

EFFECT OF LEARNING MODELS TO CHEMISTRY STUDENT OUTCOMES IN TEACHING SALT HIDROLYSIS FOR SCIENSE STUDENTS OF GRADE ELEVEN SENIOR HIGH SCHOOL AT PERCUT SEI TUAN

Kartomo Simarmata^{1*} Pasar Maulim Silitonga² and Saronom Silaban²

¹Student Magister of Chemistry Education, State University of Medan, Medan, Indonesia

²Department of Chemistry, Faculty of Mathematics and Natural Science, Estate University of Medan,
Medan, Indonesia

*Corresponding autor: kartomosimarmata48@gmail.com

Abstract-The study was an experimental and axplanatory research and it was intending to investigate the differences of Chemistry students outcome using difference models and to find out the effect of the models in teaching salt hydrolisis toward science student in grade eleven, senior high school, Percut Sei Tuan. The population was all of the science student grade eleven, the senior high school, which consisted of 4 classes. Sampling was done with two steps. The first step was to select Learning Cycle , Two Stay Two Stray, Aptitude Ttreatment Interaction and Problem Based Learning groups by random sampling technique. The second step was to select a number of 14 homogenous students from the four groups by stratified random sampling technique based on pretest and *questioner* . Student outcomes was done by using objective test. The groups were taught by using the Model of LC, TSTS, ATI and PBL respectively. Data was anlyzed by F test (α 0,05) and BNT formula. It was concluded the effect of learning models to chemistry learning outcomes was considerably higher then the other models. It's certainly LC was better than among of them. LC had average $64,57 \pm 8,1307$, ATI had average $62,85 \pm 11,7107$, TSTS had average $54,28 \pm 9,3385$ and PBL had average $38,87 \pm 5,1097$. In teaching salt hidrolisis, the students should be taught with learning cycle added worksheet because it had made outcomes was higher than all of them.

Keywords: learning model, outcomes, learning cycle, two stay two stray, treatment interaction, problem based learning.

1. INTRODUCTION

Chemistry is is often regarded as a difficult subject [⁵]. Chemistry is one of the most important brances of science, it has taken easy student to understant what happened around the world, why? Because chemistry always based on the stucture of matter, so chemistry was called by students a difficult subject. In other side, chemistry commonly incorporate many abstract concept, and in fact those abstract concepts are very important because further chemistry concept can not be easily understood if these basics concepts are not sufficiently understood by the student [⁶]. Chemistry would be easy to understand if it was taught by innovative models. They are learning cycle, two stay two stray, Aptitude T treatment Interaction and Problem based learning model.

Learning Cycle

Learning Cycle is an accescible way of expressing both the importance of experiential knowledge and the link between theory and practice. The science was taught by Learning Cycle in three consecutive phases known as, exploration, term introduction, and concept application, these phases based on the way students spontaneously lear about the world [²]. These phases had been described as follow: Exploration allows students to investigate new material so that system of regularity can be discovered and problems (questions)are raised that students attempt to answer. Term introduction allows the teacher to introduce terms to label the system and to explain the newly invented concepts. Concept application stimulates students to looking for the system wherever and applying the new cocncept to more example [³]. LC encourages strudent to think creatively and critically as well as in fasilitating a best understanding of scientific concepts, developing attitude as a scientist, improving skills of science process.

Aptitude Treatment Interaction

The study of aptitude treatment interaction (ATI) represent the search for treatments that are adapted to individual differences in aptitudes, ATI are optimally effective for students of different aptitude levels [1]. ATI plays a major role within delivering the basics for the development of “adaptive instructional systems”. How sensitive the diagnostic procedure is to the specific learning needs of each student determine the degree of adaptation [4].

Problem Based Learning

Constructivist theories of learning stress the importance of students being engaged in constructing their own knowledge, it could be found in problem based learning (PBL) [8]. Many innovative approaches to education, one of them is problem-based learning (PBL). PBL situated learning in problem-solving. In addition, this approach addresses the learning that include content knowledge, practice epistemic, and soft skills such as collaboration and independent learning. All of students motivated to probe deeply into issues searching for connections, grappling with complexity, and using knowledge to good solutions [9].

Two stay two stray

Two Stay Two Stray is one of innovative model. Using the model get the advantages that students easily split into pairs, more ideas raised and more tasks solved rather than in two or three groups. The structure of TSTS provides an opportunity for the group to present the results and information with other groups. The systematic implementation of TSTS is: (1) students work in groups consist of 4 members; (2) once completed, the two members of each group leave their group and each leaved member visit (stray) to another difference group; (3) two students who *stay* in their group are in the charge to explain their results to the guests from two difference groups; (4) students who visit back to their own groups and then report their findings from other groups; and (5) each group matches and discusses their work with the result of the other group that visited [10].

