

THE EFFECT OF APPLICATION
OF 5E LEARNING CYCLE MODEL
COMBINED NUMBERED HEAD
TOGETHER (NHT) TOWARD
CHEMISTRY LEARNING
OUTCOMES ON THE SUBJECT
OF SALT HYDROLYSIS IN XI
SCIENCE STUDENTS AT SENIOR

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The Innovation in Chemistry Education in Supporting Green Chemistry Toward The Advanced KalTim 2018

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DEPARTMENT OF MATHEMATICS AND NATURAL SCIENCE EDUCATION
FACULTY OF TEACHER TRAINING AND EDUCATION
MULAWARMAN UNIVERSITY

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Glucose = $C_6H_{12}O_6$
6 Carbon 6 Hydrogen 6 Oxygen

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MULAWARMAN UNIVERSITY

Hall of Rector 4th floor

Jl. Kuaro Campus Mount Kelua Samarinda 75123

Phone: 081347105831 / 082156669908

E-Mail: ischemistryand_e@yahoo.com

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GREEN CHEMISTRY TOWARD THE ADVANCED KALTIM 2018**



Held on September 12th, 2015

In Hall of Rector 4th floor FKIP UNIVERSITAS MULAWARMAN

Samarinda

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DEPARTMENT OF MATHEMATICS AND NATURAL SCIENCE
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2015

PREFACE

International Seminar on Chemistry in 2015 has been carried out on 12 September 2015 in Hall Rector Lt-4 Mulawarman Samarinda. Activities of the International Seminar organized by Study Program of Chemistry and fully supported by the Dean of Faculty Teacher and Training Education, Rector Mulawarman University and Forum Cooperation Chemists Eastern Indonesia (FK3TI).

The seminar was attended by a number of participants consisting of: four guest speakers who come from Universitas of Bayreuth Germany, University of Technology Malaysia, Hasanuddin University Makassar, State University Surabaya, and 45 speakers company on were divided into six groups presenting parallel and six speakers poster of lecturers from various universities in Indonesia and teachers through out East Kalimantan.

Papers presented in these proceedings is the result of research covering the fields of chemistry, chemistry education, science education and science education. As well as the papers presented in these proceedings has been selected by the Papers evaluation team of the International Seminar of the committee of Chemistry 2015. Efforts publishing these proceedings have been conducted as much as possible and if there are errors and efficiencies in the publication of these proceedings, the criticisms and suggestions are expected in order to improve the The subsequent publication of proceedings.

We as the committee would like to thank all those who have supported and helped the implementation of the International Seminar in 2015 and the publication of these proceedings.

Chairman of the committee

Dr. Usman, M.Sc.

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**THE EFFECT OF APPLICATION OF 5E LEARNING CYCLE MODEL
COMBINED NUMBERED HEAD TOGETHER (NHT) TOWARD
CHEMISTRY LEARNING OUTCOMES ON THE SUBJECT OF SALT
HYDROLYSIS IN XI SCIENCE STUDENTS AT SENIOR HIGH SCHOOL
1 TANAH GROGOT ACADEMIC YEAR 2014/2015**

Yuni Kurnia¹, Usman², Ratna Kusumawardani³

¹ Mahasiswa Prodi Kimia FKIP Universitas Mulawarman

² Staff Pengajar Prodi Kimia FKIP Universitas Mulawarman

³ Staff Pengajar Prodi Kimia FKIP Universitas Mulawarman

ABSTRACT

This study aims to determine the effect of application of 5E learning cycle model combined numbered head together (NHT) toward chemistry learning outcomes on the subject of salt hydrolysis in XI science students at Senior High School 1 Tanah Grogot academic year 2014/2015. The method is used in this study is experimental method. Samples were students of class XI Science 4 as an experimental class-treated with 5E learning cycle model combined numbered head together (NHT) and the students of class XI Science 3 as control class treated with direct instructional models. Obtaining the average value of 84,4 post-test experimental class and control class 73,8. Data analysis process two groups using t-test results obtained 3,24 t_{test} and t_{table} at 5% significance level of 1,67, then $t_{calculation} > t_{table}$. The results of this study indicate that there are. The effect of the 5E learning cycle model combined numbered head together (NHT) toward chemistry learning outcomes on the subject of salt hydrolysis in XI science students at Senior High School 1 Tanah Grogot academic year 2014/2015.

Keywords: 5E learning cycle Model Combined Number Head Together (NHT) and Learning Outcome

INTRODUCTION

Some models of learning that are considered capable of making students more passion for learning in the classroom, more active, able to develop the mindset and maximize learning outcomes, among others, is a 5E learning cycle model and learning model Numbered Head Together (NHT). Research on the 5E learning cycle model already been done before, among others by Asiyah (2013), states that this learning model encourages students to engage actively ask, answer,

work on the problems and discussions in groups to solve problems. Group discussions help students solve problems by exchanging information.

