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STAD Cooperative Learning Using Mind Mapping Media and Question Cards on Student Learning Outcomes on Chemical Bonding Material

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This research aims to determine whether there are significant differences in student learning outcomes through STAD cooperative learning via mind mapping media compared to student learning outcomes through STAD cooperative learning via question card media. This research uses a quasi-experimental method. Experimental group I used the STAD cooperative model with mind mapping, and experimental class II used the STAD cooperative model using question cards. The results of data processing show that students in the experimental class I had an average pretest score of 30.00 ± 7.73 and a posttest of 78.00 ± 5.75 with an average gain of 0.70. Meanwhile, students in experimental class II had an average pretest score of 23.00 ± 8.19 and posttest 66.20 ± 6.42 with an average gain of 0.57. The results of statistical tests using the two-party t-test using gain data obtained a t_{count} of 4.885 while the $t_{table\ value}$ was 2.021 at the significance level $\alpha = 0.05$, so t count > t table. This shows that there is a difference in the increase in student learning outcomes given in experimental class I and experimental class II, which is equal to 12.63%.

Keywords: mind mapping media, question cards, STAD cooperative learning model, improving learning outcomes, chemical bonds

1. Introduction

Chemistry subjects are one branch of the science family. Chemistry has several characteristics, namely that most of the chemistry is abstract, chemistry is a simplification of the real thing, the nature of chemistry is sequential and develops quickly, it does not just solve problems and there is a lot of material studied in chemistry (Qurniawati, Annik, 2013). It is hoped that chemistry lessons delivered at school can become a forum for students to learn about things around them. Chemistry subjects need to be taught for a more specific purpose, namely providing students with the knowledge, understanding and several abilities required to enter higher levels of education and develop science and technology. In its concepts, chemistry lessons have a fairly high level of abstractness, which causes students to experience difficulties in understanding chemistry lessons (Apriyanto, Dody, et al. 2014).

Learning in the classroom is a very important part of the educational process. If the implementation of quality learning in the classroom will produce quality output. Teachers have a very big role in organizing the class as part of the learning process and students as subjects who are learning. The teacher's ability to package a quality learning design certainly begins with thorough teaching preparation (Tyasning, 2012). The learning process in class requires students to receive and process a lot of information. Students have to note down many important things and at the same

time, they have to remember this information to use (recall) again (Walida, Luthfi Faza, et al, 2017).

Based on the results of observations at SMA Negeri 2 Siabu, teachers still often use conventional methods in teaching which makes the teacher the center of teaching and learning activities. Students generally only listen, read and memorize the information obtained which causes learning to feel monotonous and boring so the majority of students are lazy and less interested in studying chemistry, students think chemistry is a subject that is difficult to understand because it is abstract and has a lot of calculations, then the teacher who Teaching at this school very rarely uses media in the teaching and learning process. Apart from that, students' difficulties also lie in their ability to take notes and determine relationships between concepts. Tips that teachers use to overcome problems should be to implement strategies that can equip students with the skills to store the information received in long-term memory. If this condition is left without follow-up action to overcome it, it is feared that studying chemistry at school will not achieve the learning objectives that have been set.

One cooperative learning model that can be used to overcome this problem and is suitable for the characteristics of bonding material is the STAD (Student Teams Achievement Divisions) model. The STAD model is suitable for application in chemical bonding material, with this model students' difficulties in understanding chemical bonding material can be overcome. When discussing in groups, more intelligent students teach other students who are less intelligent until each member masters the material (Suguharti, 2013).

So that the results obtained in STAD learning are more optimal, there needs to be support in the form of learning media. One of the suitable media is mind mapping media and question cards. Mind mapping is a creative note-taking method that makes it easier for us to remember a lot of information. The notes made form a pattern of ideas that are interconnected with the main topic amidst the breakdown into branches. The best mind mapping is mind mapping that is colorful and uses lots of pictures and symbols (Muhamad, Sirhan, et al, 2015). Learning with mind mapping can improve memory by associating and imagining concepts, as well as interconnected keywords, making it easier for students to understand the material (Seputra, Ketut Wahyudi, 2020). A question card is a card that contains a question/problem that must be solved by the student getting the card. Students work on the questions on the question card and then write the answers on the cards provided (Astuti, 2013).

Based on research conducted by Astiti (2011), it is stated that the STAD model type of cooperative learning and achievement motivation influence student learning outcomes. Madra (2012) stated that the STAD-type cooperative learning model affects chemistry learning achievement as seen from the average score obtained by students who took part in the STAD-type cooperative learning model 85.176, which is higher than the average score obtained by students who took part in the conventional learning model in 83,735. Muhamad Sirhan (2015) stated that the mind-mapping learning method on the subject of atomic structure provides better learning results compared to learning without using mind mapping. Astuti (2013) stated that the use of card media can increase student activity in the process of learning.

Based on the description and problems above, it is necessary to conduct research entitled: "STAD Cooperative Learning with Crossword Puzzle Media and Mind Mapping on Student Learning Outcomes on Chemical Bonding Material". It is hoped that this research can contribute to designing learning media to improve student learning outcomes.

