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# Implementation Reciprocal Teaching Learning Model Towards Students'Learning Outcomes on Linear Program in Mathematics Subject of SeniorHigh School

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**ABSTRACT:** Based on the results of the research data processing, it can be generally concludd that the reciprocity teaching model for students' learning on linear program in math subjects in class XI of SMA has a positive impact on students' learning outcomes. As a research focus to be in line with the predetermined research problem formulation, the results of the research problem formulation are as follows: (1) Student learning results before being given a reciprocal teaching model with an average score of 76.33 the highest score of 82.00 and the lowest score of 68.00. (2) Student learning results after being given a reciprocity teaching model with an currenly score of 84.30 highest score of 90.00 and lowest score of 78.00. (3) There was an increase in student learning after being given a reciprocal teaching model for student learning on linear program in math subjects in class XI of SMA.

**KEYWORDS:** Reciprocal Teaching Learning, Math Study Results, Linear Program, High School Students

## INTRODUCTION

Mathematics is a universal fundamental science that plays a role in the development of modern technology, especially in improving the human mindset. When viewed from the point of view of the classification of the field of science, mathematics belongs to the exact sciences that require more understanding than memorization. Therefore, in order to solve problems in a mathematical subject, the basic ability that a student must have is the ability to understand mathematical concepts themselves.

Conceptual understanding is the ability of students to understand or master a material or object in learning. Ella Yulelawati (2012:25) suggests that a student is said to understand if he has the ability to describe a material or material to another material or material, explain the narrative into numbers, interpret things by expression in his own words or by summaries. If the student has these abilities, then you could say he already understands. In addition, if a student understands a concept, he or she will be able to generalize it in various other situations.

In other words, he can use the concept to other situations rather than just the situations that are exemplified. One of the goals of mathematics education said by Effandi, et al. (2007:13) is so that students can understand mathematics. In addition, in the Minister of National Education Regulation No. 22 of 2006 quoted by Mulyasa (2005:123) it states that the purpose of studying mathematics in schools is so that students have the ability to understand mathematical concepts, explain interconceptions and apply logarithms smoothly, accurate, efficient and precise in solving problems.

Based on the objectives of the mathematics lesson presented above, it is clear that the first goal of mathematics is for students to have the ability to understand concepts. Understanding is a basic ability that students must have. A student must first understand the concept as a basis for stepping on a higher next stage such as applying concepts, analysis and synthesis. However, conditions on the ground were not yet as expected.

Based on the information obtained by the author from the results of an interview with a mathematics teacher at SMA, the reality was that the understanding of the mathematical concepts of grade XI students was still relatively low, with the following symptoms: (1) If the teacher gave a problem with a slightly different model from an example, Most students have difficulty completing it. (2) If teachers ask back about the concepts of previous mathematical subjects, most students often cannot answer. (3) If given the assignment, most students cannot analyze and interpret the questions so they are wrong in answering.

## RESEARCH METHODOLOGY

A research method is the method by which research is conducted. According to Sugiyono (2014:3) "The method is interpreted as a scientific way to obtain data with specific purposes and uses. The research method used in this study is experimental. According to Sugiyono (2014:11) "experimental research methods can be interpreted as research methods used to seek the effect of certain treatments on others under controlled conditions", According to Zuldafrial (2012:8) "experimental method is a method of

research used to obtain information about the causal relationship between variables under controlled conditions". This study aims to find out the model of reciprocity teaching of learning outcomes.

In this study, the form of research used by researchers was Pre-Experimental Design. According to Sugiyono (2012:109) it is said "Pre-Experimental Design, because this design has not been a serious experiment because there are still external variables that also affect the formation of dependent variables. So the experimental results, which are dependent variables, are not solely influenced by independent variables". Pre-experimental designs include:

a. One-Shot Case Study
b. One-Group Pretest-Posttest Design
c. Intact-Group Comparison

The design used in this study was One-Group Pretest-Posttest Design. Thus treatment results can be known more accurately, as they can compare with the state before treatment". This is in line with research taken by researchers, where researchers want to know the effect of learning outcomes before and after being treated with a reciprocity teaching model. The following schemes can be used for this research plan:

**Research Design Table *One-Group Pretest-Posttest Design***

| ***Pre-test*** | **Perlakuan** | ***Post-test*** |
|---|---|---|
| O1 | **X** | O2 |

Information:
$O_1$ = (*Pretest*)
$O_2$ = (*Posttest*)
X = Treatment with a learning model *reciprocal teaching* (Sugiyono, 2012:111)

The population according to Zuldafrial (2010:97) is "The whole subject or object or unit of analysis used as a source of data can be human, animal, plant or object in a study". Hadari Nawawi (2014:150) stated that "Population is a whole research object consisting of humans, objects, animals, vegetation, symptoms, test values or events as a data source that has certain characteristics in a study". Nana Syaodih Sukmadinata (2010:266). A population is the total number of units of analysis whose characteristics would be expected. Suharsimi Arikunto (2006:130) said the population was the whole subject of research.

