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The Effect of Using Teams Games Tournament (TGT) Type Cooperative Learning Model Assisted by Destination Media to Improve Students' Learning Outcomes on Buffer Solution Material

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Abstract: The Effect of Using Teams Games Tournament (TGT) Type Cooperative Learning Model Assisted by Destination Media to Improve Students' Learning Outcomes on Buffer Solution Material. This study aims to determine the effect of the TGT type cooperative learning model assisted by learning media on student learning outcomes in buffer solution material. This research was conducted at MAN 2 Model Medan in the even semester of the 2024/2025 academic year. The method used was a quasi-experimental with a non-equivalent control group design. The research sample consisted of class XI-F1 G as the control class and XI-F1 F as the experimental class selected by purposive sampling. Hypothesis I testing was carried out using the Independent Sample T-Test, with the results of the study showing a sig value of 0.00 <0.05, which means that the hypothesis (Ha) is accepted and (H0) is rejected. Hypothesis II testing was carried out using the One Sample T-Test, with the results showing a sig value of 0.00 <0.05, which indicates that there is a positive student response to the TGT type cooperative learning model using destination media on buffer solution material on student learning outcomes, which means that the Hypothesis (Ha) is accepted.

Keywords: Cooperative Learning Model, Destination Media, Buffer Solution

Abstrak: Pengaruh Penggunaan Model Pembelajaran Kooperatif Tipe Teams Games Tournament (TGT) Berbantuan Media Destinasi untuk Meningkatkan Hasil Belajar Siswa pada Materi Larutan Penyangga. *Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran kooperatif tipe Teams Games Tournament (TGT) berbantuan media pembelajaran terhadap hasil belajar siswa pada materi larutan penyangga. Penelitian ini dilaksanakan di MAN 2 Model Medan pada semester genap tahun ajaran 2024/2025. Metode yang digunakan adalah quasi eksperimen dengan desain kelompok kontrol non-ekuivalen. Sampel penelitian terdiri dari kelas XI-F1 G sebagai kelas kontrol dan XI-F1 F sebagai kelas eksperimen yang dipilih secara purposive sampling. Pengujian hipotesis I dilakukan dengan menggunakan Uji Independent Sample T-Test, dengan hasil penelitian menunjukan nilai sig 0.00 < 0.05 yang berarti hipotesis (Ha) diterima dan (H0) ditolak. Pengujian hipotesis II dilakukan dengan uji One Sample T-Test, dengan hasil menunjukkan nilai sig 0.00 < 0.05, yang menandakan bahwa ada respon positif siswa terhadap model pembelajaran kooperatif tipe TGT menggunakan media destinasi pada materi larutan penyangga terhadap hasil belajar siswa, yang berarti Hipotesis (Ha) diterima.*

Kata kunci: *Model Pembelajaran Kooperatif, Media Destinasi, Larutan Penyangga*

▪ INTRODUCTION

Education in the era of globalization is very important in creating quality human resources. Therefore, education must always develop and change from time to time. Education is a teaching and learning process carried out by a teacher with students to create a generation that has extensive knowledge, skills, and good attitudes and behavior. The success of education is determined by the quality of a teacher. Teachers are fully responsible directly for learning activities in the implementation of education. A teacher is required to be a professional, not only mastering the subject matter, but teachers must be able to be an example to their students and make learning effective and efficient (Amni et al., 2021).

Changes in the development of the era have caused many changes in the world of education. One of them is changes in the curriculum. The orientation of curriculum development is to achieve a balance of competency in attitudes, skills, and knowledge (Ginting et al., 2022). The most dominant change is science-based education, students are not only limited to memorizing, but rather show more active students, thus requiring changes in learning methods. Good learning changes must be able to function as a communication tool in delivering learning materials (Aryani et al., 2022).

In educational standards, learning is oriented towards student activities. This student-oriented learning can be viewed as an approach to learning that emphasizes optimal student activities to obtain learning outcomes in the form of a balanced combination of cognitive, affective, and psychomotor aspects (Wina, 2016).

