EFFECT OF QUESTION CARD LEARNING MEDIA OF NHT TYPE COOPERATIVE LEARNING MODEL ON LEARNING OUTCOMES IN ACID-BASE CONCEPTS AMONG STUDENT OF MIPA, MAKASSAR CITY

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Abstract

This quasi-experimental study seeks to ascertain the effect of Question Card learning media on the Numbered Head Together (NHT) type Cooperative learning model toward learning Outcomes of Class XI MIPA Students on the subject matter of acids and bases. The research design used was a posttest-only control design. The sampling technique was carried out by simple random sampling, so that 2 sample classes were obtained as the experimental and control class. The instrument used in this study was the learning achievement test. The learning outcomes data obtained were analyzed using descriptive and inferential statistical analysis. The results of the descriptive analysis showed that the average experimental class learning result was 77.97 higher than the control class learning average 69.76. The results of the normality test indicated that the experimental class data were normally distributed and the results of the homogeneity test indicated that both classes came from homogeneous populations. Therefore, the hypothesis test used is a non-parametric test, the results of the Mann-Whitney test reveal that Zcount (2.36) > Ztable (1.65). There is an effect of the Question Card learning media on the NHT type Cooperative learning model on the learning outcomes on the subject matter of Acids and Bases.

Keywords: Question Card Media, NHT type Cooperative Learning Model, Learning Outcomes, Acid Base

INTRODUCTION

Education aims to help students develop their potentials, so they are able to solve problems encountered in everyday life. Therefore, education is an absolute human need that must be fulfilled throughout life.

The educational challenge that is still felt today is the low quality of education at every level and educational unit. Considering that education is a fundamental need in efforts to develop quality human resources, the problem of education is a serious concern for the Indonesian government.

One of the government's concerns about education in Indonesia is curriculum development efforts. Curriculum development is an instrument to improve the quality of education in Indonesia. Through the Ministry of Education and Culture, the government continues to make updates and innovations in the field of education, one of which is in the curriculum, namely the 2013 Curriculum. The 2013 curriculum mandates the essence of a

scientific approach including observing, asking, gathering information, associating and communicating [1].

ISSN: 2252-9454

The application of the curriculum in learning can be seen through the interactions between students and teachers, students and students, as well as students with teaching materials. These three interactions are important factors in creating a good teaching and learning situation so that they affect the improvement of student learning outcomes. The teacher as a facilitator needs to create fun learning by encouraging students to enjoy learning, so that students are more active in participating in the learning process. The way that teachers can do that is by designing creative and innovative learning so that students play an active role in the learning process and are able to find new knowledge on their own.

Observations made at MAN 1 Makassar City, especially in class XI MIPA, showed that the application of learning models was not optimal in its implementation, as was the case with learning media.

The results of interviews with the Chemistry teacher for class XI MIPA revealed that the KKM standard score on Acid-Base subject matter was 75. However, students who achieved the KKM standard score were only 60%. The low learning outcomes of these students are due to the lack of attention of students in the learning process. The active interaction of students is necessary so that the teaching and learning process is not dominated by the teacher. Therefore, learning innovations related to the application of learning models still need to be optimized so that students are interested in participating in the learning process.

Innovation in the learning process needs to be designed by the teacher as an effort to improve students' Chemistry learning outcomes, especially in Acid-Base material. This aims to create a learning process with a different atmosphere so that it influences student learning outcomes. One of the teacher's innovations is in terms of using learning models.

One learning model that involves active interaction of students is the Cooperative learning model. The cooperative learning model gives freedom to students to be actively involved in their groups, so they can build a learning community that helps each other [2]. One type of cooperative learning model is Numbered Head Together (NHT).

The NHT type Cooperative learning model or numbering thinks together is a form of collaborative learning aimed at influencing student interaction patterns. The NHT learning model is basically a group discussion variant. Its distinctive feature is that the teacher only calls one of the students by mentioning his head number to represent his group without telling in advance who will represent that group. This method of random calling can guarantee the total involvement of all students [3].

