International Journal of
Science and Engineering Investigations vol. 3, issue 24, January 2014
ISSN: 2251-8843

# Effect of Cooperative Learning Model Type of Team Assisted Individualization (TAI) and the Performance Assessment of Learning Achievement to Linear Program Course

Anetha L. F. Tilaar
Department of Mathematics, Faculty Mathematics and Natural Science, Manado state University, Manado, Indonesia
(tilaarlita@yahoo.com)

***Abstract*-:** This research using a 2x2 factorial design that aims to study the effect of the application of cooperative learning model Team Assisted Individualization (TAI) and the performance assessment on learning achievement of students taking courses Linear Program. The results illustrate that: (i) the empirical research data support the hypothesis of the proposed research, (ii) based on the test statistic F, TAI cooperative learning model and implementation of performance assessment gives a significant effect on the average learning achievement students taking courses Linear programs, (iii) based on the test statistic t, for students who obtain treatment models of cooperative learning and problem-based TAI, study results differ significantly with students who obtain treatment in classical learning.

***Keywords*-** *Cooperative Learning, Model Type (TAI), Performance Assessment, Learning Achievement, Linear Program Course*

## I. INTRODUCTION

Mathematics is the language of symbols, numerical and logical deduction based on truth. Mathematical truths are explicitly established by the "social agreement", the new rules formed from the old rules that have been agreed upon truth and accepted by the society. The importance of social interaction in the learning process is argued by Vygotsky in Ackerman, who argues that learning is a social process of construction which are linked by language and social interaction[1]. According to Wittgenstein, mathematics into the joints of the life and activity [2].

While we see today is largely the pattern of learning mathematics is still to be transmissive, teacher transfer and comnine concepts directly on the learner. In this view, students passively "absorbing" the mathematical structure of a given teacher or found in textbooks. Learning just a delivery of facts, concepts, principles and skills to students [3].

Teaching in general Linear Program aims to prepare students to face the dynamic changes with emphasis on logical reasoning, rational, and critical as well as provide skills to students to be able to use the analysis used in the Linear Program and mathematical reasoning in solving various problems in daily life or in studying other fields. To achieve the goal of teaching Linear Program, teaching in this faculty need to make improvements and increase adjusted to the material being taught.

Current educational demands continue to increase, among others, calls for an increase in the implementation of the learning process that is focused on active learners during the learning process takes place. This is because the learning process is one of the factors that affect the level of achievement of learners. One way to meet these demands is to select and assign learning approach with respect to the conditions of learning, such as the characteristics of learners in order to facilitate learning approaches, and can direct the creative thinking.

Various efforts were made in teaching faculty, a very important part in achieving the success of planned learning objectives. Teachers in this case teachers and lecturers should select a variety of approaches, strategies, methods appropriate to the situation so that the planned learning objectives will be achieved. Therefore the selection of the learning model is an important thing. Learning model is a form of program or user guide teaching strategies designed to achieve learning. The guidance includes the responsibility of teachers to plan and implement, and evaluate learning activities. One of the intended uses of the model is to improve the learning ability of students during learning

According to Eggen and Kauchak in Wardhani, a model of learning is a form of program guidelines or instructions teaching strategies designed to achieve learning. Guidelines include the responsibility of the teacher in planning, implementing, and evaluating learning activities [4]. Whereas according to Nur & Kardi, all models characterized by the structure of learning tasks, goals and structure of the awards structure. The structure of the task, purpose and structure reward structures in different cooperative learning model to structure the task, the structure and purpose of learning the model structure of the other awards [5].

Selection of appropriate learning models is expected to be a change in the cognitive level, i.e. from remembering or memorizing the direction of thinking and understanding of the

learning process, there is a change of approach to the lecture model of discovery learning or inquiry learning. Furthermore, the learning situation is also expected to be a change, from individual learning to cooperative learning. Whether or not a learning model will depend on the learning objectives, compliance with the learning materials, and the level of development of learners, the learning ability of teachers to manage, and optimize existing resources.

