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The Effect of Implementing Numbered Heads Together Learning Using Team Quiz Type Active Learning Strategies on Chemistry Learning Outcomes of Pekanbaru State 6 High School.

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ABSTRACT. This study aims to analyze the effect of implementing the Numbered Heads Together (NHT) cooperative learning model combined with the Team Quiz learning strategy on students' learning outcomes in the Basic Laws of Chemistry. This quasi-experimental research was conducted at SMA Negeri 6 Pekanbaru, with the research subject being 10th-grade students. The experimental class used the NHT and Team Quiz learning model, while the control class used conventional teaching methods. Data were collected through pretest and posttest assessments and analyzed using the t-test. The results showed that the experimental class experienced a significant improvement in learning outcomes compared to the control class. In conclusion, the implementation of the NHT model combined with the Team Quiz strategy effectively enhances students' chemistry learning outcomes.

Keywords: learning model, learning strategi, numbered heads together (nht), team quiz, learning outcomes.

INTRODUCTION

This research focuses on the effect of the application of Numbered Heads Together (NHT) type cooperative learning model and Team Quiz type active learning strategy on student learning outcomes in Basic Law of Chemistry material. This topic was chosen due to the problem of low student understanding and learning outcomes in the material, as well as low student activeness in the learning process (Safira et al., 2024). Cooperative and active learning approaches such as NHT and Team Quiz are relevant topics in the current educational context. This model is applied to overcome the problem of low student participation (Utami et al., 2023). Difficulty in understanding abstract and mathematical material, as is often the case with basic laws of chemistry (Kinasih et al., 2023).

Relevant research has shown that these methods can improve learning outcomes the NHT cooperative learning model and Team Quiz strategy together Although both have been researched separately, research that integrates these two methods in chemistry learning particularly on basic laws of chemistry, is still rare. In addition, many studies have not explored hom this combination can affect the understanding of deep abstract concepts. There are not many inconsistencies identified in the literature discussed in this section. However, there are variations in the effectiveness of different active learning strategies, depending on the (Pratiwi et al., 2023). State Senior High School 6 Pekanbaru is a school that has implementasi the 2013 curriculum. Based on the results of observation and interview with one of the X IPA chemistry teachers at SMA Negeri 6 Pekanbaru, namely Cendra Yuliana S.Pd on December 15,2016, The author can identify some of the main problems that occur in the learning process. Firs, there are still many students who have not reached the Minimum Completion Criteria (KKM) set by the school which is 75. This shows a gap in students' understanding of the subject matter. Secondly, many students do not listen or pay attention to the teacher during the learning process, thus hindering their understanding of the material presented. Third, there are still many students who have difficulty in understanding chemistry material, especially on the topic of Basic Laws of Chemistry. Finally, when the group discussion system is implemented, some students tend to rely on only one group member to

understand the material, which results in not all group members having a good understanding of the material taught by the teacher.

The formulation of the problem that will be discussed in this study is whether there is an effect on the application of the Numbered Heads Together learning model using the Team Quiz type active learning strategy on chemistry learning outcomes in the material of the Basic Law of Chemistry of class X SMA Negeri 6 Pekanbaru students. In this article structure, we will discuss the following: first, there is the introduction which explains the background of the problem, problem identification, problem formulation, objectives and benefits of the research. Then second, there is a literature review that presents theories and previous research on cooperative learning, the Team Quiz strategy, and student learning outcomes. Third, the Research Method, describes the research design, research subjects, Implementasi procedures, and instruments used to measure learning outcomes. Fourth Results and Discussion, Analyzing the data of pretest and posttest results as well as students' involvement in group discussion. Finally, Conclusion and Recommendations, summarizes the result of the research and provides suggestions for the implementation of future learning.

The purpose of this study was to examine the effect of the NHT learning model combined with the Team Quiz strategy on student learning outcomes, especially in Basic Law of Chemistry material. (Pipit Muliyah, Dyah Aminatun, Sukma Septian Nasution, Tommy Hastomo, Setiana Sri Wahyuni Sitepu, 2020).