Besides learning 5E learning cycle model, another learning model that can affect learning outcomes and student activity is a learning model Numbered Head Together. Learning model Numbered Head Together is one type of structural model of cooperative learning in the learning process which prioritizes cooperation to achieve learning objectives.

This is according to research conducted by Kartikasmi (2012), that the learning model Numbered Head Together affects creativity and student learning outcomes for the better. The combination of two learning models are intended to complement each other's deficiencies learning model. The structure is developed in this the learning model Numbered Head Together is as an additional alternative to the stages of 5E learning cycle model. Two of these models are also suitable for improving the spirit of the students in the learning process in the classroom so that the material presented will be easily accepted in particular to the subject salt hydrolysis. Salt hydrolysis subject is that contains a calculation in which students must understand clearly and also contains concepts that are difficult to remember the students with direct instructional model.

Based on the background described above, the author is interested in conducting research on the effect of application of 5E Learning Cycle model combined Numbered Head Together (NHT) toward chemistry learning outcomes of the subject salt hydrolysis in XI science student at Senior High School 1 Tanah Grogot academic year 2014/2015.

RESEARCH METHODS

This study was conducted in Senior High School 1 Tanah Grogot in May 2015. The research is a research experiment. The sample in this study were students of class XI Science 3 totaling 32 students and XI Science 4 totaling 32 students. Sampling was done by purposive sampling technique. Considerations in this sampling is the advice from a chemistry teacher at Senior High School 1 Tanah Grogot which is proved to capture the score of these two classes of documentation which is then tested by t test and F test. Research instruments is used is a test that has 6 questions at each meeting and also the observation sheet to measure student activity.

Data analysis

Before the treated (Pramudjono, 2005)

Documentation obtained in the form of data score obtained from the subject teachers of chemistry at Senior High School 1 Tanah Grogot processed by

the statistics which used the F test to determine a class derived from the variances homogeneous or heterogeneous followed by t-test to determine whether there is difference in absorption of students in two classes which will be used as a sample

$$F_{\text{calculation}} = \frac{S_1^2}{S_2^2} \text{ where } S_1^2 > S_2^2$$

If $F_{\text{calculation}} < F_{\text{table}}$ then the sample is considered homogeneous.

If $F_{\text{calculation}} \geq F_{\text{table}}$ then the sample is considered heterogeneous.

T-test is then performed to determine whether there is a difference in absorption of students

a. If the sample (variances) of both samples is homogeneous, the formula will be:

$$t_{\text{calculation}} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{S^2 \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

$$S = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}}$$

b. If the sample (variances) of both samples is heterogeneous, the formula will be

$$t_{\text{calculation}} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Notes:

\bar{X}_1 : the average score of grade XI Science 3

\bar{X}_2 : the average score of grade XI Science 4

n_1 : the sample numbers of grade XI Science 3

n_2 : the sample numbers of grade XI Science 4

S_1 : the standard deviation of grade XI Science 3

S_2 : the standard deviation of XI Science 4

S : the deviation of combination

H_0 and H_1 hypothesis is as follows:

H_0 : There are differences in absorption between XI Science 3 and XI Science 4 at Senior High School 1 Tanah Grogot

H_1 : There is no difference in absorption between XI Science 3 and XI Science 4 at Senior High School 1 Tanah Grogot

Based on the comparison of the value of the t-calculation and t-table, it can be concluded as follows:

1. If $t_{\text{calculation}} > t_{\text{table}}$ then H_0 is rejected and H_a is accepted, which means that there are differences in absorption between XI Science 3 and XI Science 4 at Senior High School 1 Tanah Grogot.
2. If $t_{\text{calculation}} \leq t_{\text{table}}$ then H_0 is accepted and H_a is rejected, which means that there is no difference in absorption between XI Science 3 and XI Science 4 at Senior High School 1 Tanah Grogot.

After treated (Pramudjono, 2005)

Data obtained through achievement test processed by the statistics, which in this case used the t test to compare two average scores is the average score of the class that uses a 5E Learning Cycle model combined Numbered Head Together (NHT) and average the value of the class using direct instructional models. Before entering F test and t test, the first step that must formulate hypotheses on H_a and H_0 as follows:

H_a : There is the effect of application of 5E Learning Cycle model combined Numbered Head Together (NHT) toward chemistry learning outcomes of the subject salt hydrolysis in XI science student at Senior High School 1 Tanah Grogot academic year 2014/2015.

H_0 : There is no effect of application of 5E Learning Cycle model combined Numbered Head Together (NHT) toward chemistry learning outcomes of the subject salt hydrolysis in XI science student at Senior High School 1 Tanah Grogot academic year 2014/2015.