According to Anita Lie, learning Cooperative learning model is not the same as a study group, but there are basic elements that distinguish the group division is done carelessly [6]. According to Kindsvatter et al in Roestiyah, has the goal of learning together, can improve outcomes student learning through cooperative groups that allow students to learn from each other, can help students who are weak, the relationship between students' learning with the more familiar and better co-operation between them, due to the group's success is highly dependent on the efforts of each of its members [7].

Cooperative learning model is a model that prioritizes the groups. Each student in the group has a different level ability. On the other hand cooperative learning model prioritizes cooperation in solving the problems to apply knowledge and skills in order to achieve the learning objectives. In the process of cooperative learning model, students are encouraged to work together on a common task and they should coordinate efforts to accomplish the task set by the teacher.

One type of learning in cooperative learning is assisted Team Individualization (TAI) developed by Slavin. This type of learning combines the advantage of learning in group work and individual learning. In addition, the type of learning assisted Team Individualization (TAI) is designed to address the learning difficulties of individual students, where students learn at their own level of ability themselves. If they do not qualify at a certain capacity, they can build a strong foundation before moving to the next stage. In addition, if students can progress more quickly, they do not need to wait for the other class members [8].

Besides learning model, assessment is also important in determining the success of a learning process. Assessment is the process of obtaining information about students' knowledge of math skills, use math skills, and the ability to make inferences for a variety of purposes. In line with the view expressed that the assessment is a process of gathering evidence about students' knowledge and expertise in this regard is integrated with the learning process and in accordance with the purpose of learning. Assessment is expected to complete the assessment tool in the form of paper and pencil test that describes the information obtained over the student's knowledge. The vision of assessment is important as a dynamic process that continuously generates information about the progress of student achievement of learning objectives listed in learning purpose.

Performance assessment is an assessment that focuses on the process. Performance assessment is assessment that gives students the opportunity to realize their performance, not answering or choose an answer from a series of possible answers is already available. Performance assessment is based on the observation rater assessment of the activity that occurs as students. The assessment of performance, behavior, or student interaction. In addition, assessment of performance is the best that can understand students' responses from the simplest to the most complex. The opinion of many, it can be said that the performance assessment is one form of assessment that asks students to demonstrate their performance so we will know their knowledge. Performance assessment requires learners to be active because it is considered not only the product, but more importantly the skills that I owned. Performance assessment in mathematics includes presentations math assignment, project or investigation, observation, interviews (interviews), and sees the result (product).

Mathematics is essentially the activities associated with human life, which is shaped by the social environment and the growth of a civilization. Learning mathematics in the wake of the communication, idea and ideas together in a group. Development principles of learning that unites the elements of independence, togetherness, individual responsibility to the group to obtain maximum results, one of which is through the application of cooperative learning model TAI (Team Assisted Individualization) in mathematics learning especially in the lecture course Linear Program.

## II. METHOD

The method used in this study is an experimental method with a 2x2 factorial design. Experimental method is complete steps taken in this study, so the data retrieved will bring objective analysis and conclusions are applicable in relation to the issue of the researcher reviewed. 2x2 factorial design is used because of the many factors in the treatment of this study consisted of two factors: performance assessment and problem-based learning model. Problem-based performance assessment consists of filing problems and problem solving, while learning model consisting of TAI models and classical models.

Variables in this study consisted of: 1) The independent variables include: (a) problem-based performance assessment and (b) learning model, and 2) the dependent variable (criterion) is a Linear Program learning outcomes. Independent variable performance-based assessment problem consists of two forms, namely: (1) the filing of a problem and (2) solving the problem. While the independent variables of learning models consist of: (1) TAI learning model, and (2) model of classical learning. Before the implementation of the first experimental measurement of the ability of the early treatment group. Therefore the initial capacity is expressed as a covariate variable.

The study design is described in the following matrix.

