THE STUDY OF STUDENTS' DIFFICULTY IN OPERATING OBE THROUGH TPS METHOD: A CASE STUDY OF ALE *(ELEMENTARY LINEAR ALGEBRA)* COURSE

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Abstract: *This study aims to assess and analyze the students' results of learning OBE Elementary Linear Algebra (ALE) using Think Pair Share learning model. This study was a classroom action research for this study aims to improve the learning outcomes of students who take mathematics education especially Elementary Linear Algebra course and improvements made continuously during the research.Subject of this study are 41 students of class A Faculty of Mathematics Education and Teaching who take Elementary Linear Algebra course in second semester of academic year 2015/2016. Data were analyzed by using simple statistics. Based on the analysis of the data, the study concluded that the learning outcomes of students increased from the first cycle to the second cycle and reach the target of this study is 70% that most of students in the class scored ≥ B.*
Keywords: *TPS, ALE, Learning Outcomes*

I. INTRODUCTION

Mathematics is an instrumental science because mathematics owns the concepts of other sciences such as engineering, economics, and social. Therefore, the quality of mathematics education needs to be improved from the outset. It is useful to improve the quality of human resources that have the ability to master and develop science and technology. The importance reason of studying mathematics is that math is so usefull everywhere. By studying mathematics; we are able to do the calculations. Math makes the calculation becomes simpler and more practical, and the students are expected to become a human being who could think logically, critically, diligent, responsible and capable of resolving the problems (Ruseffendi, 1991).

Based on the teaching experience on Elementary Linear Algebra course, researchers found that the learning process is very influential with students' ability to perform algebraic operations and OBE in the matrix, thus causing some of students failed in Elementary Linear Algebra course. The learning result of math education students who take courses in linear algebra in the last 2 years:

Table 1. Number and Percentage of Students's Repeating the Elementary Linear Algebracourses

School year	Class	Number of Students	Number of Students' Repeating	Percentage of Students' Repeating
2013/2014	A	36	21	58.3
2014/2015	A	45	18	40
	B	40	15	37.5

One attempt to improve learning outcomes was by improving the learning strategies. One of the adequate learning strategies is a cooperative learning model Think Pair Share (TPS). Cooperative learning is learning in which students learn in groups - small groups. Cooperative learning is a teaching strategy that involves the participation of students in a small group for mutual interaction. In cooperative learning, students are required to be able to understand the material to work with friends. Students are easier to find and understand a concept if they are discussing the issue with his friend (Nisa, 2014).

The purpose of this study is to analyze the students' results using Think Pair Share learning model in the subject of Elementary Linear Algebra on Mathematics Education.

TPS is a type of cooperative learning model that puts students in pairs to complete the academic assignments through three stages on which are:*Think, Pairs,* and *Share*. One virtue of cooperative learning

model TPS is to foster the involvement and participation of students by providing open opportunities to the students to speak and express their own ideas and motivate students to get involved in the conversation inside the class. Hence, the use of cooperative learning model Think-Pair-Share can help students convey information mathematically, such as express ideas, ask questions and respond to other people's questions (Marlina, 2014).

The following steps of cooperative learning model are as follows:

Table 2: Steps Cooperative Learning Model

Phase	Teacher behavior
Phase 1: Outlines the objectives and motivate students.	Teacher outlines all of the learning objectives to be achieved in the lessons and motivate students to learn.
Phase 2: Presents information	Teacher presents information to students through demonstrations or through reading materials.
Phase 3: Organize students into groups to work and learn.	Teacher explains to students how to form a study groups and help each group to make the transition efficiently.
Phase 4: Guide the group work and study	Teacher guides learning groups when they do their work.
Phase 5: Evaluation	Teacher evaluates learning outcomes of the material that has been learned or each group presents their work
Phase 6: Reward	Teacher finds out ways to appreciate the effort and the learning outcomes of individuals and groups

(Ibrahim *et al*, 2000)