Chemistry is a science that discusses the composition, movement or change of form, and energy of a substance. The concept of macromolecules and the concept of micromolecules are concepts studied in chemistry (Putra et al., 2024). Chemistry is often considered difficult by most students because chemistry is closely related to abstract ideas or concepts. Therefore, in the process of learning chemistry, an appropriate learning method or model is needed so that it can activate students and learning can be carried out properly (Khairunisa et al., 2024).

One of the chemistry materials in grade XI that is considered difficult is the material on buffer solutions, where students have difficulty understanding the questions well and have difficulty solving chemical calculation problems that require deep thinking, so that students become unconfident and lazy in solving chemistry problems. In addition, based on the results of observations in class, students prefer to use the whiteboard rather than powerpoint for science and calculation materials (Hamid, 2022). Thus, learning innovation is needed to improve learning achievement and the development of students' generic science skills. This can be proven from the results of interviews with chemistry teachers which show that student learning outcomes are still low (Putri et al., 2018).

Student learning outcomes are influenced by several factors, especially motivation which can be either intrinsic or extrinsic. Intrinsic motivation is the drive to learn that comes from the students themselves, while extrinsic motivation depends on external factors. Most students tend to have extrinsic learning motivation. Therefore, the role of teachers is very important to increase student motivation by creating interactive, fun, and interesting teaching and learning activities. This can increase students' interest in studying chemistry and encourage their learning motivation.

Based on the results of interviews with chemistry teachers at MAN 2 Model Medan, it was found that most students had poor learning outcomes in chemistry subjects. Several obstacles were identified in the learning process, including traditional learning methods and using powerpoint media as a tool, but there was no variation in learning methods. The use of lecture methods was more dominant and was not accompanied by other approaches to activate the student learning process, causing some students to be inactive in the learning process. This is because there are several steps in the learning model with a scientific approach that have not been implemented by teachers, causing some students to be inactive in the learning process.

Based on the list of grades of class XI, it turns out that student learning outcomes are still relatively low or less than optimal. This can be seen from the average daily test scores and mid-semester tests for chemistry subjects for class XI which have not met the standard criteria for achieving learning objectives set by the school in the good category. Based on daily test data, only around 50-60% of class XI students managed to achieve the standard criteria for achieving learning objectives

Thus, researchers use learning models and learning media that are appropriate to the conditions of educator problems. To improve learning outcomes, effective learning is needed, one way is to use a cooperative learning model. The cooperative model is a learning model that uses a grouping system or small teams with a number of students who have different levels of ability (Trianto, 2018).

One of the cooperative learning models that is considered interesting, effective, participatory for students, and exciting is the TGT. In the cooperative learning model of the TGT type, students are placed in teams with heterogeneous abilities to compete in a game (Agus, 2010). One of the learning media used to help students' understanding is destination media. Destination learning media is a board game media such as the snakes and ladders game but there are no snakes and ladders except that it only contains numbers.

Based on this background, the researcher was motivated to conduct this research as an effort to find out whether there is an influence of the TGT type cooperative learning model assisted by destination media on the material of buffer solutions on the learning outcomes of class XI students and to find out how students respond to the TGT type cooperative learning model assisted by destination media.

▪ METHOD

This research was conducted at Madrasah Aliyah Negeri (MAN) 2 Medan located at Jalan Williem Iskandar No.7A, Bantan Tim., Kec. Medan Tembung, North Sumatra Province. This research was conducted in the even semester of the 2024/2025 academic year. The time of implementation of this research is planned for January 2025. The population in this study were all students of class XI MAN 2 Model Medan, the 2024/2025 academic year in the even semester with the independent learning curriculum for buffer solution material. The sampling technique used in this study was Purposive Sampling, namely directly selecting one class, namely students in class XI-F1 G as the control class and XI-F1 F as the experimental class. The type of research used was a quasi-experimental type or pseudo-experiment with a non-equivalent control group design and a quantitative approach (Alamsari et al., 2011). The purpose of this pseudo-experimental research was to determine the effect of student learning outcomes with buffer solution material taught using the TGT learning model equipped with destination animation media. This type of quasi-experimental research consists of 2 classes, namely the control class and the experimental class (Al-Maskari et al., 2013). In this study, the

data collection technique was carried out by giving test questions to students. The test was used to measure the learning outcomes of the experimental class and the control class. The tests used in this study were pretest and posttest in the form of objective questions (multiple choices). Then the experimental class and the control class were given a questionnaire to determine students' responses to the models and media used. Data analysis in this study used normality tests, homogeneity tests, hypothesis tests and percentages of student responses using SPSS 26.0 for windows with a significance level of 0.05 and Microsoft Excel.