The application of the NHT learning model does not allow all students to be summoned due to limited time. Therefore, the Question Card media is used to assist teachers to help reduce the deficiencies of the NHT learning model. This is because each student has individual responsibility in the group regarding questions on the Question

Card media, which might influence how well students learn.

Using learning models is more effective when paired with appropriate learning media. Using learning media greatly increases the efficiency of the learning process in conveying the message or lesson content at this point [4]. Another use of learning media that involves interaction with students to support learning outcomes is Question Card media. Media Question Cards are learning media in the form of cards with attractive pictures and containing questions and problems that arise in real life. The questions on the Question Card media relate to the material being taught [5].

Media Question Card is effective to be applied in the learning process. This is supported by the advantages of the card media itself, including that the card media can display the components you want to explain, can be used as various forms of games that can increase the creativity of students in the classroom, and make it easier for students to learn because of their attractive appearance [6]. The use of Question Card media can foster great enthusiasm and interest in learning in students. This is because students feel they have individual responsibility in solving questions on the Question Card media because each group member gets different questions in one group.

One of the materials for Chemistry in even semester XI class that is important to learn is Acid-Base material. Because the Acid-Base substance is the substance that underlies the concept of salt hydrolysis, which affects our understanding of the concept of Acid-Base and the concept of Salt Hydrolysis [7]. According to Orwat et al., (2017), salt hydrolysis is classified as a difficult material for high school students [8]. This is reinforced by the statement of Febriani et al., (2018), which revealed that in the concept of salt hydrolysis there are abstract concepts that are interrelated with the previous material so that the salt hydrolysis material is classified as difficult [9]. The concept of Acid-Base is the basis for studying salt hydrolysis which is useful for determining the Acid-Base properties of salt solutions. Salts that dissolve in water come from Acid-Base reactions which ionize into cations and anions. Students' understanding of abstract material

ISSN: 2252-9454

and complex concepts is influenced by an understanding of simple chemical concepts [10].

Even though the Acid-Base material has very important benefits, there are misunderstandings about the actual acid-base concept. The cause of misconceptions about Acid-Base material is due to incomplete reasoning, meaning that the information that students have about a material is incomplete so that it is wrong to draw conclusions and cause misconceptions [11]. Mistakes in understanding concepts in students are caused because students only memorize concepts, not understanding Acid-Base concepts. This can affect the low learning outcomes of students. learning models supported Therefore, appropriate media are needed so that students can actively discover concepts and improve their learning outcomes without getting bored easily as they participate in the learning process.

METHOD

This research is a quasi-experimental research (quasi-experiment) aimed at determining the effects of Question Card learning media in the NHT type Cooperative learning model on the learning outcomes of class XI MIPA MAN 1 Makassar City on acid-base material. This research was conducted in MAN 1 Makassar City in the even semester of the 2022/2023 school year.

The population is all students of class XI MIPA MAN 1 Makassar City for the academic year 2022/2023, which consisted of five classes, namely class XI MIPA 1 to XI MIPA 5. The sample consisted of two classes, class XI MIPA 4 containing up to 34 students as an experimental class and class XI MIPA 3 containing up to 33 students as a control class. Both classes were selected by simple random sampling, namely taking samples from the population at random without regard to the existing strata in the population.

The research design used was the Posttest-Only Control Design. The variables used in this research consist of independent and dependent variables. The independent variable is the NHT type Cooperative learning model and the NHT type Cooperative learning model, while the dependent variable is the learning outcomes of class XI MIPA MAN 1 Makassar City students on the subject matter of Acids and Bases. The research design is shown in Figure 1 below:

$$R_1 \longrightarrow T_1 \longrightarrow O_1$$
 $R_2 \longrightarrow T_2 \longrightarrow O_2$
Figure 1. Research Design

Figure 1. Research Design

The instrument used in this study was a learning achievement test in the form of an objective test consisting of 25 multiple choice items with 5 choices. The test used has been content validated by experts. Item validation was also carried out to determine the difficulty index, discriminatory power, validity, and reliability. Furthermore, the test questions were tested on students who had studied Acid-Base material for item validation.

