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Research Article

Means End Analysis (MEA): A Learning Model to Improve Mathematics Cognitive Learning Outcomes in the Post-Pandemic COVID-19

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Abstract.
This research is motivated by the low cognitive learning outcomes of students in solving math problems. Alternative learning to the low cognitive learning outcomes of students is to apply the Means-End Analysis learning model. This model is designed using a quasi-experimental method. This study aims to determine the difference in the average cognitive learning outcomes of class VI students in learning mathematics using the Means-End Analysis model with conventional learning using the Direct Instruction model. The population of this research is all sixth-grade students of SDN 267 Bandung for the academic year 2021/2022. The samples taken were class VI A, and class VI B using a purpose sampling technique. Data collection techniques used are tests and observations. The data analysis technique used an independent t-test with a significance level of 5%. The results obtained that: there is a difference in the average cognitive learning outcomes of students between those taught with the Means End Analysis learning model and conventional learning using the Direct Instruction model. So that the Means-End Analysis model can be used as a learning model that can improve cognitive mathematics learning outcomes in the post-pandemic COVID-19.

Keywords: mathematics cognitive learning outcomes, means end analysis (mea): a learning model, post-pandemic covid-19.

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1. INTRODUCTION

One of the sciences that humans must learn is mathematics, so that the teaching starts from elementary, secondary, to tertiary education. Mathematics is a learning that has an important position, especially in elementary school as an effort to carry out its goals [1]. In general, mathematics learning has a goal, namely to plan how students are able to meet the evolving era with logical, rational, and critical thinking exercises that students can apply these mathematical thinking patterns in everyday life and also in other teaching materials [2]. Mathematics plays a role as a means of solving life problems because

in the educational environment mathematics is a universal science that underlies the development of modern Science and Technology [3].

Every teacher would want their students to have good learning outcomes, but in fact learning outcomes in the cognitive aspect of most mathematics subject matter are still relatively minimal. In 2018 the Program for International Student Assessment (PISA) obtained results in the field of mathematical ability showing that Indonesia was ranked 72 out of 77 countries [4]. The OECD country's average score on math ability is 489 and Indonesia's average score is 379 [5].

The existence of the corona virus pandemic has changed all aspects of life, including the field of education [6]. The Ministry of Education and Culture issues Circular Letter Number 15 of 2020 regarding how to guide the online learning process during the Covid-19 emergency. In the circular guideline, it is explained that the objectives to be carried out in carrying out the Learning From Home Process are to fulfill the rights of students in the form of educational services that continue to run during the emergency response period, protect from adverse effects on the citizens of the education unit, cut off their eyes. the chain of spread and transmission within the education unit and provide full support for the psychosocial impact of teachers, students, and parents, as well as recommend as many as 23 pages that can be accessed by parents and teachers as a source of student learning at home during the COVID-19 emergency [7]. Followed by Press Release Number 137/sipres/A6/VI/2020 regarding the implementation of learning in the academic year and the new academic year during the corona virus pandemic, one of the important points is that face-to-face learning can be carried out in the green zone while still paying attention to health protocols [7]. This makes several regions of Indonesia which are in the green zone category to carry out face-to-face learning activities, one of which is the city of Bandung.

The lack of student learning outcomes, one of which is due to the assumption of most students that mathematics is one of the difficult and difficult subjects, even scary [8]. In addition, one of the other obstacles faced by parents when Learning From Home, due to the lack of readiness of parents in guiding students in learning in an atmosphere of learning at home so that students are less able to understand the material that has been given to students via online [9]. So that the cognitive learning outcomes of most students decreased. The lack of students' cognitive learning outcomes can be found at SDN 267 Bandung. After making observations at SDN 267 Bandung on November 24, 2021 for class VI students, data on student learning outcomes in learning mathematics is still relatively minimal.

The lack of student mastery of the material explained by the teacher causes most students to be unable to solve problems that deceive students. Students can only solve problems that are similar to the examples given by the teacher. When the teacher changes the question that was originally asked to be known, students feel that the question has never been discussed before. So that most students do not reach the KKM school. The data obtained from the results of the sixth grade mathematics daily test, there are 29 students out of 37 students whose scores are still below the KKM. Based on these problems, alternative solutions are needed to deal with the low cognitive learning outcomes of students during Face-to-face Learning. If what is taught is only oriented to procedural and routine problems, an increase in the ability to understand mathematics cannot be achieved. Good knowledge of mathematics and understanding student learning well must be owned by a teacher [10]. Teachers must apply approaches, strategies, and models that make students involved in learning both mentally, physically, and socially so that the development of student abilities and planned learning objectives can be achieved [11].

One way to improve students' cognitive learning outcomes during the post-covid-19 pandemic requires the use of learning models that help students to be more active in learning. The learning model is very effective in improving the quality of student learning because in learning activities students are required to be active and it is expected that students can use higher-order thinking skills and can hone cohesiveness and cooperation between students in a group [12]. This study will use a learning model that requires the active involvement of students in getting a concept, so that students can interact with each other in expressing ideas, ideas, and proposing strategies that will be used from known facts. This will help improve their emotions which are useful for placing these memories into long-term memory.

One of the learning models that demands active involvement of students in learning is the Means End analysis (MEA) learning model. The Means End Analysis (MEA) model is a method that in its implementation designs an overall goal with organized thinking [13]. With the Means End Analysis (MEA) model, students have the possibility to experience the development of critical, systematic, logical and creative thinking patterns [14]. The steps of the Means Ends Analysis (MEA) learning model, namely the teacher explains the material, the teacher explains the results that will be obtained by students, then students can create easier sub-problems from the material provided by the teacher, students organize the sub-problems that mutually sustainable, the teacher gives problem-solving questions to students who will be analyzed (analysis) ways (means) to solve them, students apply the methods that have been analyzed to solve the problem, after

completing a review, evaluation and revision by students who are guided by the teacher [15].