Research Design

The type of research used is quasi-experimental. The design chosen is two group pretest-posttest design.

Table 1. Research Design is Two Group Pretest-Posttest Design

Class	Pretest	Treatment	Posttest
Experiment	T_1	X_1	Y_1
Control	T_2	X_2	Y_2

(Dalimunthe et al., 2021)

Research Procedures

The following are the research procedures used :

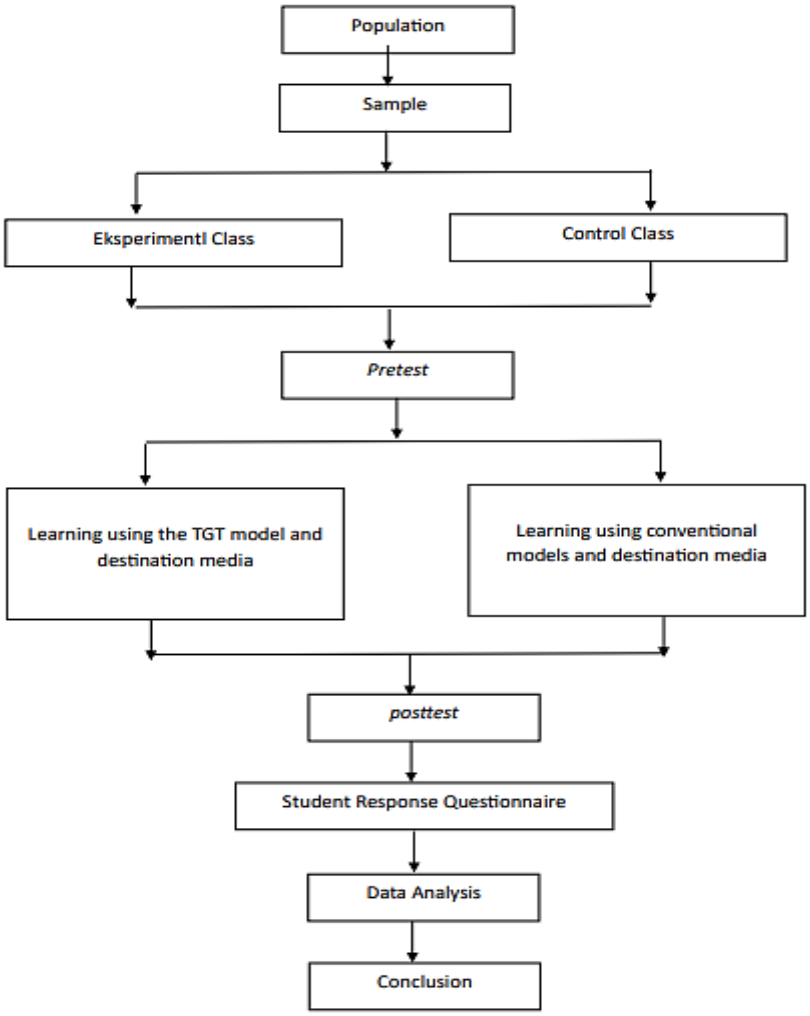

Figure 1. Research Procedure

▪ RESULT AND DISCUSSION

Research Instrument Data Analysis

This research was conducted at MAN 2 Model Medan located at Jl. Williem Iskandar No.7A, Bantan Tim., Medan Tembung District, North Sumatra Province. This research was conducted in January 2025, even semester of the 2024/2025 academic year. In the early stages of this research, instrument validation was carried out by expert validators. Furthermore, validation was carried out on 40 multiple-choice test questions which were then tested on 35 students of class XII F1 D. The test instrument trial was conducted at MAN 2 Model Medan. After the questions were tested, calculations were carried out with the aim of determining the feasibility of the questions, and the calculations included the level of difficulty of the questions, the discrimination power of the questions, the validity of the items, the distractors, and the reliability of the questions.

