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The Effect of PowerPoint-Based Card-Assisted TGT Cooperative Learning Model on Chemical Bonding Material on Student Learning Outcomes

Hizratul Fitria*, Herlinawati
State University of Medan
*Email Corresponding: hizratulfitria23aa@gmail.com

Abstract : This study aims to determine the effect of the TGT-type cooperative learning model assisted by PowerPoint-based cards on chemical bonding material on student learning outcomes. This type of research is a type of experimental research with a quantitative approach. The population in this study were all students of class X MIPA at SMA Negeri 15 Medan. Samples were taken by purposive sampling of 2 classes. The treatment of the two sample classes was distinguished by the use of the TGT learning model in the experimental class while the control class used the conventional learning model with the same media. The instrument used was a multiple choice test instrument with 20 questions. Data were analyzed by normality, homogeneity, and two-party hypothesis testing with a significance level of 0.05. the results of the data analysis show that: There is an influence of the PowerPoint-based card-assisted TGT type cooperative learning model on student learning outcomes in chemical bonding material where the average value of students taught with PowerPoint-based card-assisted TGT type cooperative learning model on student learning outcomes in bonding material chemistry was significantly higher at 81.11 in the experimental class than the average value of students who were taught with conventional PowerPoint-based card-assisted learning models on student learning outcomes in chemical bonding material of 73.75 in the control class.

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Introduction

One of the foundations that determine the success of a country is education. Schools as educational institutions are required to carry out a good and optimal learning process so that they can produce intelligent, skilled, and high morals young generations of the nation. (Fauziah, 2021). Improving the quality of education must be carried out in steps to improve the quality of human resources. Qualified quality human resources will guarantee success in efforts to master technology for national development. These qualities include students' ability to think logically, critically, creatively, initiative, and adaptively to changes and developments in science and technology (Ruslan & Mutmainnah, 2019).

Chemistry lessons in high school are still considered difficult by most students and make most of the chemistry concepts abstract concepts to learn (Juliana Neri, Muflihah, 2019). Chemistry is one of the subjects that students are less interested in, because it is a subject that is not easy to understand so many high school (SMA) students have difficulty learning chemistry. (Rusianti et al., 2019). One of the subjects studied in chemistry class X in the odd semester is Chemical Bonds.

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Based on observations and interviews at SMA Negeri 15 Medan, it turned out that the results of chemistry learning in the chemical bonding material in class X were not optimal, as seen from the percentage of students who passed the evaluation stage. by 52% and those who did not pass by 48%. The KKM score for chemistry is 75. The teacher still uses the lecture method with a conventional learning model when delivering material. Students just need to sit still, pay attention, take notes, and memorize. So that there is no active student learning process. In addition, the use of media is also not optimal because there are quite a lot of tools and time in preparing for learning, causing students to become bored and find chemical bonding material difficult to understand, especially in the sub-concept of determining electron configurations, determining the number of valence electrons, describing Lewis structures, determining the tendency of an element. achieving stability, determining atoms following the duplet/octet rule, predicting the formulas of the compounds formed, and predicting the types of bonds based on the Lewis structure so that they affect student learning outcomes. The role of the teacher must be able to create a pleasant learning atmosphere so that students remain interested in learning.

The use of appropriate learning models and media is one of the strategies to improve student learning outcomes, as can be seen from the problems stated above. The TGT learning model and PowerPoint-based card media are active learning models and media. The TGT type cooperative learning model has been used in various kinds of learning, such as the calculation and application of chemical characteristics, and science facts and concepts (Mamangkai Eka & Rampe, 2019). Card media is a type of media that is often made of buffalo paper, which is rectangular in shape and measures 10 cm by 7 cm. Each card contains a question for discussion (Abdillah & Fadhilah, Raudhatul Rizmahardian, 2018). PowerPoint media can provide opportunities for students to learn actively and foster creative abilities in bringing together all elements such as text, images, sound, even video and animation so that they become an interesting learning medium (Warkintin & Mulyadi, 2019).

According to the results of previous research, the use of learning media and combined learning models can improve student learning outcomes. In the research conducted (Abdillah & Fadhilah, Raudhatul Rizmahardian, 2018) It was reported that the Model Teams Games Tournament (TGT) was assisted by question card media with an average pretest score of 36 and an average posttest of 62.94 indicating that students understood covalent bond material more quickly. Likewise the results of research conducted (Silalahi, 2018) stated that the Work Card media in the Cooperative Learning model for chemical bonding material obtained an average pretest score of 23.67 and a posttest score of 76.61, can improve student learning outcomes. As well as research conducted (Hartati & Refelita, 2020) reported that the Teams Games Tournament (TGT) learning model equipped with student PowerPoint media on atomic structure and SPU material could improve student learning outcomes, obtained scores with the average results of experimental class 1 79 and experiment II 76.25.