METHOD

This research is a quasi experiment conducted at SMA Negeri 6 Pekanbaru on students of class X IPA in the academic year 2016/2017. The research aimed to determine the effect of the Numbered Heads Together (NHT) learning model combined with active learning strategy team quiz on student learning outcomes. Two classes were used as samples, namely the experimental class that was given treatment with the NHT model and the control class that was not given the treatment. Sampling was done using simple random sampling technique. Data were collected through observation, pretest and posttest tests, and documentation. Before the experiment, a homogeneity test was conducted to ensure that the basic abilities of the two classes were equal. Data analysis used t-test to determine whether there was a significant difference in learning outcomes between the experimental and control classes after the treatment was given.

Table 1. Pretest – Posttest Research Design

Group	Pretest	Treatment	Posttest
Experiment	T_1	X_1	T_1
Control	T_1	-	T_1

Description:
T_1 = Homogeneous Test Data
X = treatment of the experimental class using the Numbered Heads Together (NHT) learning model using the team Quiz type active learning strategy
T2 = Hypothesis Test Data

RESULT AND DISCUSSION

Result

The first stage of the researcher prepares all learning devices that will be used during the learning process, namely the syllabus, Prosem (Semester Program), Rpp (Learning Implementation Plan), homogeneity questions, *pretest* and *posttest* questions, number card and teacher observation

sheets. The second stage of the researcher conducted a validity test of the basic laws of chemistry in class XI IPA 6. The third stage of the researcher conducted a homogeneity test in class X_1, X_2, and X_5. The fourth stage researchers implemented the *Numbered Heads Together* (NHT) learning model using the Team *Quiz* type active learning strategy in the experimental class (class X_1) and implemented the lecture or conventional model in the control class (class X5), each class consisting of 6 meetings including *pretest* and *posttest*. The following is a presentation of the research data:

Homogeneity Test Data

This homogeneity test data was taken through a test on the subject of compound names. This homogeneity test was conducted on 3 classes, namely class X_1, X_2, and X_5. The following is a summary of the values in table 2.

Table 2. Distribution of Homogeneity Score

Class Interval	Class X Frequency$_1$	Class X Frequency$_2$	Class X Frequency$_5$
60 - 65	10	0	3
66 - 71	10	9	9
72 - 77	0	9	4
78 - 83	10	8	6
84 - 94	6	8	10
Total	**36**	**34**	32

Hypothesis Test Data

Hypothesis testing data is data obtained from analyzing *pretest* and *posttest* scores of experimental and control classes. The following is a summary of the aliens in tables 3, 4, 5.

Table 3. Frequency Distribution of pretest Score

Class Interval	Experiment Frequency	Control Frequency
10 - 15	6	4
16 - 21	4	4
22 – 27	15	6
28 – 33	6	5
34 – 39	5	13
40 - 45	0	0
Total	**36**	**32**

Table 4. Frequency Distribution of Posttest Values

Class Interval	Experiment Frequency	Control Frequency
60 – 65	2	2
66 – 71	3	2
72 – 77	10	13
78 – 83	12	10
84 – 89	6	3
90 - 95	3	2
Total	**36**	**32**

Table 5. Frequency Distribution of *Posttest* Pretest Difference

Class Interval	Experiment Frequency	Control Frequency
40 – 44	0	3
45 – 49	5	11
59 – 54	10	8
55 – 59	10	7
60 – 64	9	2
65 - 69	2	1
Total	**36**	**32**

Data Analysis

Data Analysis of Sampling Homogeneity Test

The data that has been summarized is then analyzed with the bartlett test and obtained data as summarized in table 6.

