algebraic functions.

b) $H_1 : \mu_1 \neq \mu_2$ There is no significant difference of learning outcomes of 11^{TH} grade students after being taught using the Teams Games Tournament (TGT) and Make A Match (MAM) learning models on the topic of limit algebraic functions.

Table 8 Hypothesis Test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
								Std. Error Difference	95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference		Lower	Upper
Learning Outcomes	Equal variances assumed	2,504	,124	3,740	30	,001	2,563	,685	1,163	3,962
	Equal variances not assumed			3,740	25,199	,001	2,563	,685	1,152	3,973

From the table above, the sig value (2-tailed) is obtained as 0,001, where 0,001 < 0,05. Therefore, based on the significance of H_0 being rejected, it can be concluded, based on the hypothesis test criteria, that there is a significant difference in the learning outcomes between experiment class 1 and experiment class 2.

4. N Gain Score Test

Data used in this n gain score test are the pretest-posttest data of students in both classes. The n gain score test is used to determine the effectiveness of the TGT learning models and the MAM learning models. Learning outcomes of the n gain score test are as follows:

Table 9 N Gain Score Test

Descriptives

	Kelas			Statistic	Std. Error
N_Gain_Skore_ Persenst	Experiment class 1	Mean		75,3825	1,42167
		95% Confidence Interval for Mean	Lower Bound	72,3523	
			Upper Bound	78,4127	
		5% Trimmed Mean		75,6447	
		Median		75,7875	
		Variance		32,338	
		Std. Deviation		5,68666	
		Minimum		62,50	
		Maximum		83,54	
		Range		21,04	
		Interquartile Range		8,50	
		Skewness		-,642	,564
		Kurtosis		,140	1,091
	Experiment class 2	Mean		78,0848	1,14448
		95% Confidence Interval for Mean	Lower Bound	75,6454	
			Upper Bound	80,5242	
		5% Trimmed Mean		78,2109	
		Median		78,6667	
		Variance		20,957	
		Std. Deviation		4,57792	
		Minimum		70,15	
		Maximum		83,75	
		Range		13,60	
		Interquartile Range		8,40	
		Skewness		-,327	,564
		Kurtosis		-1,399	1,091

Based on the calculation of the n gain score test, the average gain score for experiment class 1 (TGT learning models) is 75%, with a percentage range of maximum and minimum scores of 84% and 63%, respectively. Meanwhile, the average gain score for experiment class 2 (MAM learning models) is 78%, with a percentage range of maximum and minimum scores of 84% and 70%, respectively. Based on the interpretation of the

effectiveness of the n gain score test, it can be concluded that the use of the TGT learning model is quite effective in improving students' learning outcomes in the topic of limits algebraic functions for 11^{th} grade students. On the other hand, the use of the MAM learning model is effective in improving students' learning outcomes in the topic of limits algebraic functions for 11^{th} grade students. This research indicates that the MAM learning model is more effective when used with 11^{th} grade students, from a gain score of 78% while the TGT learning models has a gain score of 75%.

DISCUSSION

This research was conducted at MA Raudlatul Ulum, located in Karang Anyar, Klampis District, Bangkalan Regency. The research object of this study is 11^{th} grade students. The research involves two classes, namely class 11 IPA 1, which received treatment using the TGT learning models as experiment class 1, and class 11 IPS 1, which received treatment using the MAM learning models as experiment class 2. These two classes were given different treatments to compare the learning outcomes of students after being taught using the two different learning models. The number of students in experiment class 1 and experiment class 2 is 16 students each. The students were given a pretest before being treated with the different learning models. After the treatment, both experiment class 1 and experiment class 2 were given a posttest. The data from the posttest in both classes are normally distributed because experiment class 1 and experiment class 2 have sig values of 0,225 > 0,05 and 0,149 > 0,05, respectively. Additionally, both sets of data have homogeneous variances, as seen from the homogeneity test results using SPSS version 23, which obtained a sig value of 0,124 > 0,05.

Based on the results of the t-test using SPSS version 23, a sig value of < 0,05 was obtained, which means H_0 is rejected. Therefore, based on the criteria for hypothesis test, it can be concluded that there is a significant difference between the learning outcomes of the experiment class 1 and the experiment class 2. Consequently, it can be said that there is a difference in the learning outcomes of 11^{th} grade students after being taught using the TGT and MAM learning models. Next, a gain test was conducted to determine which learning model is more effective for 11^{th} grade students. Based on the gain test calculations, the average gain score for experiment class 1 (TGT learning model) is 75%, with maximum and minimum percentage scores of 84% and 63%. Meanwhile, the average gain score for

experiment class 2 is 78%, with maximum and minimum percentage scores of 84% and 70%. In this study, the difference in gain score is 3%, indicating that the use of the MAM learning model is more effective for 11th grade students in the topic of limits algebraic functions.

Learning outcomes of this study are in line with previous research conducted by (Kusuma & Khoirunnisa, 2018) titled "Application of Cooperative Learning Models Make a Match and Team Games Tournament on Learning Outcomes". The results of that study showed that the average mathematics learning outcomes of students using the MAM Learning Models were higher than the average mathematics learning outcomes using the TGT learning models, with a difference of 2,7%. This research is also supported by a study conducted by Sari (2014) titled "Difference in Student Learning Outcomes Using Cooperative Models MM and TGT with the help of Powerpoint," which showed that the improvement in learning outcomes with the MAM learning model using PowerPoint media was higher, at 73,53% with a high gain qualification, compared to using the TGT learning models with PowerPoint, which was 69,49%. However, this research is not in line with a study conducted by Syofiana (2018) titled "Comparison of Student Learning Outcomes Using Cooperative Learning Models Make A Match (MM) And Team Games Tournament (TGT) in Mathematics Subjects in Class XI IPA MAN 1 Kota Bengkulu". The results of that study concluded that the result test of students applying the TGT learning models were more effective than implementing the MAM learning models, with an average difference of 37,29%.

The researcher's hypothesis in this study before conducting the research was that the TGT learning model is more effective compared to the MAM learning model. However, after conducting the research, it was found that the MAM learning model is more effective compared to the TGT learning model. Both the TGT and MAM learning models having an impact on learning outcomes of 11TH grade students on the topic of limit algebraic functions . Students can better understand the material through both learning models, which has an impact on improving student learning outcomes. This is evidenced by the positive influence and differences resulting from the use of the TGT and MAM learning models.

CONCLUSION

1. Based on the conducted research, it can be concluded that there is a significant difference in the learning outcomes of students taught using the TGT and MAM learning models in the topic of limit algebraic functions.
2. The research findings indicate that the MAM learning model is more effective for 11^{th} grade students with a gain score of 78% while the TGT learning models has a gain score of 75%.

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