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# The Effectiveness of Means-Ends Analysis (MEA) Learning Model Application on Improving Mathematical Learning Result of Elementary School Students in Parepare City

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**Abstract**—This research investigates the enhancement of mathematics learning of fifth-grade students of public elementary educational institutions in Parepare city. Means-Ends Analysis (MEA) is used for this study as a learning model. The method used is a quantitative approach with a type of queasy experiment. The research style used by the Nonequivalent pre-test -post-test management team style. Random sampling was conducted by proportional cluster, which was to select one school in each sub-district and randomly taken fifth grade at each school as an experimental group and determine the other fifth quality as a control group. The techniques used for the data collection was in the form of test and documentation. The result revealed that the student learning result before and after use of the Means-Ends Analysis (MEA) had a rise where the common pretest value was 42.50 then improved to the post-test value to 80.33 whereas in the control class is 43.87 to 77.41. The result of the descriptive statistical analysis revealed that mathematics learning in the experimental class had a higher improve as opposed to the control class. The result of hypothesis testing obtained on  $t$  depends on 23.878 while  $t$  desk acquired 2.045 or  $t$  depend  $> t$  desk or  $23.878 > 2.045$ . Lastly,  $H_0$  is rejected, or there are differences in average before and after treatment. This shows that there is a positive influence on the use of MEA learning model on improving the result of mathematics learning in fifth-grade students of public elementary educational institutions in Parepare city.

**Keywords**—means and analysis learning model; mathematics learning result

## I. INTRODUCTION

The result of the 2015 Program for International Student Assessment (PISA) that has been conducted, in every three years stated that the average student achievement score was still low for science, reading, and mathematics, which were rank 62, 61 and 63 of 69 countries evaluated. It needs to make learning enhancements in an effort to boost the accomplishment of Indonesian students, especially in the aspect of Mathematics.

Mathematics is basic science that must be provided to elementary school because it contributes most to all other knowledge. Mathematics is essential, and some of the reasons for learning mathematics in elementary school are as follow; 1) mathematics prepared students to be ready to face the times by exercising by logical, rational, critical,

careful, honest, effective and efficient thinking, 2) It also prepares students to use mathematics and mathematical mindset in everyday life and in learning various sciences [1].

From the objectives, it is expected that the simple mathematics learning process can train their thinking skills. This opinion is the same as Riana [2] that the ability to reason is required by students in knowing a mathematical problem, because in the solution there are steps that are sometimes analytical, and these conditions will certainly impact the learning result of students.

Mathematical learning will not reach its goal maximally if the right learning model does not sustain it. The Means-Ends Analysis learning model (MEA) is a problem-based learning model that has been efficiently used by several scientists such as the research done by Harto et al. [3] with the title; Influence of Means-Ends Analysis (MEA) Studying Models with assisted Group learning background LKS on fourth grade Student mathematics learning result in Bebetin Town.

The summary of the two studies demonstrates that the Means-Ends Analysis (MEA) learning model is significant and can enhance student learning result in mathematics subject. This learning model uses a heuristic approach so that students are required to be able to develop their thinking skills through their discovery or findings.

Newell and Simon first developed the Means-Ends Analysis learning model in 1972 in Artificial Intelligence. The model is to control search effort in computer problem solving and become one of the methods used since 1950 as a creativity tool in design method books. MEA is also a way to explain one's opinion based on mathematical proof [2]. Currently, MEA has started to be adopted in the context of learning. Similarly, MEA becomes one of the design or variation of learning on how to solve a problem in mathematics learning.

According to Sweller [4], MEA is a learning model that maximizes problem-solving activities through a heuristic approach, in the form of series of questions that are instruction or guidelines to help a student solve a problem. Harto et al. [3] described that the Means-Ends Analysis Studying Design (MEA) is a learning model that differs between problem-solving models and syntax. The

presentation of the materials uses a heuristic based on problem-solving, which is fixing a problem into two or more sub-objectives.

Based on some of the views, it can be figured that the Means-Ends Analysis learning model (MEA) is a learning model that desires students to solve problems through a variety of instructed guidelines individually. They will gather these instructions and arrange for them to discover the right solutions.