Table 6. Summary of Homogeneity Test Analysis

Sample	dk	S_1^2	Log S_1^2	(dk). Log S_1^2	B	Xhitung	X tabel
X_1	35	58,73	1.77	61,95	165,33	1,24	5,99
X_2	33	32,11	1,51	49,83			
X_3	31	50,98	1, 71	53,01			

The analysis results show that the variances of X_1, X_2, and X_5 are homogeneous. Because the variances are homogeneous, it can be concluded that the three classes have the same ability and can be used as research samples. So in sampling can use *random sampling* techniques and select class X_1 as the experimental class and class X_5 As the control class.

Instrument Analysis

The instruments in this study are questions used for pretest and posttest in the form of objective questions. The class that researchers took to test this instrument was class XI IPA 6 with 36 students. The test results of the questions were then analyzed to determine the validity, reliability, difficulty level, and differentiating power of the questions.

Question Item Validity

In testing the validity of the questions, researchers used content validity and empirical validity.

Content validity

The question is said to be valid if its content has been able to representatively represent the entire material or subject matter that should or indicator.

Table 7. Summary Of Question Item Validity

No	Criteria	Number question	Total	Percentage
1	Valid	1-30	30	100%
2	Invalid	-	-	-
	Total		30	100%

Empirical validity

The question is said to be valid if its content has been able to representatively represent the entire material or subject matter that should or indicator.

Table 8. Summary Of Empirical Validity of Problem Item

C	Criteria	Number question	Total	Percentage
1	Valid	1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30,	27	90%
2	Invalid	6, 16, 29	3	10%
	Total		30	100%

Question Reliability

Based on the results of the analysis of the trial questions, the reliability was 0.89 with a high category.

Problem difficulty level

Based on the results of the analysis of the trial questions on the Basic Law of Chemistry material, it is known that 30% with difficult criteria, 40% with moderate criteria, and 30% with esay criteria (attachment 0) contained in table 9.

Table 9. summary of problem difficulty levels

C	Criteria	Number question	Total	Precentage
1	Difficult	4, 16, 19, 21, 22, 23, 24, 25, 26,	8	27%
2	Medium	6, 7, 11, 12, 13, 14, 15, 17, 18, 20, 22, 28	12	40%
3	Esay	1, 2, 3, 5, 8, 9, 10, 27, 29, 30	10	33%
	Total		**30**	**100%**

Hypothesis Test Data Analysis

Normality Test Data

This normality test data is obtained using the chi-squared test. The following is a summary in table.

Table 10. summary of posttest data normality analysis

Class	X^2 Count	X^2 Tabel	Criteria
Experiment	10,1	12,59	Normal
Control	5,4	12,59	Normal

Based on the data above, it is concluded that the experimental class and control class have normally distributed *posttest* data, namely X^2 count, < X^2 Table.

Homogeneity Test Data

This homogeneity test data is obtained using the Variance test (F test). The following is a summary in table 11.

Table 11 Summary of Homogeneity Analysis of *Posttest* Data

Class	N	Variance
Experiment	36	44,02
Control	32	38,68

Based on the data above, it is concluded the experiment.

Hypothesis Test Data.

After it is known that the posttest data is homogeneous and normally distributed, the hypothesis test uses the t-test. The following data is in table 12.

Table 12 Summary Homogeneous and Normally Distributed

Thitung	t table	Description
2,27	2,00	Ho is rejected

Discussion

The analysis presented from onward focuses on the evaluation of the Numbered Heads Together (NHT) model, combined with the Team Quiz strategy, in improving student learning outcomes in chemistry at SMA Negeri 6 Pekanbaru. Below is a detailed discussion in English: Data Analysis and Hypothesis Testing.

The research was conducted to analyze the-effects of using the NHT model with the Team Quiz strategy on student performance. Two classes were selected, an experimental class using the NHT model and a control class using the traditional lecture method. Homogeneity Test, The test confirmed that both the experimental and control classes were homogenous in terms of prior knowledge, ensuring that any differences in posttest scores could be attributed to the teaching methods used. Pretest Results, Both classes started with similar pretest scores, reflecting an equal baseline understanding of the subject matter. Prottest Results, After implementing the NHT model in the experimental class, students showed a significant improvement in their posttest scores compared to the control class, where traditional teaching methods were used.