2. METHODS

2.1 Population and sampling

The population is all of grade elevent students. Sampling was done with two steps. The first step was to select LC , TSTS, ATI and PBL groups by random sampling technique. The second step was to select a number of 14 homogenous students from the four groups by stratified random sampling technique based on fretest and quetioner. Student outcomes was done by using objective test. The groups were taught by using the Model of LC, TSTS, ATI and PBL respectively.

2.2 Variable and instrument of reseach

The research used some variables, learning models and media as independent variable, while dependent variable is a chemistry student outcomes after learning had done before, and control variables are one teacher, the timing, book, pretest and posttest.

2.3 Research instruments

In the research had been tested out by objective test a number 40 multiple choice, each question has 5 options. The right answer was given score 1, and 0 for the false one. Before using the objective test, it had been validated to expert validator. The instrument was used while pretest and posttest. The reseach was done by random sampling technique. The groups were taught by using the Model of LC, TSTS, ATI and PBL respectively. The overview of the research is summarized in Figure 1.

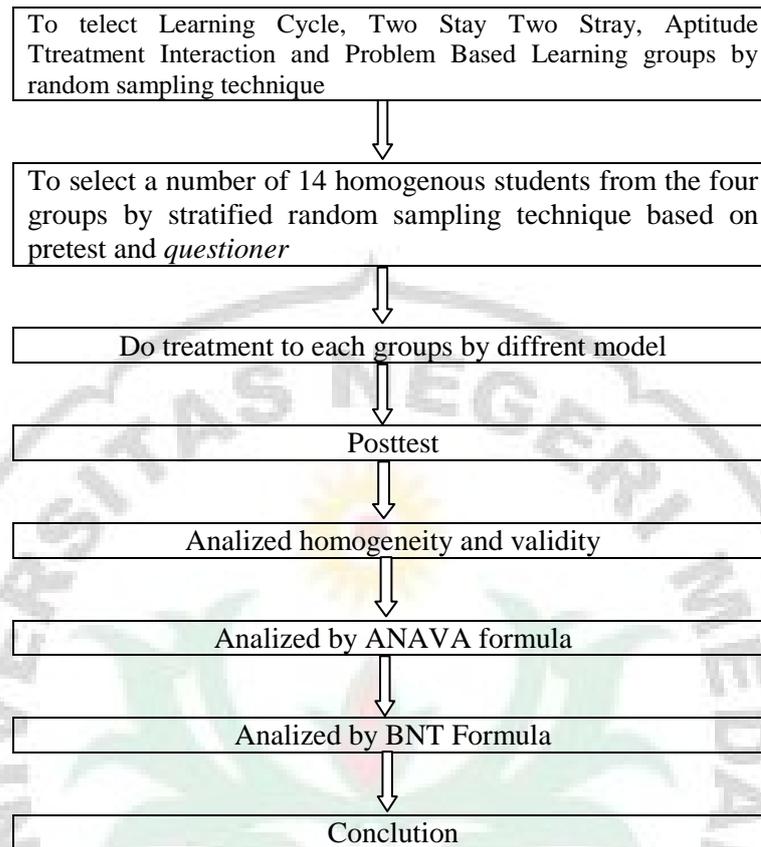


Figure 1. The overview of research procedures

[7] data analysis techniques was done as follows: described posttest each class into Table 1.

Table 1. posttest each class

| No | Learning models | | | |
|---------|-----------------|------------|-----------|-----------|
| | Group LC | Group TSTS | Group ATI | Group PBL |
| 1 | 68 | 48 | 60 | 48 |
| 2 | 80 | 56 | 68 | 32 |
| 3 | 64 | 44 | 60 | 36 |
| 4 | 72 | 48 | 68 | 36 |
| 5 | 72 | 64 | 56 | 44 |
| 6 | 48 | 32 | 60 | 40 |
| 7 | 60 | 76 | 64 | 40 |
| 8 | 72 | 44 | 68 | 40 |
| 9 | 64 | 60 | 60 | 36 |
| 10 | 60 | 56 | 48 | 28 |
| 11 | 60 | 44 | 52 | 40 |
| 12 | 56 | 56 | 80 | 40 |
| 13 | 60 | 68 | 56 | 36 |
| 14 | 68 | 64 | 80 | 44 |
| Total | 904 | 760 | 880 | 540 |
| average | 64,57 | 54,28 | 62,85 | 38,57 |

3. RESULTS AND DISCUSSION

The results of instrument consist of: content, difficulty degree, cheat, reliability formula. The objective test is a number 25. According analyzed by KR-20 $\alpha = 0,05$ (N=38), the shown the calculation, $r_{\text{formula}} = 0,8452$ and $r_{\text{standar}} = 0,320$. If $r_{\text{formula}} > r_{\text{standar}}$ so, the instrument test is reliable.