Based on the above definition, it can be concluded that population is the whole of every element, whether human, object or symptom, that has a particular characteristic. As for this research, researchers only took class XI IPA and IPS SMA Negeri 04 Sungai Raya with a population of 72 students. The method of sampling in this study used a non-random sampling system (nonprobability sampling) using purposive sampling. Purposive sampling consists of two alternatives: judgment sampling and quota sampling. In this study, the researcher used judgment sampling because the samples to be used in this study had to meet the following criteria: Students who had obtained the research material "linear program" because it was quite difficult for students to understand. The class whose average score is below KKM is 75. Therefore, the sample used in this study was XI IPS, which was 31 students consisting of 14 male students and 17 female students.

Validity based on criteria is the validity observed in terms of the relationship of other measuring instruments which is seen as a criterion for determining the height of validity under question (Budiyono, 2011:12). In determining the validity level of the question item, the correlation of the Pearson Product Moment is used by correlating the scores obtained by students on a question item with the total scores obtained. Formula used:

$$r_{XY} = \frac{n.\sum X.Y - (\sum X)(\sum X)}{\sqrt{(n.\sum X^2 - (\sum X)^2).(n.\sum Y^2 - (\sum Y)^2)}}$$

Keterangan:
$r_{XY}$ = Validity correlation
$X$ = test score
$Y$ = criteria score
$n$ = Lots of data
(Jihad dan Haris, 2008: 180)

Interpretation of the correlation coefficient value $r_{XY}$ use the following criteria:
$0{,}80 < r_{XY} \leq 1{,}00$ : highest
$0{,}60 < r_{XY} \leq 0{,}80$ : high
$0{,}40 < r_{XY} \leq 0{,}60$ : currently

$0{,}20 < r_{XY} \leq 0{,}40$ : low
$r_{XY} \leq 0{,}20$ : lowest
(Jihad dan Haris, 2008: 180)

The problem items used in this study if the correlation coefficient r_XY ≥ 0.60. Based on the results of a correlation test study using the spss.v20 program, the following results were obtained:
Test Result Table / Correlation Test

| No | question | Rxy-Table | R - count | category | information |
|---|---|---|---|---|---|
| 1 | question 1 | 0,367 | 0,380 | Low | Valid |
| 2 | question 2 | 0,367 | 0,491 | currently | Valid |
| 3 | question 3 | 0,367 | 0,460 | currently | Valid |
| 4 | Soal 4 | 0,367 | 0,626 | Tinggi | Valid |

Budiyono (2011:31) said that "The power of distinction is good if the group of students is good at answering correctly the point about more groups of students are not good at it." This problem can be analyzed using the following differentiating power formula (DP):

$$DP = \frac{S_A - S_B}{I_A}$$

Information:
$S_A$= Total group scores for the processed questions
$S_B$= Sum of the lower group scores on the processed items
$I_A$= Ideal score for one group of processed questions
(Jihad dan Haris, 2008: 181)
With the power differentiator test items as follows.

**Differentiated Power Criteria Table**

| **Distinguishing Power Value** | **Criteria** |
|---|---|
| 0,40 or more | Very good |
| 0,30 - 0,39 | Good |
| 0,20 - 0,29 | Minimum, needs to be fixed |
| 0,19 down | Bad, discarded or remodeled |

(Jihad dan Haris, 2008: 181)

In this study, the test problem items used if DP > 0.29 or within the criteria were quite good. Based on the results of a differentiating power test using the spss.v20 program, the following results were obtained:

**Differentiated Power Calculation Results Table**

| No | question | Rxy-Table | R - count | category |
|---|---|---|---|---|
| 1 | question 1 | 0,367 | 0,380 | good |
| 2 | question 2 | 0,367 | 0,491 | Very good |
| 3 | question 3 | 0,367 | 0,460 | Very good |
| 4 | question 4 | 0,367 | 0,626 | Very good |

The difficulty level of the question item states the proportion of the number of participants who answered the question correctly to all test participants (Budiyono, 2011: 30). The problematic difficulty index is a number that indicates both difficult and easy problems. The higher the difficulty index the easier the problem is. A good problem is one that is neither too easy nor too

difficult. The analysis of the difficulty level of the problem is to examine problems in terms of their difficulty so that which questions are meant to be easy, moderate, and difficult. The degree of difficulty on each item of the question is calculated using the formula:

$$TK = \frac{S_A + S_B}{n_{maks}}$$

Information:

$TK$ = Difficulty level

$S_A$ = Top group score total

$S_B$ = Sum of the scores of the lower group

$n$ = Number of students in the upper and lower groups

$maks$ = maximum score for the question in question

(Jihad dan Haris, 2008: 182)

The difficulty level of the problem is determined by the following criteria.