TABLE I. 2X2 FACTORIAL EXPERIMENT RESEARCH DESIGN

| Learning Model (B) | Performance-Based Assessment Issues (A) | |
|---|---|---|
| | filing Issues ($A_1$) | problem solving ($A_2$ |
| TAI Models ($B_1$) | (X,Y)11k k=1,2,3,...,n11 $A_1B_1$ | (X,Y)21k k=1,2,3,...,n21 $A_2B_1$ |
| Classical models ($B_2$) | (X,Y)12k k=1,2,3,...,n12 $A_1B_2$ | (X,Y)22k k=1,2,3,...,n22 $A_2B_2$ |

Description:

A1 = group given performance assessment submission Problems

A2 = group given the performance assessment of problem Solving

B1 = group given learning TAI

B2 = group given classical learning

X = initial ability scores as covariates

Y = score learning outcomes

K = a lot of samples in each cell

Research Variables

In this study used two independent variables and the dependent variable. The first independent variable is the performance-based assessment that acts as a treatment issue. Form of performance-based assessment is divided into two problems, namely performance assessment form submission and assessment of problem solving performance. The second independent variable is a model of learning which is also treated as a variable. This variable consists of TAI learning model and model of classical learning.

The dependent variable is the student learning outcomes. The study results are obtained student scores after following achievement test conducted after the experiment finished. Before the implementation of the experiment, will be done in advance of data collection capabilities for all students beginning college students who will be given the treatment. Initial capability expressed as a covariate variable. After the initial skills test is given, then the experiment began in the third grade subjects obtain a linear program, the fourth semester class B, class C, class D and class E.

Experiments were carried out in the fourth semester class B and class C which are both given the same treatment performance-based assessment that troubleshooting problems. As for the treatment of learning model, given the fourth semester class D and class learning model TAI C given model of classical learning. In the implementation of this study, half of the class D had given IV treatment performance assessment submission classical problems and learning models. While the fourth semester class E given treatment performance assessment submission issues and learning models assisted Team Individualization (TAI). The fourth experimental group each class taught by one lecturer. Each end of the core competencies formative test given to all treatment groups. The process of providing formative tests monitored directly by researchers, by providing time 2 times 30 minutes.

The samples using multistage random sampling technique because the students are grouped according to the administration of the registration, so it cannot be moved from one class to another. Hypothesis testing is done by using a significance level of $\alpha = 0.05$. The null hypothesis is rejected if the value of F0 <F table with a significance value of $\alpha$ - 0.05.

The statistical hypothesis to be tested in this study as follows:

1. H0: $\mu A1 \leq \mu A2$
   H1: $\mu A1 > \mu A2$
2. H0: $\mu B1 \leq \mu B2$
   H1: $\mu B1 > \mu B2$
3. H0: Int. A x B = 0
   H1: Int. A x B $\neq$ 0
4. H0: $\mu A1B1 \geq \mu A1B2$
   H1: $\mu A1B1 < \mu A1B2$
5. H0: $\mu A2B1 \leq \mu A2B2$
   H1: $\mu A2B1 > \mu A2B2$
6. H0: $\mu B1A1 \geq \mu B1A2$
   H1: $\mu B1A1 < \mu B1A2$
7. H0: $\mu B2A1 \leq \mu B2A2$
   H1: $\mu B2A1 > \mu B2A2$

Description:

$\mu A1$ = average student learning outcomes assessment given application performance problems

$\mu A2$ = average student results are given problem-solving performance assessment

$\mu B1$ = verage learning outcomes of students who are taught by TAI models

$\mu B2$ = average learning outcomes of students who are taught by the classical model of learning

A = assessment based performance problems

B = learning model

$\mu A1B1$ = average student learning outcomes assessment given application performance problems and taught learning model TAI

$\mu A2B1$ = average student results are given performance assessment and problem solving are taught by TAI learning model.

$\mu A1B2$ = average student learning outcomes assessment submission given problem and taught classical learning model

$\mu A2B2$ = average student learning outcomes assessment is given and taught problem-solving performance with classical learning model

$\mu B1A1$ = average learning outcomes of students who are taught by TAI learning model and given the performance assessment submission problems

$\mu B1A2$ = average learning outcomes of students who are taught by TAI learning model and given the performance assessment of problem-solving

μB2A1 = average learning outcomes of students who are taught by the classical model of learning and performance assessment submission given problem

μB2A2 = average learning outcomes of students who are taught by the classical model of learning and problem-solving performance assessment given.