There are several weaknesses of the research conducted (Abdillah & Fadhilah, Raudhatul Rizmahardian, 2018) that is, the time used is less than optimal and based on interviews with students, students feel that when working on difficulty questions, students feel embarrassed to ask questions and pay less attention to researchers when delivering material during the learning process. Then the weaknesses of the research conducted (Silalahi, 2018) namely the little time given by the school to conduct research and the classroom environment which is not conducive when sitting in groups causes a lot of time to be wasted so that the teaching and learning process is less effective and less in line with expectations. As well as the weaknesses of the research conducted (Hartati & Refelita, 2020)

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that is, it takes quite a long time to group students, then student learning outcomes are not much different between the experimental class I which is taught using the TGT learning model assisted by PowerPoint media and the experimental class II which is taught using the TGT learning model.

From some of these studies it can be concluded that using learning models and learning media will help students improve learning outcomes in chemical bonding material more effectively. Even though this research has been widely used and has the weaknesses of each researcher, I, as the next researcher, will combine the PowerPoint-based Card-assisted TGT learning model. Its purpose is to train students' skills and memory and improve student learning outcomes in fun learning.

Based on the description above, researchers are motivated to conduct research in order to create an active and fun learning atmosphere with the title "The Effect of PowerPoint-Based Card-Assisted TGT Models on Chemical Bonding Material on Student Learning Outcomes".

Research methods

This research is a type of experimental research with a quantitative approach. This study wanted to prove the influence of the TGT-type cooperative learning model assisted by PowerPoint-based cards on chemical bonding material on student learning outcomes.

The population in this study was class X SMA Negeri 15 Medan in the 2022/2023 academic year in the odd semester with the 2013 curriculum material on chemical bonds. The characteristics of these students in the same curriculum, the same semester, and the same academic year are basically the same. The samples to be taken for this study were students of class X MIPA 4 as the control class and X MIPA 5 as the experimental class. The sampling selection technique in this study used a purposive sampling technique.

The instrument used is a test instrument in the form of an initial test (Pretest) which is given at the beginning of learning and a learning achievement test (Posttest) is given at the end of the subject of chemical bonding in the form of an objective test of 20 questions which have been validated by an expert validator, the questions are then tested on samples which is not a real sample from the population, then the questions will be tested for validity, reliability, level of difficulty, and discriminating power to be used in research.

Data collection techniques, in this study the method of collecting data is by giving test questions to students. The test is 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 choice).

The data analysis technique used in this study is the normality test, homogeneity and two-party hypothesis testing. Before using the two-party t-test, prerequisite tests are first carried out in the form of normality tests and homogeneity tests. If the prerequisites are met, a two-party t-test can be performed.

Research Results and Discussion

Research result

Based on the research findings, the lowest pretest score for the experimental class was 25, while for the control class was 30. The highest score for the pretest in the experimental class was 60 and in the control class was 65. While the lowest posttest score for the

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experimental class was 60 and the highest was 95, the posttest score the lowest for the control class is 55 and the highest is 90.

Table 1 presents a brief summary of the findings of research conducted in the experimental and control classes, as well as pretest and posttest data on student learning outcomes.

Table 1. Data on Student Learning Outcomes

Data	**statistics**	**Class**	
		Experiment	**Control**
Pretest	Maximum value	60	65
	Minimum value	25	30
	Average value	42,22	46,94
Posttest	Maximum value	95	90
	Minimum value	60	55
	Average value	81,11	73.75

. The average pretest scores for the experimental and control classes were 42.22 and 46.94, respectively, as shown in Figure 4.1. Because students in the experimental and control classes had not studied these subjects, students seemed to be guessing when answering these questions, which resulted in low pretest scores. For the posttest value data, it is known that the average value in the experimental class is higher than that in the control class, according to the posttest value data. In this case, the average posttest score of the experimental class was 81.11 while that of the control class was 73.75.