According to Shoimin (2014) learning Think Pair Share has several components including:

a. *Think*
Implementation begins from learning Think Pair Share of self-thinking about solving problem. Thinking requires students to be more diligent in learning and looking for references actively to make it easier to solve a problem or question from the teacher.

b. *Pair*
After thinking, students were then askedto discuss the results of their thinking in pairs. Discussion is a step to unite the opinion of each student in order to deepen their knowledge. Discussions could encourage students to express and listen to either their opinionsor others' opinions in the group actively and be able to cooperate with others.

c. *Share*
After discussing the results of their thoughts, pairs of students are asked to share the ideas together to the entire class. Sharing requires students to be able to express his opinion and responsible, and requires the stundent maintains the opinions that have been delivered.

The steps of Think Pair Share learning model is as follows: (1) Teacher conveys the content and competencies to be achieved. (2) Students are asked to think about the material / problems submitted by teachers. (3) Students are asked to pair up with a friend nextto them (group 2) and express each other's ideas. (4) The teacher leads the result of small plenary discussions then each group expressed the results of their discussion. (5) Starting from these activities, the teacher directs the discussion onto the subject material and adds material that has not been disclosed by students. (6) The teacher gives the conclusion. (7)Closing.(Istarani, 2012).

Elementary Linear Algebra is MKK group and is anobligatory subject that includes a system of linear equations and matrices, determinants, general vector spaces, multiplication in space and linear transformations. It is the prerequisite subjects to whom that have been / are being taken courses Calculus 1 and Calculus 2.

In Elementary Linear Algebra courses,students required to master:

a. Completion SPL
b. Arithmetic operations and OBE Matrix

c. Determinants and finding the inverse of a matrix
d. Characteristics of the vector space and determine its properties
e. Vector multiplication and form an orthonormal basis
f. Characteristics of linear transformations in a vector space and its properties

The learning result is a benchmark to determine the success of students in mastering the lesson after the learning process. The learning result is the behavior that arise for example from the uninitiated, the emergence of new understanding, change any habits, skills, abilities, qualities appreciated the development of social, emotional and physical growth (Hamalik, 1983).

Learning outcomes can be skills, values, and attitudes of students that can be used to see how far the instructional objectives have been achieved or mastered by students. It is shown after they take their learning experience.

Lorin (2001) says that the cognitive domain has six levels, namely:
a. *Knowledge*, emphasis on students' memories about the material that has been taught.
b. *Understanding*,means understand the material being taught.
c. *Applications*, is the use of procedures / material that has been taught to students.
d. *Analysis*, the basic elements of matter that are interconnected to one another.
e. *Evaluation*, assessment of student ability of the material that has been studied.
f. *Creating*, ie rearrange / merge elements into the structure right.

Learning outcomes can provide information to teachers and students them selves, how and to which they master the material and the ability to achieve a student of the subject material that has been given by a lecturer. In this study, researchers will look at the results of student learning in the cognitive domain.

II. RESEARCH METHODS

This research is a classroom action research for this study aims to improve the learning outcomes of students from mathematics education who take Elementary Linear Algebra course. Classroom action research is a study class or jointly with others by means of designing, implementing and reflects the collaborative and participatory actions that aim to improve the quality of the learning process in their class through specific actions within a cycle (Kunandar, 2010).

Subject of this study are 41 students of class A Faculty of Mathematics Education and Teaching who takes Elementary Linear Algebra course in second semester of academic year 2015/2016.

Research procedure of PTK (classroom action research) is divided into four stages, namely:

1. Planning phase
   The steps are:
   a. Decidethe group of students based on heterogeneity of cognitive ability.
   b. Design a group discussion.
   c. Prepare for the allocation of time for presentation of results of group discussions.
   d. Prepare for the allocation of time for a response from another discussion group.