## III. Results and Discussion

1. Differences Linear Program Learning Outcomes Performance Assessment Filing a given problem and the performance assessment given Troubleshooting with Control Capability Initial.

Results of hypothesis testing analysis of 1 indicates that H0 is rejected by Test-F, rows A to F count value = 79.44> F table value = 3.92. Thus it can be concluded that there are differences in learning outcomes between groups Linear Program students are given a problem and the performance assessment submission groups of students who were given a problem-solving performance assessment after controlling for initial ability students.

Implementation of performance assessment aims filing problems so that learners can and are able to construct as many questions or problems of a given task. The main purpose of the assessment is the assessment of the students' performance of the filing problem about student performance worthy Linear Program solved based on information known. While the problem-solving performance assessment aims to measure the ability of students to solve problems that are assigned based on Linear Program troubleshooting procedures combined with problem solving of Polya who followed the steps of: (i) understanding the problem, (ii) to plan how to solve problems, (iii) perform calculations, and (iv) verify the resolution process.

The results illustrate that the students taking the course Linear Program has sought to develop problem-solving skills through the four stages proposed by Polya.

2. Differences Linear Program Learning Achievement for the stusents' who are given learning Model TAI and those using Classical Learning Model to Control the basic Capabilities.

Results of the analysis indicate that the hypothesis testing 2: H0 rejected by the F test, row B with value Fhitung = 69.41> F table value = 3.92. Thus it can be concluded that there are differences in mathematics achievement between groups of students are given learning model TAI and the group of students who were given a model of classical learning.

The results illustrate that the application of cooperative learning model type TAI in teaching courses Linear Program emphasizes cooperation among group members and is dominated by student activities. All members of the group responsible for the results of the completion of the task or problem are given.

3. Effect of Interaction Between Performance Assessment and Problem Based Learning Model toward Student Learning achievement with Basic Capabilities Control.

Results of hypothesis testing analysis 3 showed that H0 is rejected by the F test statistics, factor A * B with Fhitung = 16:48> F table value = 3.92. Thus it can be concluded that there are significant interaction between assessment performance and problem-based learning model to mathematics learning outcomes after controlling for basic capability.

4. Differences Between Linear Program Learning Outcomes Students Taught group with TAI and Classical Learning Model Special for Group Performance Assessment Filing Marked Problems with Controlling Initial Capabilities.

The results of the analysis indicate that the hypothesis testing: H0 rejected by statistical t-test, t = 9.18 value> value table = -1.66. Thus it can be concluded that there are differences in learning outcomes between groups of students were given the problem with performance assessment submission of groups of students who were learning model TAI and classical learning models after controlling for initial ability.

Implementation of performance-based assessment problems combined with the application of cooperative learning model TAI, aims to motivate students to improve the quality of teaching, particularly in lectures Linear Program. Stages in cooperative learning TAI provides an opportunity for students to apply their ideas and experiences in everyday life to solve the problem of a Linear Program.

5. Linear Program Learning Outcomes difference between groups Taught by TAI and Learning Model Taught by the group Classical Learning Model, which is given a special assessment for Group Problem Solving Performance After Controlling Initial Capabilities.

The results of the analysis indicate that the hypothesis testing H0 rejected by t test. 3:42 tcount> value table = -1.66. Thus there is a significant difference between student learning outcomes assessment is given by solving the performance model of TAI and students who are taught by the classical models after controlling for initial ability.

The results showed that, given a group of students with the problem-solving performance assessment cooperative learning model TAI successfully develop the mindset and are able to work together to discuss and solve problems Linear Program, compared to only work if the students themselves.

6. Differences in learning outcomes Linear Program taught by classical learning model and given the problems with the submission of the performance assessment of learning outcomes Linear Program taught by TAI and given a model of learning problem-solving performance assessment, after the initial Control Capabilities.