The steps of the MEA learning model are; 1) Students are categorized heterogeneously, 2) Learning starts with a problem situation, 3) Asking questions that are connectivity to the problem situation, 4) Identifying differences in the submission of problems proposed by students, 5) Arranging problems in a hierarchical manner, 6) Choose a solution from the problem that arises, 7) Presentations in front of the class, 8) Individual quizzes [4].

The objective of the learning result is a change in behavior at the end of learning activities. These are indicated regarding student ratings (achievement scores) and behavioral changes. Huang [5] declares that learning result is abilities that children get after going through learning activities. This aspect of modifying represents cognitive, affective and psychomotor factors.

Based on the understanding of learning result it can be described that these are mathematics changes that happen at the end of the learning activities of mathematics that contains cognitive, affective and psychomotor factors. As well as understanding the ideas or understanding of mathematics.

## II. RESEARCH METHOD

The main purpose of quantitative research is to discover whether or not there is an influence of use of Means-Ends Analysis (MEA) learning model on the improvement of mathematics learning result of fifth-grade students of the public elementary school in the Parepare city.

For this study the research design used was quasi-experiment, and this design was The Non-equivalent pre-test post-test control group. There is an experimental group, and there is also a control class selected as a reference to find out how effective the treatment is done in the experimental class. The form of the research is the pre-test given before treatment and the post-test given after treatment. The aim is to compare whether there is something different or not.

The Parepare city has 80 public schools which are spread across four sub-districts. Sampling was carried out by proportional cluster random sampling, which is choosing one school in each sub-district and randomly taking fifth grade at each school as an experimental group and the other fifth grade as the control group. Finally, at the end of the random sampling, four schools were selected. Data collection techniques used test forms and documentation.

In each experimental class, material learning was carried out in fifth grade, which is determining multiples of the smallest Community (KPK) and the largest Common Factor (FPB) for 3 x 40 minutes using MEA teaching methods. While in each control class is given learning with the same material using conventional teaching methods. Before the learning is done the pre-test and post-test are carried out after learning. The pre-test was conducted a day before

learning, and the post-test was carried out one day after learning.

Data analysis techniques used in this research are descriptive statistical analysis and inferential statistical analysis. The descriptive statistical analysis was used to describe students' mathematics learning result when given treatment in the form of using Means-Ends Analysis (MEA) learning design with illustrative data in the form of distribution tables of mean, median, mode, and standard deviations. Through inferential statistical analysis to test the research hypothesis. Before testing the hypothesis, a prerequisite test is conducted. In the data prerequisite test, normality test and homogeneity test were also carried out, whereas the hypothesis test used the t-test.

To simplify and get the right result, all data analysis is done by using a computer system or software called Statistical Package for Social Science (SPSS) edition 22 which is used for the social sciences and it is also used for various kinds of researchers for complex statistical data analysis. Data are analyzed using the paired sample T-Test analyze system which is used to find out an average difference sample that is the result of the pretest and posttest data.

## III. RESEARCH AND DISCUSSION

The statistical result that will be given is categorized into two parts, namely: Descriptive statistic result, and Inferential statistic result.

### A. Descriptive Statistics

This is described as a Statistical result with regards to the value of student learning result before treatment (pretest) of a student in the experimental class. The class treated in the form of the application of Means-Ends Analysis (MEA) learning model and the value of student learning result after the treatment (posttest) can be seen in the following table:

TABLE I. DESCRIPTION OF THE SCORE PRETEST AND POSTTEST STUDENT LEARNING RESULTS OF THE EXPERIMENTAL CLASS (N = 120) ORGANIZATION).

Statistics	Statistical value	
	Pretest	Post-test
Sample values	120	120
Mean	42.50	80.33
Median	40.00	80.00
Deviation standard	16.17	14.01
Variance	261.63	196.43
Minimum	20.00	50.00
Maximum	80.00	100.00

Based on the table above, the data of the pretest shows that the average value obtained by the number of 120 students is 42.50 with a median value of 40.00. While the standard deviation obtained is 16.17 with a variance of 261.63. The minimum score is 20, and the maximum score is 80. On the score of the learning result analyze (posttest), it can be seen that the average score acquired by the number of 30 students is 80.33 with a regular of 80.00 and a normal distinction of 14.01 and distinction 196.43. The lowest ranking is 50.00, and the highest possible ranking is 100.00.