**Difficulty Level Criteria Table**

| Difficulty Level Value | Difficulty Level Criteria |
|---|---|
| 0,00 – 0,30 | Difficult |
| 0,31 – 0,70 | Currently |
| 0,71 – 1,00 | Easy |

(Jihad dan Haris, 2008: 182)

In this study the difficulty index used was a moderate criterion, which was between 0.30 and 0.70. Based on the results of a measurement level test using the spss.v20 program, the following results were obtained:

**Difficulty Level Calculation Results Table**

Statistics

| | | question 1 | question 2 | question 3 | question 4 |
|---|---|---|---|---|---|
| N | Valid | 29 | 29 | 29 | 29 |
| | Missing | 0 | 0 | 0 | 0 |
| Mean | | 1.72759 | 1.80345 | 1.72414 | 1.54138 |
| category | | Easy | Easy | Easy | Easy |

An instrument is called reliability if the measurement results with it are the same if the measurements are made on the same person at different times or on different people (but have the same conditions) at the same time or at different times (Budiyono, 2011:13). To find essay-shaped reliability, the formula Alpha can be used as follows:

$$r_{11} = \left(\frac{n}{n-1}\right)\left(1 - \frac{\sum {s_i}^2}{{s_t}^2}\right)$$

Information:

$r_{11}$ = instrument reliability coefficient

$n$ = number of instrument items

$\sum {s_i}^2$ = sum of variance of the i-th hemisphere

${s_t}^2$ = variance of total scores obtained by test subjects

(Jihad dan Haris, 2008: 180)

The reliability coefficient criteria ($r_{11}$) used are:

$0{,}90 \leq r_{11} < 1{,}00$ : Highest

$0{,}70 \leq r_{11} < 0{,}90$ : High

$0{,}40 \leq r_{11} < 0{,}70$ : currently

$0{,}20 \leq r_{11} < 0{,}40$ : low

$0{,}00 \leq r_{11} < 0{,}20$ : lowest

(Jihad dan Haris, 2008: 180)

The instrument used in this study if it had an Alpha coefficient was at least 0.40. Based on the research results, the reliability test of saol test data can be obtained as follows:

Tabel Reliability Statistics

| Cronbach's Alpha | N of Items |
|---|---|
| .616 | 5 |
| category | Currently |

The data collection techniques used in this study are as follows:

The technique used in data collection is the Measurement technique. Measurement is the process of collecting data to determine intelligence, abilities, and other abilities in a particular field. Meanwhile, the measurement referred to in this study is the provision of a student learning result test in the form of a final test (posttest) conducted using a reciprocity teaching learning model. Documentary study techniques are techniques for collecting data carried out by categorization and classification of written materials related to research issues, both from document sources and from newspaper and other books (Zuldafrial, 2012:38). The data obtained in this study were posttest data. The steps for analyzing the data are as follows: (1) To answer subproblems number 1 and 2, which is to find the average grade of the student's learning using an elaboration learning strategy, it can be calculated using descriptive statistics, with the mean formula (mean). The formula used is as follows:

$$\overline{X} = \frac{\sum x}{n}$$

Information :

$\overline{X}$ = Average

$\sum x$ = Total score

$n$ = Total Student

with criteria :

Average Value Criteria Table

| Range | category |
|---|---|
| 00 – 49 | Classified as a failure |
| 50 – 59 | Classified as lacking |
| 60 – 69 | It is considered sufficient |
| 70 – 79 | It is considered good |
| 80 – 100 | Classified as special |

For problem 3 use the calculation T – test as follows:

$$t = \frac{Md}{\sqrt{\frac{\sum d^2 - \frac{(\sum d)^2}{n}}{n(n-1)}}}$$

Information:

t = t-test

Md = average difference between pre-test and post-test

D = difference between pre-test and post-test scores

n = number of research subjects

## RESEARCH RESULTS AND DISCUSSION

### A. Description data

The data in this study are data on students' learning outcomes in the cognitive domain. The data were obtained from classes using reciprocity teaching learning models. The sample used in this study was one class, class XI IPS. Class XI IPS numbered 31 students divided into pretest and posttest.