The results of the analysis indicate that the hypothesis testing H0 is rejected based on the test statistic t. Tcount 8.76> value table = -1.66. Thus there are differences in learning outcomes for groups of students who are taught by TAI learning model with the results of the study group were given the problem with performance assessment submission students are given an assessment group problem solving performance after controlling for initial ability students.

The results illustrate that students are motivated to solve problems based Linear Program problem. The steps followed by students trying applied, thereby increasing the activity in the lecture. Students seek and find creative and solve masalahyang frequently encountered in everyday life.

7. For the students' Taught with Learning Classical Model, students' Learning Outcomes Given Math Performance Assessment Filing Issues Higher Marked Assessment of Student Performance Troubleshooting

The test results showed that the hypothesis H0 is rejected based on the test statistic t. 3:02 tcount> value table = -1.66. It can be concluded that for a group of students who are taught through classical learning model, there are differences in mathematics achievement between groups of students were given the problem with performance assessment submission of groups of students who were given a problem-solving performance assessment after controlling for initial ability students.

Implementation of performance assessment can streamline the process of improving the learning outcomes of students in the lecture Linear Program, as students are required to apply existing measures from the beginning to the completion of activities.

## IV. CONCLUSION

1. Linear Program learning outcomes of students were given a problem filing performance assessment higher than students who were given learning outcomes assessment problem solving performance by controlling the initial capability.

2. Linear Program learning outcomes of students taught with higher TAI learning model of student learning outcomes Linear Program is taught by the classical model of learning by controlling the initial capability.

3. There is a significant interaction effect between performance assessment based learning model problems with the learning outcomes of a Linear Program after controlling for initial ability.

4. For the group given the performance assessment submission problems, the learning outcomes of students who are taught by TAI learning model is higher than the group that was taught the classical model of learning.

5. For a given group problem solving performance assessment, learning outcomes between groups Linear Program is taught by TAI learning model is higher than the group that was taught by classical models, after controlling for initial ability.

6. For a group that was taught by TAI learning model, learning outcomes Linear Program between the group given the performance assessment submission problems is higher than a given group problem solving performance assessment after controlling for initial ability.

7. For a group that was taught by the classical model of learning, learning outcomes Linear Program between the group given the performance assessment submission problems higher than the group given the performance assessment of problem solving.

## V. SUGGESTION

Based on the conclusion of the study, it can be suggested the following.

1. The teachers who teach mathematics in particular Linear Program materials can engage and assess students in learning by using a problem-based performance assessment.

2. Teachers who use performance assessment submission should issue through a classical model of learning, for teachers who use problem-solving performance assessment should be through learning model TAI.

3. Need to be trained specifically and systematically integrate problem-based performance assessment and instructional model for teaching mathematics in particular are learning Linear Program.

4. To implement performance-based assessment and instructional model problem requires preparation and institutional workforce. To prepare educational personnel who have the ability can be done through formal channels such as preparation through Workforce Education Institutions and through upgrading.

5. Students and students should use the filing tasks and problem solving as a model of self-study at home to improve their learning outcome

## REFERENCES


[1] Ackerman, E. 1996, Perspective Taking Object of Construction, Lawrence Elbraum Associates, New Jersey.

[2] Wittgenstein, 1978, Remark on the Foundation of Mathematics, MIT Press.Cambridge.

[3] Clements, D.H. & Battista, M.T. 2001. Constructivist Learning and Teaching. (Online)

[4] (Http://www.terc.edu/investigation/relevant/html/constructivistlearning. html.

[5] Wardhani. Sri. (2005). Contextual Learning Mathematics. Instructional Materials Training in Mathematics PPPG, Yogyakarta: PPPG Matematika.

[6] Nur, M.& Kardi S. 2000. Introduction to Teaching and Classroom Management . Surabaya: Unesa University Press

[7] Lie Anita, 2008. Cooperative Learning. Practicing Cooperative Learning in the Classroom spaces. Grasindo, Penerbit PT Gramedia Widiasarana Indonesia Jakarta.

[8] Roestiyah. 2008. Strategi Belajar Mengajar. Jakarta: Rineka Cipta

[9] Slavin, S.E. 1995. Cooperative Learning, second edition. Massachusets: Allyn & Bacon.