For the t-test can be divided into two groups, namely the variance test homogeneous and heterogeneous variance test. Both homogeneous or heterogeneous variance can be seen through the test F (Pramudjono, 2005).

$$F_{\text{calculation}} = \frac{S_1^2}{S_2^2} \text{ where } S_1^2 > S_2^2$$

If $F_{\text{calculation}} < F_{\text{table}}$ then the sample is considered homogeneous.

If $F_{\text{calculation}} \geq F_{\text{table}}$ then the sample is considered heterogeneous.

T-test is then performed to determine whether there is a difference in absorption students. If the sample (variances) of both samples is homogeneous, the formula will be:

$$t_{\text{calculation}} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$S = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}}$$

b. If the sample (variances) of both samples is heterogeneous, the formula will be

$$t_{\text{calculation}} = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Notes:

\bar{X}_1 : the average score of grade XI Science 3

\bar{X}_2 : the average score of grade XI Science 4

n_1 : the sample numbers of grade XI Science 3

n_2 : the sample numbers of grade XI Science 4

S_1 : the standard deviance of grade XI Science 3

S_2 : the standard deviance of XI Science 4

S: the deviance of combination

Based on the comparison of the value of the t-calculation and t-tabulation, it can be concluded as follows:

1. If $t_{\text{calculation}} > t_{\text{table}}$ then H_0 is rejected and H_a is accepted, which means there is the effect of application of 5E Learning Cycle model combined Numbered Head Together (NHT) toward chemistry learning outcomes of the subject salt hydrolysis in XI science student at Senior High School 1 Tanah Grogot academic year 2014/2015.
2. If $t_{\text{calculation}} \leq t_{\text{tabulation}}$ then H_0 is accepted and H_a is rejected, which means there is no effect of application of 5E Learning Cycle model combined Numbered Head Together (NHT) toward chemistry learning outcomes of the subject salt hydrolysis in XI science student at Senior High School 1 Tanah Grogot academic year 2014/2015.

RESULTS AND DISCUSSION

Results of Study

1.1.1.1 The Result Before Treatment

Result	XI Science 3	XI Science 4
Average Score	53,4	52,2
$F_{\text{calculation}}$	1,75	
$F_{\text{tabulation}(5\%)}$	1,84	
$t_{\text{calculation}}$	0,30	
$t_{\text{tabulation}}$	1,67	

The average score of students before the subject of salt hydrolysis is equilibrium and acid-base in the class of XI Science 3 is 53.4 and in the class of XI Science 4 is 52.2. Based on table it can be seen that the $F_{\text{table}} = 1.84$ and $F_{\text{calculation}} = 1.75$, so $F_{\text{calculation}} < F_{\text{table}}$ it can be concluded that the data homogeneous, where as the test obtained $t_{\text{calculation}} = 0.30$ and $t_{\text{table}} = 1.67$ so $t_{\text{calculation}} \leq t_{\text{table}}$, it shows that in both classes there is no difference in the ability of absorption before it is treated, then proceed with the study. Based on data analysis can be seen that the results of the study after being given treatment on each sample group, as the following table.

The Result After Treatment

Analisis Data	XI IPA 3	XI IPA 4
	Direct Instructional Model	5E Learning Cycle model combined Numbered Head Together (NHT)
Average Score	73,8	84,4
$F_{\text{calculation}}$	1,26	
$F_{\text{table}(5\%)}$	1,84	
$T_{\text{calculation}}$	3,24	
t_{table}	1,67	

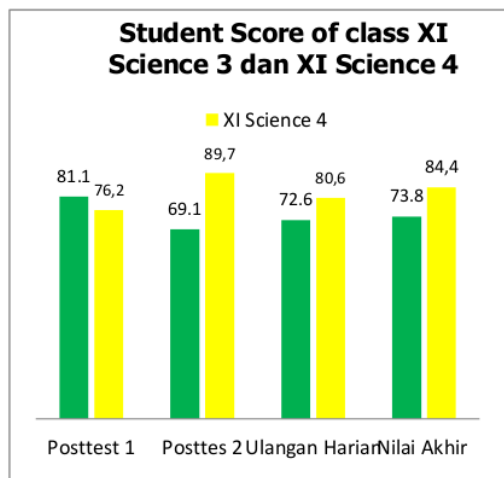
The results showed that the average student learning outcomes using 5E Learning Cycle model combined Numbered Head Together higher than students who used direct instructional models. The average score of XI Science 3 is 73.8 and the average score of XI Science 4 is 84.4. Furthermore, table

shows that $F_{\text{calculation}}=1.26$ and $F_{\text{table}}=1.84$, so $F_{\text{calculation}} < F_{\text{table}}$ it can be concluded homogeneous samples. Ttest calculations obtained $t_{\text{calculation}}=3.24$ and $t_{\text{table}} = 1.67$ so $t_{\text{calculation}} > t_{\text{tabulation}}$ the significant level of 5% then H_0 is rejected and H_a accepted. Thus, it can be seen that there is the effect of application of 5E Learning Cycle model combined Numbered Head Together (NHT) toward chemistry learning outcomes of the subject salt hydrolysis in XI science student at Senior High School 1 Tanah Grogot academic year 2014/2015.