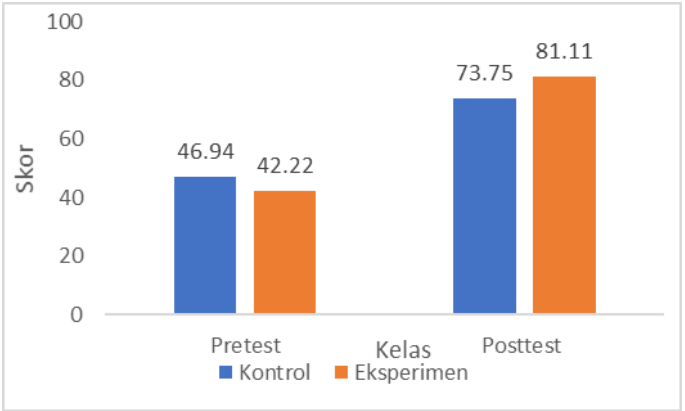

Figure 1. Comparison of the average value of student learning outcomes in the experimental class and the control class

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Normality test

Data normality testing is done to find out whether the data is normally distributed or not. The data used are pretest and posttest data of student learning outcomes. The test criterion is If the value $\chi^2_{hitug} \geq \chi^2_{tabel}$ then the data distribution is not normal and if the value $\chi^2_{hitug} \leq \chi^2_{tabel}$ then the data distribution is normal. By using the excel program, the output and calculations using excel are obtained, namely:

Table 2. Normality test

Class	Data	χ^2_{hitug}	χ^2_{tabel}	α	Information
Exsperimen	*Pretest*	61,23	9,488	0,05	Normal distribution
	Posttest	-44,27			Normal distribution
Control	*Pretest*	-59,31	9,488	0,05	Normal distribution
	Posttest	-44,01			Normal distribution

Based on the table above it can be concluded:

1. χ^2_{hitug} for the pretest it is -61.23 and χ^2_{hitug} for the posttest it is -44.27 according to the normality test of the experimental class. With α = 0.05 and dk 4 which is 9.488, the data on student learning outcomes is normally distributed because Chi-Square $\chi^2_{hitug} \leq \chi^2_{tabel}$.
2. χ^2_{hitug} for the pretest it is -59.31 and χ^2_{hitug} for the posttest it is -44.01 according to the normality test of the control class. With α = 0.05 and dk 4 which is 9.488, it can be shown that the data on student learning outcomes is normally distributed because Chi-Square $\chi^2_{hitug} \leq \chi^2_{tabel}$.

Homogeneity Test

To find out whether the two sample groups come from a homogeneous population or have the same basic abilities or not, a data homogeneity test was performed using the F test at a significance level of 0.05. If $F_{hitung} \leq F_{tabel}$, then the data is homogeneous, and if $F_{hitung} \geq F_{tabel}$, then the data is not homogeneous. The data from the homogeneity test results are presented in table 2.

Table 3. Homogeneity test

Class		s_1^2	F_{hitung}	$Ftabel_{(0,05)(35,35}$	A	Information
Pretest	Exsperimen	170,63	1,565	1,757	0,05	Homogen
	Control	108,96				
Postest	Exsperimen	78,73	1,094	1,757	0,05	Homogen
	Control	71,96				

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Conclusions can be drawn from the table above as follows:

1. The homogeneity test of student learning outcomes in the experimental class yields F_{hitung} = 1.565, with α = 0.05, and db 35 = 1.757. From these data it can be seen that the value of $F_{hitung} \leq F_{tabel}$ indicates that the data on student learning outcomes is homogeneous.
2. The homogeneity test of student learning outcomes in the control class yields F_{hitung} = 1.094, with α = 0.05, and db 35 = 1.757. From these data it can be seen that the value of $F_{hitung} \leq F_{tabel}$ indicates that the data on student learning outcomes is homogeneous.

Hypothesis testing

If it is determined that the data is homogeneous and normally distributed, a two-tailed t-test can be used to test the hypothesis. Since the alternative hypotheses read "there is" and "no", a two-tailed test is used. This test will determine whether the research hypothesis is accepted or rejected. Test criteria: The alternative hypothesis (H_a) is accepted and the null hypothesis (H_O) is rejected if $t_{hitung} \geq t_{tabel}$. The following table shows the results of calculating the hypothesis test for the two samples:

Table 4. Two-party hypothesis test

Sumber data	Kelas	$\bar{x}$	S^2	t_{hitung}	t_{tabel}	Keterangan
Posttest hasil belajar	Eksperimen	81,11	78,73	3,60	2,06	Ha diterima
	kontrol	73,75	71,96			

According to Excel's test criteria, if $t_{hitung} \leq t_{tabel}$, then Ho is accepted, and if $t_{hitung} \geq t_{tabel}$, then Ha is accepted. Based on the results of the hypothesis test, it was obtained that tcount was 3.60 and ttable was 2.06. then $t_{hitung} \geq t_{tabel}$ and Ha are accepted which shows that there is an influence on student learning outcomes using the PowerPoint-based card-assisted TGT model.