### B. Research results

#### 1. Pretest Data Research Results

Data on pretest learning outcomes using the reciprocity teaching model can be seen in the results of data analysis using the spss. V 20 program as follows:

Tabeletatistics

| | | question 1 | question 2 | question 3 | question 4 | mark |
|---|---|---|---|---|---|---|
| N | Valid | 36 | 36 | 36 | 36 | 36 |
| | Missing | 0 | 0 | 0 | 0 | 0 |
| Mean | | 19.3889 | 20.1667 | 19.2778 | 17.5000 | 76.3333 |
| Median | | 20.0000 | 20.0000 | 19.0000 | 18.0000 | 76.5000 |
| Std. Deviation | | 1.45951 | 1.23056 | 1.36510 | 2.46692 | 3.48876 |
| Minimum | | 17.00 | 18.00 | 17.00 | 12.00 | 68.00 |
| Maximum | | 22.00 | 22.00 | 22.00 | 21.00 | 82.00 |
| Sum | | 698.00 | 726.00 | 694.00 | 630.00 | 2748.00 |

Based on table 4.2 above, it is possible to describe the student's learning outcomes before being given a reciprocal teaching learning model with a score of 2748. The average value is 76.33 highest value is 82.00 lowest value is 68.00 and the standard deviation is 3.48. Raw data are presented in the appendix.

**2. Posttest Data Research Results**

Posttest learning outcomes data with a reciprocating learning model can be seen in the results of data analysis using the spss.v20 program as follows:

Tabel Statistics

| | | question 1 | question 2 | question 3 | question 4 | mark |
|---|---|---|---|---|---|---|
| N | Valid | 36 | 36 | 36 | 36 | 36 |
| | Missing | 0 | 0 | 0 | 0 | 0 |
| Mean | | 21.2778 | 21.1667 | 21.2222 | 20.6389 | 84.3056 |
| Median | | 21.0000 | 21.0000 | 21.0000 | 20.0000 | 85.0000 |
| Std. Deviation | | 1.44640 | 1.44420 | 1.28976 | 1.74279 | 2.90634 |
| Minimum | | 19.00 | 19.00 | 19.00 | 17.00 | 78.00 |
| Maximum | | 24.00 | 24.00 | 23.00 | 23.00 | 90.00 |
| Sum | | 766.00 | 762.00 | 764.00 | 743.00 | 3035.00 |

Based on table 4.2 above, it is possible to describe the student's learning results after being given a reciprocal teaching learning model with a total score of 3035. The average value is 84.30 highest value is 90.00 lowest value is 78.00 and the standard deviation is 2.90. Raw data are presented in the appendix.

**3. Prerequisite Test**

**a. Normality Test**

The purpose of the normality test is to determine whether the data obtained from each of the variables analyzed actually follow a normal distribution pattern or not. Normality testing in this study used colmogorov-Smirnov. with a 95% confidence value, or a tolerance value of 0.05 using the SPS ver 20.00 tool if the significant value in this test is above 0.05, then the data are normally distributed. Conversely, if the significant value is below 0.05 then the data is not normally distributed. The results of these statistical calculations are presented in table 4.5:

**Tabel 4.5**

**Tests of Normality**

| | KK | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | Df | Sig. | Statistic | Df | Sig. |
| HBKE | PRE | .100 | 36 | .200* | .972 | 36 | .474 |
| | POST | .150 | 36 | .039 | .965 | 36 | .307 |

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

The results of the data analysis using the SPSS application program ver 20.00, by using the Lilliefors Significance Correction analysis with a shapiro-wilk technique for normality tests of normal distributed pretest learning results with significance less than 0.05 (0.474 > 0, and 3.454 >0.05) and the normality test of normal distributed posttest learning outcomes significantly less than 0.05 (0.307 > 0.05).

**b. Homogeneity Test**

A data homogeneity test is performed to determine whether the data is homogeneous or not homogeneous. The test used to calculate homogeneity in this study was using the Fisher test, with the following formula:

$$F = \frac{\text{high Variance}}{\text{low Variance}}$$

The test criteria are as follows:
If Fcalculate is ≥ Ftabel, it means is not homogeneous, and
If Fcalculate is ≤ Ftabel, it means homogeneous data.