1) Validity Test

The formula used in determining or calculating the validity of the test instrument is the product moment formula to find the r count for each question item with N = 40. Questions that are declared valid are questions that have r count > r Table (Jahro 2023). Based on the validity test, it was obtained that out of 40 test items, 22 questions were declared valid, while 18 questions were declared invalid. The following are the results of the test instrument validity test:

Table 2. Results of Question Validity Test

Category	Number of Question											Items Total
Valid	2	3	4	5	6	8	10	12	13	14	18	22 questions
	19	20	21	23	26	27	31	32	34	36	40	
Invalid	1	7	9	11	15	16	17	22	24	25	28	18 questions
	29	30	33	35	37	38	39					

2) Discriminatory Power

The discriminatory power of questions is the ability of the question items to differentiate between students with high and low abilities (Kurniyawan dan Tanshzil, 2024). Based on the results of the excel calculation test, it was found that there were 26 questions in the eligible category, 14 in the unqualified category.

3) Distraktor

Based on the trial of the question instrument to students, the distractors or distractor answers that meet the requirements are questions number 1,2,3,4,5,6,7,8,10,11,12,13,14,15,17,18,19,21,23,24,25,26,27, 29,31,33,34,35,36,38,40. While those that do not meet the requirements are questions number 9,16,20,22, 28,30,32,37,39.

4) Reliabilitas Tes

To calculate the reliability of the test instrument in this study, the KR-20 formula was used so that the rcount value = 0.88 was obtained where rcount> rTable (0.361) so that the test instrument was declared reliable, and was in the high category (Lastri, 2023).

Based on all prerequisite tests, the test instrument had met the requirements, so the test instrument used as a data collection tool to see the results of this study was with a total of 20 questions, namely with question numbers 2, 3, 5, 6, 8, 10, 12, 13, 14, 18, 19, 20, 21, 23, 27, 31, 32, 34, 36, and 40.

Research Data Analysis

1) Analysis of Cognitive Learning Outcomes

Analysis of cognitive learning outcomes is carried out to determine the level of student ability based on the grouping of low and high learning outcomes (Magdalena et al., 2020). This analysis is carried out to identify the extent of the effectiveness of the learning model used. The grouping of learning outcomes can be seen in table 3.

Table 3. Grouping of Learning Outcomes

Class	Control		Experiment	
Group	**Pretest**	**Posttest**	**Pretest**	**Posttest**
Low	20.22±3.83	67.39±8.10	22.06±3.56	79.71±4.83
Tall	33.75±4.33	68.75±9.07	32.5±3.53	83.33±5.42

Based on table 3, it can be seen that the posttest learning outcomes in the high group are greater than the posttest learning outcomes in the low group, namely in the control class 68.75±9.07>67.39±8.10 and in the experimental class 83.33±5.42>79.71±4.83 as well as the pretest learning outcomes in the control class 33.75±4.33>20.22±3.83 and in the experimental class 32.5±3.53>22.06±3.56.

2) Normality Test

A normality test is conducted to determine whether the research data is normally distributed or not. Processing of the normality test using IBM SPSS Statistics 26 for Windows Data normality test using the Kolmogorov-Smirnov test. The research data can be said to be distributed with the criteria of normal distribution if Sig> 0.05 and not normally distributed if Sig <0.05 (Mufida et al., 2022). The following is a table of data tests for the normality of the pretest and posttest as well as the questionnaire in the control and experimental classes :

Table 4. Normality Test

Class	**Data**	**Sig (2-tailed)**	**Information**
Learning Outcomes	Control	0.202	Normally Distributed
	Experimen t	0.091	Normally Distributed
Student Questionnaire	Control	0.311	Normally Distributed
	Experimen t	0.200	Normally Distributed

Based on the data from the table, it shows that each sample has a significant value > 0.05, namely in the experimental class learning outcomes obtained a sig value of 0.091 > 0.5, and the student response questionnaire 0.200 > 0.05, and also the student learning outcomes in the control class obtained a sig value of 0.202 > 0.05, the student response

questionnaire in the control class was 0.311 > 0.05, which means that the data is normally distributed.