3.1 Reliability formula

Reliability formula is well known by K-R 20 [7]:

$$r_{11} = \left(\frac{n}{n-1} \right) \left(\frac{S^2 - \Sigma pq}{S^2} \right)$$

varians total is:

$$S^2 = \frac{\Sigma Y^2 - \frac{(\Sigma Y)^2}{N}}{N}$$

$$S^2 = \frac{28786 - \frac{1040400}{38}}{38}$$

$$S^2 = \frac{28786 - 37378,94}{38}$$

$$S^2 = \frac{1407,06}{38}$$

$$S^2 = 37,02$$

And based on varians total, concluded that instrumnet reliability below:

$$r_{11} = \left(\frac{40}{40-1} \right) \left(\frac{37,02 - 6,5048}{37,02} \right)$$

$$r_{11} = \left(\frac{40}{39} \right) \left(\frac{30,5152}{37,02} \right)$$

$$r_{11} = (1,0256)(0,8242)$$

$$r_{11} = 0,8452$$

Based on $r_{\text{formula}} = 0,8452$, nilai $r_{\text{standar}} (N=38), (\alpha 0,05)$ is 0,320. $r_{\text{formula}} > r_{\text{standar}} (0,8452 > 0,320)$ the finally concluded the highly objective test. To know the degree of difficulty each objective test analized by formula:

$$P = \frac{B}{T}$$

B= correct
T= total of sample
One of objective test

$$P = \frac{36}{40}$$

P = 0.9 (very easy)

Table 2. Degree of difficulty

| No | B | T | B/T | Classification | No | B | T | B/T | Classification |
|----|----|----|------|----------------|----|----|----|------|----------------|
| 1 | 36 | 38 | 0,94 | very easy | 21 | 19 | 38 | 0,5 | medium |
| 2 | 28 | 38 | 0,73 | Medium | 22 | 32 | 38 | 0,84 | easy |
| 3 | 32 | 38 | 0,84 | Easy | 23 | 43 | 38 | 0,89 | easy |
| 4 | 37 | 38 | 0,97 | very easy | 24 | 1 | 38 | 0,02 | very difficult |
| 5 | 33 | 38 | 0,86 | Easy | 25 | 24 | 38 | 0,63 | medium |
| 6 | 33 | 38 | 0,86 | Easy | 26 | 24 | 38 | 0,63 | medium |
| 7 | 17 | 38 | 0,44 | Medium | 27 | 20 | 38 | 0,52 | medium |

| | | | | | | | | | |
|----|----|----|------|----------------|----|----|----|------|--------|
| 8 | 33 | 38 | 0,86 | Easy | 28 | 34 | 38 | 0,89 | easy |
| 9 | 26 | 38 | 0,68 | Medium | 29 | 9 | 38 | 0,23 | medium |
| 10 | 29 | 38 | 0,76 | Medium | 30 | 30 | 38 | 0,78 | medium |
| 11 | 35 | 38 | 0,92 | very easy | 31 | 31 | 38 | 0,81 | easy |
| 12 | 36 | 38 | 0,94 | very easy | 32 | 22 | 38 | 0,47 | medium |
| 13 | 34 | 38 | 0,89 | Easy | 33 | 10 | 38 | 0,26 | medium |
| 14 | 31 | 38 | 0,81 | Easy | 34 | 26 | 38 | 0,68 | medium |
| 15 | 18 | 38 | 0,47 | Medium | 35 | 9 | 38 | 0,23 | medium |
| 16 | 2 | 38 | 0,05 | very difficult | 36 | 16 | 38 | 0,42 | medium |
| 17 | 20 | 38 | 0,52 | Medium | 37 | 23 | 38 | 0,60 | medium |
| 18 | 25 | 38 | 0,65 | Medium | 38 | 30 | 38 | 0,78 | medium |
| 19 | 31 | 38 | 0,81 | Easy | 39 | 33 | 38 | 0,86 | easy |
| 20 | 25 | 38 | 0,65 | Medium | 40 | 34 | 38 | 0,89 | easy |

Based on degree of difficulty, very easy test is 4, easy test is 13, medium test is 21, and very difficult test is 2. Data was analyzed by F test (α 0,05) and BNT formula. It was concluded the effect of learning models to chemistry learning outcomes was considerably higher than the other models. It's certainly LC was better than among of them in Table 3.

Table 3. the average of chemistry student outcome and standar deviation

| Variable | Treatment | | | |
|----------|-----------------------------|------------------------------|-----------------------------|-----------------------------|
| | LC | TSTS | ATI | PBL |
| Outcome | 64,57 ± 8,1307 ^a | 54,28 ± 11,7107 ^b | 62,85 ± 9,3385 ^a | 38,87 ± 5,1097 ^c |

Having the effect of learning models to chemistry student outcomes in teaching dalt hydrolsis for science students of grade eleven, senior high school at Percut Sei Tuan. It was concluded the effect of learning models to chemistry learning outcomes was considerably higher than the other models. It's certainly LC was better than among of them. LC had average 64,57 ± 8,1307, ATI had average 62,85 ± 9,3385 and PBL had average 38,87 ± 5,1097. In teaching salt hidrolsis, the students should be taught with learning cycle added worksheet because it had made outcomes was higher all of them.

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