2. Measures Implementation Phase
   The steps to be performed are:
   a. Request students to sit in a group discussion.
   b. Request students to present results of group discussion.
   c. Request students from other discussion groups to consider and respond to the results presented by others'group.
   d. Teacher observes any activity undertaken during the learning process.
   e. Do the achievement test each end of the cycle.

3. Observations
   Observations made by filling the observation sheet. The observations will be assisted by a colleague who also teaches in place the researcher in charge. During the learning process, the observers will observe and record student activity using observation sheet. Each column on the observation sheet marked with *achecklist* when observers judge that the students do activities.

4. Reflection

Reflection is the final stage of a continuous cycle of action research. In this stage,the observers and researchers discuss the results in class actions and problems that occur in it. In discussions conducted an analysis of the actions that have been implemented.

The research instrument was the final test which is used to see how the learning outcomes of students during the learning process. Student results obtained from tests conducted after the end of one cycle. It was analyzed to see students learning completeness individually or get the value ≥B. In this study, resultsare expected that the number of students who gain ≥B value may exceed 70%. Learning completeness of a student can individually calculated using the formula:

$$NI = \frac{T}{SM} x100\%$$

Where: NI = Learning completeness individually
T = Score obtained by student
SM = Maximum score on the test

III. RESULTS AND DISCUSSION

To see the results of student learning in Cycle I, researchers gave tests on Saturday February 6, 2016 consisting of three items of essay. From 41 students who took the class A Elementary Linear Algebra course, only 11 students whose scores ≥B. The tests result that have been done in the first cycle are presented in Table 3.

Table 3.Completeness Learning in Cycle I

cycles	Students who achieve values ≥ B		Students who achieve value <B	
	number	Percent	number	Percent
I	11	26.83%	30	73.17%

From Table 3 above, it can be seen that the number of students who received grades ≥ B as many as 11 people mostly are students who are not serious in thefollowing teaching and learning process. Prior to the test, they do not repeat the lessons at home. The conclusion from the above data is that the indicators of success thoroughness expected in this study for a minimum of 70% has not been reached. In this case, the researchers guide students and provide motivation so that they do more exercises at home.

Based on these descriptions, it can be said that the students have not been able to understand the material well. Thus, the learning outcomes of students in the first cycle were not as expected, ie 70% of the number of students in the class get ≥ B. Therefore, follow-upis needed for the next cycle.

Before researchers went into the next cycle with a different material from the first cycle, a researcher along with students discussing again the test questions so that students know where their mistakes. To view the results of student learning in Cycle II, researchers gave the test on Saturday, February 27, 2016. The test consists of three items ofessay. From 41 students who took the class A elementary statistics course, 30 students that scored ≥ B. The achievement test data that has been done in the second cycle is presented in Table 4.

Table 4.Completeness Learning in Cycle II

cycles	Students who achieve values ≥ B		Students who achieve value <B	
	number	Percent	number	Percent
II	33	80.49%	8	19.51%

From Table 4 above, itcan be seen that the number of students who received grades ≥ B is 33 people or 80.49%. The conclusion from the above data is that the indicators of success completeness expected at this research that at least 70% has been reached.

During the study, the students' difficulty and confusion is when investigators deliver measures that will be performed by students in the implementation of cooperative learning model *Think Pair Share,* but after the next meeting students can understand and carry out the tasks assigned to him.

As the reseacher mentioned earlier, essentially cooperative learning Think Pair Share is a learning technique which groups of students shares knowledge and help each other when they difficulty in solving the problem related to the material and to motivate students to develop ideas and compare appropriate problem solving, so as to obtain better learning outcomes.

Researchers as executor and observer agreed to stop action on the second cycle of the study through this. This is because all the indicators of success assigned to the learning outcomes have been met.

IV. CONCLUSION

Based on the analysis of the data, it can be concluded that the learning outcomes of students increased from the first cycle to the second cycle and reach the target in this studyis 70% over 41students in the class scored ≥ B.

Related to the research results that have been obtained, the researchers advice to teachers to use the method of discussion in learning mathematics.

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