3) Homogeneity Test

The homogeneity test aims to see whether two or more groups of data samples are taken from populations that have the same variance or are homogeneous (Muliani et al., 2021). This test is carried out with the help of IBM SPSS Statistics 26 for windows The basis of decision making in this homogeneity test is:

1. If the Significance value (sig) on the based on mean> 0.05, then the data is homogeneous
2. If the Significance value (sig) on the based on mean <0.05, then the research data is not homogeneous, as presented in table 4.5 summary of homogeneity test data (Sianturi, 2021).

Table 5. Homogeneity Test

Data	Nilai Sig.	Information
Learning Outcomes	0.160	0.160 > 0.05 = Homogen
Student Questionnaire	0211	0.211 > 0.05 = Homogen

Based on the table above, the results of the homogeneity test of learning outcome data and student response questionnaires in the experimental class and control class are data that have a sig value greater than 0.05, which indicates that the learning outcome data and student response questionnaires obtained are homogeneous.

4) Hypothesis Test I

Based on the results of the normality and homogeneity tests that have been carried out, then continued with the first hypothesis test with the help of IBM SPSS Statistics 25 for Windows, namely the Independent Sample T-Test (Saraswati dan Agustika, 2020). The Independent Sample T-Test aims to determine whether there is an effect of the use of the TGT type cooperative learning model using the destination media of the buffer solution material on student learning outcomes. The following is a table of the results of the Independent Sample T-Test calculation :

Table 6. Hypothesis Test I

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Hasil Belajar Siswa	Equal variances assumed	1.148	0.000	-22.520	68	0.000	-43.000	1.909	-46.810	-39.190
	Equal variances not assumed			-22.520	67.455	0.000	-43.000	1.909	-46.810	-39.189

Based on the hypothesis test that has been carried out using the IBM SPSS Statistics 26 for Windows program, it was obtained that there is an influence of the use of the TGT type cooperative learning model using the buffer solution material destination media on student learning outcomes, as seen from the sig value of 0.00 <0.05, which means that the hypothesis (Ha) is accepted.

5) Hypothesis Test II

To find out the second hypothesis test, namely to find out how students respond to the TGT type cooperative learning model assisted by destination media, using the One Sample T-Test.

Table 7. Hypotesis II

One-Sample Test

	Test Value = 83.57					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Questionnaire	92.106	69	0.000	85.821	83.96	87.68

Based on the student response table above, a sig value of 0.00 <0.05 was obtained, which indicates that there is a positive student response to the TGT type cooperative learning model using destination media on the buffer solution material on student learning outcomes, which means that the Hypothesis (Ha) is accepted.

- **DISCUSSION**

Both classes were given an initial understanding test (pretest) to determine students' knowledge of the reaction rate material before being taught. The questions used were 20 multiple-choice questions consisting of five choices that had previously been analyzed by the instrument with validity tests, reliability tests, test difficulty levels, test of question discrimination power, and distractors.