Table Percentage 5E Learning Cycle model combined Numbered Head Together

Meeting	Student Activity (%)	Criteria
I	80,5	Good
II	80	Good
Average	80,25	Good

Based on the table it can be concluded that the average achievement of the learning process stage activities undertaken by the students has been successful. The posttest results in two meetings and the results of daily tests in class XI Science 4 using a model 5E Learning Cycle model combined Numbered Head Together and class XI Science 3 using direct instructional model can be seen in the following graph.

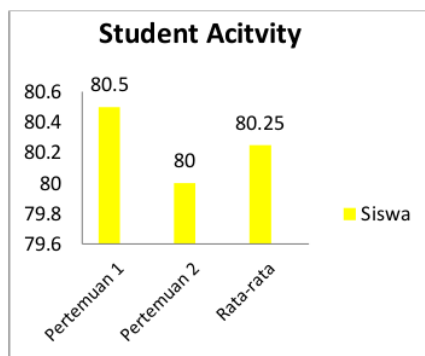


Based on the results of the posttest meeting picture 1 and 2 as well as the daily test class XI Science 3 (direct instructional model) and XI Science 4 (5E Learning Cycle model combined Numbered Head Together) there are differences in learning results claims on the subject of salt hydrolysis.

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Posttest and daily test conducted looked for differences in student learning outcomes experimental class and control class. This difference can be seen from the end of the second class XI Science 3 which is value is 73.8 and XI Science 4 is 84.4, indicating that the 5E Learning Cycle model combined Numbered Head Together make student learning outcomes for the better rather than direct learning models.

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Based on the results of the calculation of the average score posttest, daily tests and observations made in the experimental class that has been done, that 5E Learning Cycle model combined Numbered Head Together have a positive impact on student learning outcomes, especially material salt hydrolysis.

After statistical data management by using the t test variance homogeneous $t_{\text{calculation}} = 3.24$ and $t_{\text{table}} = 1.67$ so $t_{\text{calculation}} > t_{\text{table}}$ the significant level of 5% then H_0 is rejected and H_a accepted. This shows that there is the effect of application of 5E Learning Cycle model combined Numbered Head Together (NHT) toward chemistry learning outcomes of the subject salt hydrolysis in XI science student at Senior High School 1 Tanah Grogot academic year 2014/2015. During the learning process, the observation made by the four observers. Student activity observation results are shown in the following graph:



Student Activity Level image on Application of Learning Model Learning Cycle 5E combined Numbered Head Together (NHT)

Based on the overall Images can be known application of the 5E Learning Cycle model combined Numbered Head Together been implemented properly.

The results of observations made on the first day and the second study showed that activity 5E Learning Cycle model combined Numbered Head Together went well and effectively. At the first meeting and the second, the application of the learning model show teacher have been carrying out all stages of the learning that has been developed previously. Based on observations known to the teachers have implemented learning model as a whole stage. The average yield of observation of students known to the student activity by 80.25% with good criteria means the activity of students in the learning process very active role in learning

CONCLUSIONS AND SUGGESTIONS

Conclusion

Based on the research that has been done, it can be concluded that:

1. There is the there is the effect of application of 5E Learning Cycle model combined Numbered Head Together (NHT) toward chemistry learning outcomes of the subject salt hydrolysis in XI science student at Senior High School 1 Tanah Grogot academic year 2014/2015. The highest student learning outcomes obtained in the experimental class with a value of 84.4, while the control class value is lower at 73.8.
2. Activity of students in the learning 5E Learning Cycle model combined Numbered Head Together (NHT) on the subject of salt hydrolysis is 80.5% with good criteria.

Suggestion

As the end of this study, the authors can be argued as follows:

1. In applying the 5E Learning Cycle model combined Numbered Head Together (NHT) teacher should divide the time in the learning process well, so that students actually take the time to understand the material being studied. Among others on the stage and Head Together Explanation given more time to discuss and think together to explore the ability of students so that students can understand and do well all the questions.
2. Teachers make Learning Cycle 5E models combined Numbered Head Together (NHT) as an alternative model of teaching chemistry in schools in order to improve the quality of student learning outcomes.
3. The more research that is model Learning Cycle 5E combined Numbered Head Together (NHT) on another subject that have similar characteristics with salt hydrolysis.

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