Discussion

The purpose of this study was to determine the effect of the PowerPoint-based card-assisted TGT learning model on student learning outcomes. The number of meetings held was two meetings. The first meeting was started by greeting, praying, checking student attendance, giving motivation and apperception and conveying the learning objectives, then giving the initial test (pretest) to the research sample, where the pretest questions consisted of 20 questions that fulfilled the requirements in terms of validity, reliability, different power, and level of difficulty.

As for the pretest activities to determine students' initial abilities and as a benchmark for improving student learning outcomes after different treatments were carried out in the two classes. The pretest average obtained by students in the experimental class was 42.22 and the control class was 46.94. After completing the pretest, a learning process was carried out in which the experimental class was taught using a PowerPoint-based card-assisted TGT learning model and the control class was taught with a conventional PowerPoint-based card-assisted model. In the learning process of the experimental class, 6 group learning was carried

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out to work together in answering the questions given. Then a posttest was carried out to find out the extent to which student learning outcomes after learning using the PowerPoint-based card-assisted TGT learning model in the experimental class and the conventional PowerPoint-based card-assisted learning model in the control class.

Based on the results of the study, there were differences and improvements between chemistry learning outcomes using PowerPoint-based card-assisted TGT learning models in the experimental class and the control class using conventional PowerPoint-based card-assisted learning models. The average value of the posttest experimental class was 81.11, while the average value of the control class was 73.75. These results are in line with the research conducted (Abdillah & Fadhilah, Raudhatul Rizmahardian, 2018) that the role of the Teams Games Tournament (TGT) cooperative learning model assisted by question card media in the covalent bond sub-matter can improve student learning outcomes with an average pretest score of 36 and an average posttest score of 62.94. According to the research that has been done in the experimental class, students can be interested in continuing chemistry lessons which include the concept of chemical bonds. One of the supporting factors for improving learning outcomes is the use of the TGT learning model, where students actively think, ask questions, practice answering questions quickly, express opinions in discussions, communicate effectively, and help each other in understanding material that is not yet understood. These results are in line with research (Hartati & Refelita, 2020) stated that learning using the TGT type learning model supplemented by PowerPoint media on cognitive learning achievement was better than learning using the TGT cooperative learning model as evidenced by student achievement in experimental class 1 of 79 higher than experimental class II of 76.25. It can be seen that during the learning process in the experimental class, students will collect point by point from several questions listed in the PowerPoint.

Hypothesis testing is carried out based on student learning outcomes by producing data tcount 3.60 and ttable 2.06, which indicates that Ha is accepted and Ho is rejected because $t_{hitung} \geq t_{tabel}$. This means that there is an influence on student learning outcomes taught using the PowerPoint-based card-assisted TGT learning model. The influence of PowerPoint-based card media on the TGT learning model can display several chemical bond questions, if the card is clicked then the question will appear then when you click on the answer then what will appear is an animated icon if the correct answer is marked with an animated smile sticker and if the wrong answer is marked with sad animated stickers. Thus making learning more interesting and motivating students.

The TGT learning model assisted by PowerPoint-based cards makes the class atmosphere more enjoyable, prevents students from getting bored and keeps students engaged in learning, which will ultimately affect students' understanding of learning chemistry. Students will compete to answer questions, so that one group does not get points. The group felt sad and then the group tried to take the last question so that they got points for their group. In addition, this TGT learning model can also arouse students' interest and compete in learning and foster good attitudes, such as a sense of responsibility towards oneself and the team.

Conclusion

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Based on the data obtained and the hypothesis testing that has been done, the following conclusions can be drawn. There is an influence of the PowerPoint-based card-assisted TGT-type cooperative learning model on student learning outcomes in chemical bonding material where the average value of students who are taught with PowerPoint-based card-assisted TGT-type cooperative learning model on student learning outcomes in chemical bonding material is significantly higher by 81.11 in the experimental class than the average value of students who were taught with conventional PowerPoint-based card-assisted learning models on student learning outcomes in chemical bonding material of 73.75 in the control class.

Suggestion

Based on the results of the research and conclusions that have been put forward above, it is recommended for further researchers to follow up on a number of things as follows: 1) The TGT Learning Model can be an alternative learning model for teachers to increase activity and create a fun learning process for students so as to improve results student learning. 2) For future researchers who will research further about the TGT learning model so that they can carry out more optimal supervision and make learning more interesting subject matter to achieve better learning outcomes.

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