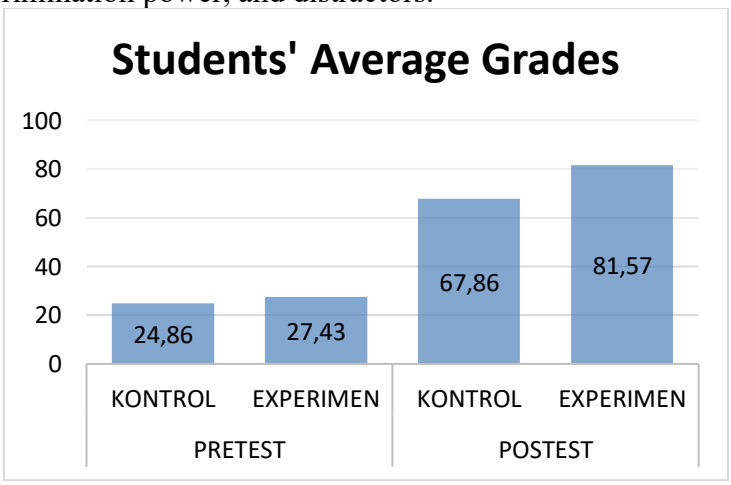

Figure 2. Students Average Grades

During the pretest, the average achievement of learning outcomes in the control class was 24.86 and the experimental class was 27.43. This value is a relatively low value because students have never studied buffer solution material before.

Furthermore, in the experimental class, learning was carried out with a cooperative TGT type model assisted by destination media on the buffer solution material for student learning outcomes, then a post-test was carried out and the average value of the experimental class was 81.57. While in the control class, learning was carried out with a conventional model assisted by destination media. Then, a post-test was carried out and the average post-test was 67.86. So the pre-test learning outcome scores for the control class and the experimental class were obtained with a difference of 2.57 and the post-test learning outcome scores for the control class and the experimental class were obtained with a difference of 13.71

Based on the post-test and pre-test data in the experimental class and the control class, a cognitive domain learning analysis can be carried out using low and high value groupings, as can be seen in the picture below.

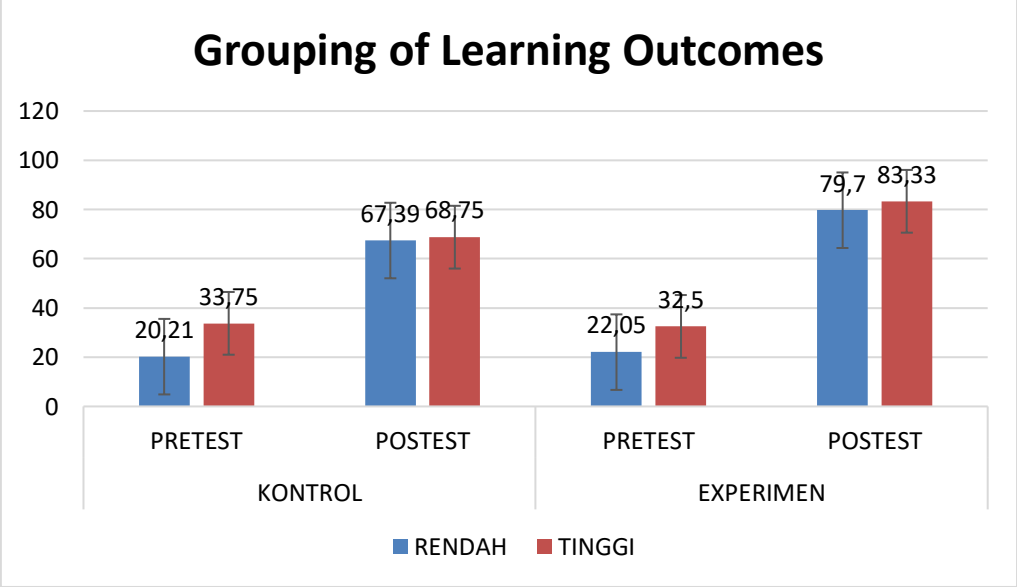

Figure 3. Gruoping of Learning Outcomes

Based on Figure 3., it can be concluded that the posttest scores in the low and high groups in the control and experimental classes are higher than the pretest posttest scores in the low and high groups in the control and experimental classes. Likewise in the high group of the experimental class > the high group of the control class. This shows that there is an increase in learning outcomes in students using the TGT type cooperative learning model assisted by destination media.