The data collection technique used in this study was the posttest data given to students at the end of the lesson. If the answer is correct it will be given a score of 1, whereas if the answer is wrong or does not answer it is given a score of 0. The data analysis techniques consist of descriptive statistical analysis and inferential statistical analysis. Descriptive statistical analysis included individual completeness, class completeness, and indicator completion, while inferential statistical analysis was carried out by testing the hypothesis. A parametric test (t-test) is used if the experimental and control classes are normally distributed and come from homogeneous population. However, if one of the classes is not normally distributed or does not come from a homogeneous population, then the parametric test cannot be used. However, you should use a nonparametric test, the Mann-Whitney test.

RESULTS AND DISCUSSION

1. Research result

The characteristics of the learning outcomes achieved by students in class XI MIPA MAN 1 Makassar City on the topic of Acids and Bases are described using descriptive statistical analysis. Table 1 displays the findings of the descriptive statistical analysis conducted on the experimental class that was instructed utilizing Question Card media in the NHT type cooperative learning model as well as the control class that exclusively utilized the NHT type cooperative learning model.

Table 1. Description of Student Learning Outcomes in Experiment Class and Control Class

No	Descriptive	Statistic Score (Posttest)		
NO	Statistics	Experiment Class	Control Class	
1.	Sample Size	34	33	
2.	Highest Score	88	80	
3.	Lowest Score	64	52	
4.	Average Score (X)	77,97	69,76	
5.	Median (Me)	78,18	72,53	
6.	Modus (Mo)	84,82	73,81	
7.	Standard Deviation (S)	7,02	7,62	

The results of the descriptive statistical analysis in Table 1 show that there is a difference in the average learning outcomes of students in the experimental and control class. Students in the experimental class had a mean score of 77.97, while students in the control class had a mean learning outcomes score of 69.76. Differences in student learning outcomes in the experimental class and control class are caused by differences in the treatment given. This mean indicates that students using Question Card media in the NHT type of cooperative learning model achieve higher learning

outcomes than students using the NHT type of cooperative learning model.

The learning outcomes achieved by the students in the experimental and control classes were grouped based on the completeness criteria of class XI MIPA MAN 1 Makassar City Chemistry learning outcomes, as shown in Table 2.

Table 2. Percentage of Mastery Learning Outcomes of Experiment Class and Control Class Students

Completed Class	Category	Experime nt Class		Control Class	
Class		F	%	F	%
≥80%	Complete	21	61,76	11	33,33
<80% Not Complete		13	38,24	22	66,67
Jum	Jumlah		100	33	100

From Table 2, it can be seen that the learning outcomes of the students in the experimental class using the Question Card media in the NHT type cooperative learning model were higher than the proficiency of the students in the control class in the NHT type cooperative learning model. The learning outcomes achieved by students in the experimental and control classes, when categorized using the completeness criteria for each indicator, are achieved at the percentages shown in Table 3.

Table 3. Category Completeness of Each Indicator Class Experiment and Control Class

Nic	Indicator -	Experiment Class		Control Class	
No	Indicator	Percentage	Description	Percentage	Description
1.	Identify substances that are acidic or basic based on their characteristics in everyday life.	89,22%	Complete	79,80%	Complete
2.	Explain the various concepts of Acids and Bases.	100%	Complete	75,76%	Complete
3.	Comparing the concept of acids and bases according to Arrhenius, Bronsted-Lowry, and Lewis and concluding them.	61,76%	Not Complete	65,66%	Not Complete
4.	Calculate the concentration of H ⁺ and OH ⁻ ions in a solution based on the ionic equilibrium in the solution.	88,24%	Complete	78,79%	Complete
5.	Calculating the pH of a strong acid solution and a strong base solution.	78,68%	Complete	71,97%	Not Complete
6.	Calculating the K_a value of a weak acid solution or K_b of a weak base solution with a known concentration and pH.	76,47%	Complete	45,46%	Not Complete
7.	Calculating the degree of ionization and the equilibrium constant of Acid and Base solutions.	80,39%	Complete	81,82%	Complete
8.	Observe the color change of a universal indicator or pH meter in various solutions.	79,41%	Complete	39,39%	Not Complete
9.	Determine natural materials that can be used as indicators.	35,29%	Not Complete	51,52%	Not Complete
10.	Analyzing the trajectory of changes in the pH of several indicators extracted from natural materials through experiments.	66,18%	Not Complete	74,52%	Not Complete
	Average	75,5	56%	66,	44%