Tabel Test of Homogeneity of Variance

| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| HBKE | Based on Mean | 1.757 | 1 | 70 | .189 |
| | Based on Median | 1.999 | 1 | 70 | .162 |
| | Based on Median and with adjusted df | 1.999 | 1 | 69.981 | .162 |
| | Based on trimmed mean | 1.773 | 1 | 70 | .187 |

Based on the results of the data obtained, then the calculations for experimental classes > f table (0.186 > 1.96) can be inferred that the experimental class data are homogeneous.

**c. Hypothesis Testing**

Tabel Paired Samples Statistics

| | | Mean | N | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Pair 1 | MARK PRETEST | 76.3333 | 36 | 3.48876 | .58146 |
| | MARK POSTTEST | 84.3056 | 36 | 2.90634 | .48439 |

Tabel Paired Samples Test

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confidence Interval of the Difference | | | | |
| | | | | | Lower | Upper | | | |
| Pair 1 | NPRE – NPOST | -7.97222 | 2.23589 | .37265 | -8.72874 | -7.21571 | -21.393 | 35 | .000 |

1) According to the Analysis of the results of paired samples statistics in table 4.7 above, it can be described as follows:
2) This study used samples of n1 = 36 people, n2 = 36 people.
3) The mean value for PREPEST=76.33 and the mean value for POSTTEST=84.30.
4) Standard deviation for PRETEST = 3.48 and standard deviation value for POSTTEST = 2.90.
5) From the paired table the test sample above can be analyzed if: -t count ≤t table ≤t count then Ho is accepted. And vice versa if: compute ≥ t table ≥ count then Ad is accepted.
6) Based on the table above, it is known that the research test value is 21,393. At the 5% and d.b 36 significance levels, it is known that the value of ttable ¬ is 2.077. It can be inferred from these results that the value of ttest (21.393) ≥ table (2.077), so that the alternative hypothesis (Ha) is accept and the null hypothesis (Ho) is rejected.

**C. DISCUSSION**

Based on the statistical engineering results of the application of the t-test formula, it is known that the computed value (21.393) ≥ t table (2.077) is at 5% significance and d.b. It's 26. This can be concluded that the null hypothesis (Ho) is rejected, while the alternative hypothesis (Ha) is accepted, and the null hypothesis (Ho) is rejected. which means that there is an increase in student learning after being given a reciprocal teaching model for student learning on linear program materials in math subjects in class XI of SMA Negeri 04 Sungai Raya.

It can thus be concluded that the reciprocity teaching learning model in this study had a significant influence on the learning outcomes of students on linear programming materials in mathematics subjects in class XI of State High School 04 Sungai Raya. Since the study's model of reciprocity teaching on materials in linear programming in mathematics subjects in class XI of State High School 04 Sungai Raya had a significant influence on the study of linear programming materials in mathematics subjects in class XI of State High School 04 Sungai Raya, then it is recommended to the teacher to give the learning program to all students to improve student learning outcomes in other subjects. Not only that, based on the above research results, the reciprocity teaching model can lead to learning that evokes a learning atmosphere in the classroom, so it is hoped that teachers can also apply other learning methods.

## CONCLUSION

Based on the results of the research data processing, it can be generally concluded that the reciprocity teaching model for students' learning on linear program materials in math subjects in class XI of SMA Negeri 04 Sungai Raya has a positive impact on students' learning outcomes. As a research focus to be in line with the predetermined research sub-sub-problem formulation, the results of the research sub-sub-problem formulation are as follows:

1. The student's learning results were given a reciprocal teaching model with an average score of 76.33 of the highest score of 82.00 and the lowest score of 68.00.
2. Student learning results after being given a reciprocity teaching model with an average score of 84.30 highest score of 90.00 and lowest score of 78.00.
3. There was an increase in student learning after being given a reciprocal teaching model for student learning on linear program materials in math subjects in class XI of SMA Negeri 04 Sungai Raya.

Based on the conclusions and implications of the research results described above, researchers can submit several suggestions to:

1. Learning with a reciprocity teaching model deserves to be used by mathematics teachers at SMA Negeri 04 Sungai Raya as an alternative to learning.
2. The results of this study can be used as a reference for similar studies with different materials. This research can be developed by adding other attributes such as learning style, motivation, student mindset, student creativity and so on.
3. For other researchers who want to continue this research, it is recommended to minimize the weaknesses and limitations of the research as much as possible, so that better research results are obtained.
4. Teachers should be able to master several learning models according to the material taught, in order to create a good and enjoyable learning, and good student learning results as well.
5. Students are expected to pay more attention to teacher explanations and listen to explanations, during the teaching and learning process, because math learning is very important for dealing with the world of work in the global market today, which does require a good skill.

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