Statistical result with regards to the value of the original test (pretest) of student in the control class, which is the class that is not given treatment in the form of the implementation of Means-Ends Analysis (MEA) learning model and the value of student learning result after being given treatment (posttest) can be seen in the following table.

TABLE II. DESCRIPTION OF THE SCORE PRETEST AND POSTTEST STUDENT LEARNING RESULTS OF THE CONTROL CLASS (N = 120)

Statistics	Statistical value	
	Pretest	Post-test
Sample values	122	122
Mean	43.87	77.41
Median	40.00	80.00
Deviation standard	15.58	15.48
Variance	242.84	239.78
Minimum	15.00	40.00
Maximum	70.00	100.00

Based on the value of the learning result test (pretest) it can be seen that the common score acquired by the number of student of 31 individuals is 43.87 with a median of 40.00 and a standard deviation of 15.58 with a variance of 242.84. The minimum score is 15.00 and the maximum score is 100.00. While the result of statistics with regards to the final test score (posttest) of a student in the control class, demonstrates that the average value acquired by the number of student on 31 individuals is 77.41 with a median of 80.00 and standard deviation 15.48 and variance of 239.78. The minimum score is 40.00 and the maximum score is 100.00.

**B. Inferential Statistics**

Based on the analysis requirement test, the experimental class pretest and posttest value were normally distributed, as proved by the Shapiro-Wilk test score obtain a pretest significant value of 0.085 > 0.05 and the posttests are 0.065 > 0.05 while for the Kolmogorov-Smirnov test acquired pretest considerable value of 0.107 > 0.05 and the posters are 0.074 > 0.05. And the variance pretest and posttest are declared homogeneous, as proved by the significant value obtain at 0.619 where the data criteria are said to be homogeneous because they are greater than  $\alpha = 0.05$ .

TABLE III. DATA HYPOTHESIS TEST RESULTS

		Paired Samples Test				
		Paired Differences		t	df	Sig (2-tailed)
		Mean	Std. Dev			
Pair 1	Posttest - Pretest	37.83	8.678	23.87	119	.000

Based on the table above, making decisions and illustrating the results of hypothesis testing are done at a significance level of 5% (0.05). The result obtains at the significance obtain value is smaller than 0.05, which is 0.000

< 0.05. Sig. (2-tailed) < 0.05 or 0.000 < 0.05 and this signifies that there is a difference when pretest (before treatment) and posttest outcomes (after treatment) testing other hypothesis see the value of t in the paired sample T-Test table and compare to the distribution value t on t table. The value of t acquired in the table result of paired sample T-Test is 23.878 while the value of t distribution on t table with  $\alpha > 0.05$  test two-party and a sample of 129 individuals are 2.045 so that t counts > t table or 23.878 > 2.045 H0 is refused. This shows that there is a difference in average student learning result before and after treatment. This implies that there is a good impact between the MEA learning model on learning the result of fifth-grade elementary school students in Parepare City.

**IV. CONCLUSIONS AND RECOMMENDATIONS**

From descriptive statistical analysis demonstrates the use of Means-Ends Analysis (MEA) learning model in the experimental class on student learning result which is superior to control class. The result of inferential statistics in the hypothesis test obtains that H0 is rejected. The null hypothesis (H0) which was rejected was concluded that there was an impact of implementation of the Means-Ends Analysis (MEA) learning model on the enhancement of statistical learning result of fifth-grade students of public elementary school 3 in Parepare city. Also, it is expected that the implementation of the Means-Ends Analysis (MEA) learning model can enhance student statistical learning result in data interpretation material.

The recommendations that can be presented are as follows; 1) For instructors or teachers, if they want to apply the Means-Ends Analysis (MEA) learning model to pay more attention to the use of time required so that learning can be more significant, 2) For the school, to consider implementing the Means-Ends Analysis (MEA) learning model as an enhancement in the grade of a student in solving problems in groups, most especially for high class.

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