Inferential statistical analysis was used to test the research hypothesis, namely whether there is an effect of Question Card media on the learning outcomes of class XI MIPA MAN 1 Makassar City students on Acids and Bases for the NHT type Cooperative learning model. However, before testing the hypothesis, prerequisite test consisting of a normality and homogeneity test of learning outcomes for students in experimental and control classes were first performed.

a. Prerequisite Test

1) Normality Test

The normality test uses the chi-square test statistic (χ^2), to classify data as normally distributed if $\chi^2_{count} < \chi^2_{table}$. Calculations in the experimental class show that the data are from a normally distributed sample. However, the control class showed that the samples were not normally distributed. Results for the experimental and control classes are shown in Table 4.

Table 4. Test the normality of student learning outcomes in the experiment class and control class

ISSN: 2252-9454

Class	χ^2 count	$\chi^2_{\text{table}}(\alpha) = 0.05$	Conclusion
Experiment	5,52346	9,49 (dk = 4)	Normally Distributed
Control	26,3095	7,82 (dk = 3)	Not Normally Distributed

2) Homogeneity Test

Homogeneity test criteria if $F_{count} < F_{table}$ then the variance of the experimental or the control class variance homogeneous. The computational results show that both the experimental and control classes are derived from homogeneous population. Table 5 shows the results of the homogeneity test of learning outcomes for students in the experimental and control classes.

Table 5. Homogeneity Test of Student Learning Outcomes in Experimental and Control Classes

Class	Fcount	$F_{\text{table}}(\alpha) = 0.05$	Conclusion
Experiment	1,18	1,79	Homogeneous

212

Control

b. Hypothesis Testing

Hypothesis testing is used to test H_0 and H_1 which are formulated on statistical hypotheses accepted or rejected. Hypothesis testing in this study was performed by one party statistical test with the following hypothesis.

 $\begin{aligned} &H_0: \ Z_{count} \! \leq \! Z_{table} \\ &H_1: \ Z_{count} \! > \! Z_{table} \end{aligned}$

Based on the results of the hypothesis test, we find that the data in both classes have a homogeneous variance and that the data are normally distributed in the experimental class, but

not in the control class. Therefore, parametric statistics (t-test) cannot be used to perform hypothesis testing. However, hypothesis testing can be performed using non-parametric statistics, the Mann-Whitney test.

ISSN: 2252-9454

Based on the calculation of student learning outcomes using the Mann-Whitney test, $Z_{count} > Z_{table}$ (2.36 > 1.65), the use of Question Card media in an NHT type Cooperative learning model was compared to class XI MIPA MAN 1 Makassar City on the subject matter of Acid and Base. Table 6 shows the results of calculating student learning outcomes rankings using the Mann-Whitney test.

Table 6. Student Learning Outcomes Hypothesis Test

Class	Total	Zcount	$Z_{\text{table}}(\alpha)$ = 0,05	Keputusan
Experiment	Experiment 34		H ₁ is accepted and	
Control	33	2,36	1,65	H ₀ is rejected

2. Discussion

This study aims to determine the effect of Question Card media of the NHT type Cooperative learning model on the Acid-Base topic learning outcomes of class XI MIPA MAN 1 Makassar City. There were two classes that were used as research samples, namely class XI MIPA 4 as the experimental class and class XI MIPA 3 as the control class. The experimental class was taught using Question Card media in the NHT type Cooperative learning model, while the control class was only taught using the NHT type Cooperative learning model.

Using Question Card media in experimental class can foster great enthusiasm and interest in learning in your students. Because students feel they have individual responsibility in solving questions on the Question Card media because each group member gets different questions in one group. The enthusiasm of students can be seen in discussion activities such as actively giving opinions, uniting opinions in order to obtain agreed answers, and being able to respect the opinions of group members. This is consistent with research findings that the use of Question Card media increase student interest and motivates them to actively participate in the learning process. The card designs are attractive yet simple, so students

aren't distracted from the practice questions on the cards [12].