2. Research Methodology

The research was conducted at SMA Negeri 2 Siabu in April-May in the second semester of FY. 2019 / 2020. This research uses a quasi-experimental method. Experimental group I used the STAD cooperative model with crossword puzzles, and experimental class II used the STAD cooperative model with mind mapping media. The population used in this research was class X-IPA students totaling 4 with an average number of students of 30 people. The sampling method in this research was taken using

the Random Sampling technique, obtaining experimental class I, namely class X Science [1] and experimental class II, namely class X Science [2]. The research design is as follows:

Table 1 Research Design

Class	Pretest	Treatment	Posttest
Experiment I	T_1	X_1	T_3
Experiment II	T_2	X_2	T_4

Data collection was carried out using tests to measure student learning outcomes (cognitive). Statistical tests were carried out at a significance level of 5%. Before data analysis, a prerequisite test was carried out, namely the homogeneity test and normality test of the data obtained with SPPS Windows17, and then the data was analyzed descriptively.

3. Results and Discussion

3.1 Data analysis Instrument

After conducting a trial test used as a research instrument, 25 valid questions out of 40 questions were obtained. Testing the reliability of the test instrument using the Kuder Richardson-20 (KR-20), the $_{\text{calculated r}}$ was 0.9234 and the $r_{\text{table value}}$ α=0.05 was 0.339, indicating reliability. Testing the level of difficulty of the questions from 25 valid questions, obtained 22 questions in the medium category 2 questions in the difficult category, and 1 question in the easy category. Testing the differentiating power of questions obtained 1 question in the bad category, 7 questions in the fair category 12 questions in the good category, and 5 questions very good category.

3.2 Student learning outcomes

The data obtained includes data on chemistry learning outcomes during the learning process. Learning outcomes are obtained from multiple-choice tests, while student activities are obtained from observation sheets. Data was obtained from class X IPA [1] using the STAD cooperative model using mind mapping media and class X IPA [2] using the STAD cooperative model using question card media. Research data regarding student learning outcomes is briefly presented in the table following.

Table 2 Student Learning Results

Achievement Indicators	Class	Pretest Score	Posttest Value
Learning outcomes	Crossword puzzles	30 ± 7.73	78 ± 5.27
	Mind Mapping	23 ± 8.19	66 ± 6.42

Based on Table 2, the average pretest score for experimental class 1 is 30, with a standard deviation of 7.73, while for the pretest data for experimental class 2, the average pretest score is 23, with a standard deviation of 8.19. For the post-test data on the learning outcomes of experimental class 1 students, the average post-test score was 78, and the standard deviation was 5.27, while for the post-test data for experimental class 2, the average post-test score was 66, and the standard deviation was 6.42.

3.3 Normality and Homogeneity Test Data

The research results of the data were tested for normality and homogeneity using SPSS Windows17. Kolmogrof-Smirnov normality test at a significant level (α) = 0.05 with the test criteria being that the sig. value > α, then the data is normally distributed. Meanwhile, test homogeneity with the Levene Test. Test results in Table 3 in lower.

Table 3. Data Normality and Homogeneity Test

Media	Normality		Homogeneity	
	Pretest	Posttest	Pretest	Posttest
Mind Mapping	0.388	0.171	0.470	0.834
Question Cards	0.734	0.223		

Based on the table above, the normality test is obtained:

1. The experimental class I value (sig.0.388 > 0.05) shows that the pretest data comes from a normally distributed population. Meanwhile, for the experimental class II, the price (sig.0.734 > 0.05) shows that the pretest data comes from a population that is distributed normally.
2. For the post-test value for experimental class I, the value (sig.0.171 > 0.05) shows that the post-test data comes from a normally distributed population. For the posttest value for experimental class I, the value (sig.0.223 > 0.05) shows that the posttest data comes from a population that is distributed normal.

Based on the table above, for the homogeneity test, we obtain:

1. For the pretest, the experimental class (sig.0.470 > 0.05) indicates that the pretest data comes from a homogeneous population.
2. For the posttest, the experimental class (sig.0.834 > 0.05) shows that the pretest data comes from a homogeneous population.

3.4 Test Hypothesis

For hypothesis testing, data were analyzed statistically using SPSS Windows 17 independent sample test. The following results are a hypothesis testing table.

Table 4. Independent Sample Test Results Learning Results Test with 2 Learning Media

Class	Sig. (2-tailed)	Sig.	Note.
Instructional Media	0,000	0.05	Ha is accepted, Ho is rejected

From the table above it can be seen that overall there is a significant difference in student learning outcomes from the two sample groups which is indicated by a value of sig.0.000 <0.05 which means accept Ha. This means that there is a significant difference in student learning outcomes with the STAD cooperative learning model via mind mapping media compared to student learning outcomes with the STAD cooperative learning model via card media. question.

The STAD learning model is a learning model that is very suitable to be applied in learning because with this model less capable students will be helped because there are group discussions, less capable students will teach less capable students. However, using models alone in learning is not enough, it would be better if assisted with media, because media is a means of conveying learning material to students and so that students are more interested and not bored in learning. In this research, the media used were mind mapping media and question cards. From the media treatment, student learning outcomes using mind mapping media were higher than student learning outcomes using question card media.

4. Conclusion

There is a difference between student learning outcomes taught by the STAD cooperative learning model through

mind mapping media and student learning outcomes taught by the STAD cooperative learning model via question card media. Differences in learning outcomes 11.8.

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