Based on the results of the prerequisite tests, namely the normality test and the homogeneity test, the results of the data normality test are greater than sig 0.05. For Student Learning Outcomes data, the results of the experimental class sig are 0.172 and the results of the control class sig are 0.195. So it can be stated that the experimental class is 0.172> 0.05 and the control class is 0.195> 0.05. For student response questionnaire data, the results of the experimental class sig are 0.110 and the results of the control class sig are 0.172. So it can be stated that the experimental class 0.110 > 0.05 and the control class 0.172 > 0.05. So from the pretest and posttest data in the experimental class and the

control class can be stated to be normally distributed. The results of the homogeneity test of student learning outcome data with homogeneous data requirements are at a significant level of a > 0.05, which is worth 0.160 or greater than 0.05 and the student response questionnaire data is worth 0.211 or greater than 0.05. It can be concluded that the sample has the same variance or is homogeneous.

Furthermore, the Independent Sample T-Test was carried out to determine the first hypothesis. Based on the normality and homogeneity test, student learning outcome data is stated to be normally distributed and homogeneous at a significance level of 95% or α = 0.05, because the sig. value <0.05. Based on the results of the hypothesis test with the IBM SPSS Statistics for Windows program, it was found that there was an effect of the use of the TGT type cooperative learning model using destination media for buffer solution material on student learning outcomes, which was seen from the average learning outcomes of the experimental class being higher than the average learning outcomes of the control class. Where the sig. value was obtained. of 0.00 <0.5. So it can be concluded that the first hypothesis is accepted. In addition, the average learning outcomes of students in the experimental class were higher than those of the control class, which further strengthens the evidence that the TGT learning model assisted by destination media is effective in improving students' understanding of buffer solution material. Therefore, the first hypothesis in this study is accepted.

This study not only analyzes the effect of the TGT type cooperative learning model assisted by destination media on student learning outcomes, but also evaluates student responses to the learning model. To measure student responses, a One-Sample T-Test was conducted using the IBM SPSS Statistics for Windows program. The results of the One-Sample T-Test showed that the Sig. value. (2-tailed) = 0.00, which is smaller than 0.05 (Sig. < 0.05). This indicates that there is a positive student response to the use of the TGT type cooperative learning model assisted by destination media on the buffer solution material, so that the alternative hypothesis (Ha) is accepted. In addition, the difference in questionnaire results between the experimental class and the control class also supports the results of the statistical test.

The average score of the student response questionnaire in the experimental class using the TGT learning model assisted by destination media was higher, which was 88.07, compared to the control class which obtained an average of 83.57. These results indicate that students gave a more positive response to the TGT learning model assisted by destination media, which is likely due to a more interactive, interesting, and collaborative learning approach, thus increasing student involvement and motivation in understanding the buffer solution material. Based on the overall research conducted at MAN 2 Model Medan, it can be concluded that there is an effect of the use of the TGT type cooperative learning model using destination media on buffer solution material on student learning outcomes and there is a positive student response to the TGT type cooperative learning model using destination media on buffer solution material on student learning outcomes.

▪ CONCLUSION

The conclusions that can be drawn from the results of the research and discussion are as follows: (1) The Cooperative Learning Model of Teams Games Tournament (TGT) Type Assisted by Destination Media has a significant effect on student learning outcomes in the Chemistry subject of Buffer Solution material in class XI MAN 2 Model Medan. This is shown through the results of the hypothesis test analysis carried out using the t test. After the calculated t is known, the significance level (2 tailed) is 0.000. Based on

the calculations that have been carried out, it can be seen that the sig result (2 tailed) is 0.000 <0.05, so it can be concluded that Ho is rejected and Ha is accepted because there is a significant difference which means there is a visible effect in the use of the TGT type cooperative learning model assisted by destination media. (2) Student responses to the learning model were measured using a questionnaire using the One-Sample T-Test which showed a Sig value. (2-tailed) = 0.000, which is smaller than 0.05 (Sig. <0.05). This indicates that there is a positive response from students to the use of the TGT type cooperative learning model assisted by destination media on the buffer solution material. The average score of the student response questionnaire in the experimental class using the TGT learning model assisted by destination media was higher, namely 88.07, compared to the control class which obtained an average of 83.57. These results indicate that students gave a more positive response to the TGT learning model assisted by destination media.

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