Mastery of each indicator in Table 3 shows that the mastery of each indicator in the control class is lower than the mastery of each indicator in the experimental class. This is influenced by the use of learning media, so that the learning process is less effective which causes students' interest in learning is also low. This is because the use of Question Card media can foster students' learning interest and improve their ability to solve problems, so that it influences student learning outcomes [13].

The enthusiasm of the students was high during the numbering stage, because there was an additional property in the form of a hat tied on the head and equipped with a head number which was interesting for students. At this stage, group formation is carried out and a head number is given to each group member. Students will later be called using this Coordinator number to randomly present the results of the group discussion. The use of Question Card media in the NHT learning model in experimental education applies to the questioning, head together, and answering stages.

Experimental class students at the questioning stage each received different questions on the Question Card media in one group, so they tried to solve the problem because they felt they had individual responsibility for the success of their

group. This is supported by research that the use of Question Card media can increase student activity in the learning process, where students are required to answer questions on the media so that students try to better understand the subject matter [14].

In the head together stage in the experimental class, it was seen that students were more active in discussing the answers that had been completed by each to obtain a mutually agreed upon answer. When there are individual answers that are lacking according to other group members, students submit answers according to each of them along with the reasons, then the group leader is responsible for considering the answers until a mutually agreed upon answer is obtained. The use of Question Card media in the NHT learning model can increase interaction among students during discussions, as well as improve students' problem-solving abilities well [15]. In addition to practicing group cooperation, at this stage it is also trained so that students can respect the opinions of their group mates.

Answers agreed upon by students at the head together stage will be presented at the answering stage if the head number of group members is called by the teacher. When one group member is told the head number, the other group members help remind the answers that have been discussed together before. Experimental class students seemed more active in giving responses to groups that presented their discussion results compared to control class students. This is because the mastery of the material possessed by students in the experimental class is more evenly distributed through the discussion process which is carried out in groups compared to students in the control class. Because the NHT learning model assisted by Ouestion Card media can improve the ability to remember information, and students can exchange opinions to be discussed before it is conveyed [16]. This stage can also train students' competitive spirit to collect points with their group mates.

The importance of giving assignments as evaluation material to students so that students are motivated to re-read the material that has been taught. The evaluation function for students is to find out their progress after carrying out learning activities [17]. One form of evaluation that can

strengthen students' understanding of the material is by giving assignments after the learning process. This is supported by several opinions that assignments can further deepen, enrich, or broaden insights about what is learned from the teacher, where students will be more active in learning and more enthusiastic about increasing knowledge, fostering initiative, and dare to take responsibility for themselves, so that when students students get satisfactory grades, it will provide motivation so that further students can improve achievements [18,19,20].

Based on the one-sided Mann-Whitney test in Table 6, it can be concluded that the use of Question Card media in the NHT type Cooperative learning model has an effect on the learning outcomes of class XI MIPA MAN 1 Makassar City students on the subject matter of Acids and Bases. One of the factors that influence student learning outcomes is the use of learning models that are supported by appropriate learning media.

The use of Question Card media in the NHT learning model is expected to provide more motivation to students in solving problems. When students get a problem that must be solved, students will be challenged to solve the problem properly. Successful or failed problem solving will always be embedded in their brain memory. This is because the experience of problem solving is experienced directly by students through their own sensory organs. With the problems presented in the Question Card media, students will try to find alternative solutions through various hypotheses. With the hypothesis that students have, they will be interested in proving the truth of the hypothesis through discussion activities. Therefore, the use of Question Card media is very suitable to be applied in the NHT type Cooperative learning model seeing the stages in the NHT model are fun and can also involve interaction between students.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that the use of Question Card media in the NHT type Cooperative learning model affects the learning outcomes on the Acids-Bases in class XI MIPA MAN 1 Makassar City.

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ISSN: 2252-9454