The average posttest score in the implemental class was 78,42, while the control class had an average of 77,34.

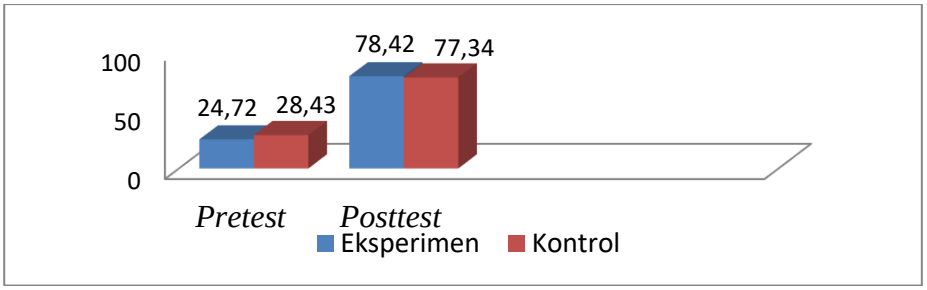

Figure 1. Comparison of Average Pretest and Posttest Values of Experimental and Control Classes

The NHT model fostered better engagement, allowing students to work collaboratively and retain information more effectively. Group Activity and Student Interaction: The NHT approach emphasized group interaction, where each student was accountable for their contributions. The

Team Quiz strategy further reinforced learning through collaborative problem-solving. In contrast, the control class relied on passive learning through lectures, limiting student engagement and active participation.

Hypothesis Testing: Using a t-test, the hypothesis that NHT would significantly improve student learning outcomes was supported. The t-value obtained was 2.27, surpassing the critical t-value of 2,00, thus rejecting the null hypothesis and confirming the positive impact of the NHT model with Team Quiz on learning outcomes. Learning Outcomes: The results showed that students in the experimental class had better retention of the material, demonstrated through higher scores across various cognitive levels (knowledge, understanding, and application.

Based on the data above, it is obtained that tcount > t table, namely 2.27 > 2.00, it can be concluded that H0 is rejected and the value of the coefficient of determination (Kp) is 7.2 %.

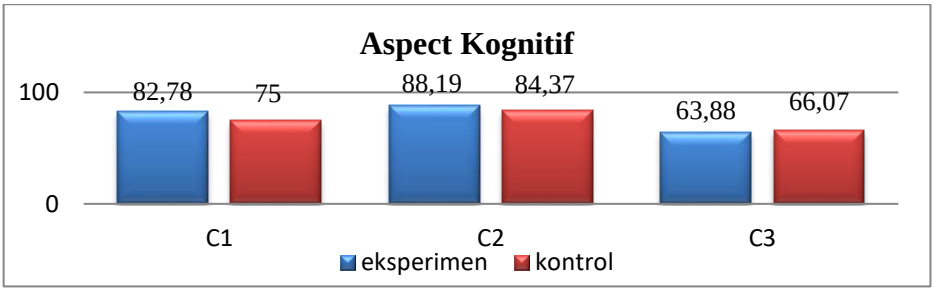

Figure 2. Comparison Diagram of Cognitive Aspects of Experimental and Control Classes

CONCLUSION

The conclusion of this study is that the application of the Numbered Heads Together (NHT) cooperative learning model combined with the Team Quiz type active learning strategy has a positive influence on students' learning outcomes on the material of Basic Laws of Chemistry at SMA Negeri 6 Pekanbaru. Based on the data obtained, the experimental class tha used this learning model showed a significant increase in learning outcome compared to the control class that used conventional learning methods. In addition, this learning model also increases student activities in the group learning process. Data analysis through t-test shows that there is a significant difference between the post-test scores of both classes, with t-count greater than t-table, which indicates that null hypothesis (H0) is rejected.

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