The success of student learning in a lesson depends on how the teacher conveys the subject matter to students. Based on the explanation that has been explained, this research focuses on the effect of using the Means End Analysis (MEA) model in order to improve students' cognitive learning outcomes in learning mathematics.

2. RESEARCH METHOD

This study uses a quantitative approach, which is one type of research that creates several findings that can be used by using several measurement methods or statistical procedures and using objective theory [16]. The research method that the author uses is quasi-experiment [17]. The design used in this research is using the Nonequivalent Pretest-Posttest Control Group Design. This design is a design similar to the pretest-posttest control group design, but in this design the two groups were not chosen randomly [18]. The data were tested using statistical tests, namely normality test, homogeneity test, hypothesis testing, and N-Gain.

The research was conducted at SDN 267 Bandung. The population in this study was class VI at SDN 267 Bandung, totaling 2 classes. The sample is class VIA with 29 students and class VIB with 31 students. Then it will be determined which is the experimental class, namely the class that uses the Means End Analysis model is class VIB and the control class that uses the Direct Instruction model is class VIA. The sampling technique in this study uses purposive sampling, the sample is selected in a planned manner with the provision that the sample to be selected has almost the same academic achievement.

3. result and discussion

This research is an experimental quantitative research by giving treatment to two different samples, namely the experimental class and the control class at class VI SDN 267 Bandung. The Means Ends Analysis learning model was given treatment for the experimental class and the Direct Instruction model was given for the control class. Each class was given a pretest and treatment 4 times and after that was given a posttest which aims to get data on learning outcomes from each sample. The results of the data analysis of the experimental group and the control group are presented in the Table 1.

TABLE 1: Description of the data on the improvement of mathematics learning outcomes in experiment class and control class.

Data Description	Experiment Class	Control Class
N	31	29
Mean	0.26	0.16
Variance Standard Deviation	0.04 0.20	0.02 0.15

Based on Table 1, the data was compiled and analyzed in several stages, namely normality test, homogeneity test, and hypothesis testing. The first step carried out in the normality test for the experimental class and the control class was testing using the SPSS Statistics 25 software for windows, the Shapiro Wilk normality test. The requirements of the Shapiro Wilk normality test are that in making a decision a conclusion has a category, namely if the significance is $< \alpha$ = 0.05 then H_0 is rejected, that is, the data is not normally distributed, and if the significance $\geq \alpha$ = 0.05 then H_0 is accepted, that is, the data is normally distributed. After the experimental class and control class data are calculated, get a significance greater than α = 0.05 so that the two data on increasing mathematics learning outcomes in the experimental class and the control class have a population that is normally distributed.

After getting data that is normally distributed, the next step is to test the homogeneity of the experimental class and control class. The decision-making criteria are determined if the significance $< \alpha$ = 0.05 then H_0 rejected, that is, the data with variance is not homogeneous and if the significance $\geq \alpha$ = 0.05 then H_0 accepted, namely the data with homogeneous variance. After being calculated using Levene's software SPSS Statistics 25 test for windows, the significnce is 0.13. This value is greater than the significance of α = 0.05. Because the significance $\geq \alpha$ = 0.05 then H_0 accepted. Thus, the results of Levene's test software SPSS Statistics 25 for windows give the conclusion that the two classes have homogeneous variance.

The hypothesis was tested with H_0 that there is no difference in the increase in cognitive learning outcomes of mathematics learning between students who follow the Means End analysis (MEA) learning model and students who follow the Direct Instruction model. According to the results of the normality test and the homogeneity of variance, the experimental group data and the control group data were normally distributed and homogeneous. According to the previous explanation, the statistical test is the independent t-test. The criterion of the hypothesis is that H_0 is rejected if t_hitung $\geq$ dari t_tabel and in the opposite situation, then H_0 is accepted. At a significant level of 5% with dk = n1+n2-2 [12].

Table 2: Analysis of independent t-test test data for increasing cognitive learning outcomes of mathematics in experiment class and control class.

No	Sample	Mean	Df	N	t_{hitung}	t_{tabel}	Conclusion
1	Experiment Class	0.274	58	31	2.317	2.000	H_0 rejected
2	Control Class	0.167		29			

Based on Table 2, the results of the analysis using the independent t-test can be obtained t_hitung = 2.317, with dk = 31+29-2 = 58 at a significant level of 5% obtained t_tabel = 2.000. Because t_hitung ≥ from t_tabel (2.317 > 2.000) it can be concluded that there are differences in the increase in cognitive mathematics learning outcomes between students who follow the Means End Analysis learning model and the Direct Instruction model. In other words, learning mathematics using the Means End Analysis model on data processing materials is better than learning mathematics on data processing materials using the Direct Instruction model.

Very many problems were found when the observations were made, but the only focus of this research was the main problem in students' cognitive learning outcomes that were closely related to the process of solving a problem contained in essay questions when the questions were not like the examples given by the teacher. After the research was carried out, it was obtained a research result that the cognitive learning outcomes in the classes applied by the Means Ends Analysis model were different from the learning outcomes in the classes applied by the Direct Instruction model. This is proven based on data analysis, in the experimental class the mean value of increasing students' cognitive mathematics learning outcomes is 0.668. Meanwhile, the mean value of increasing cognitive mathematics learning outcomes in the control class is 0.167. If the two gains are compared, the mean value of the experimental group is more maximal.

Based on the results of the analysis, it was found that the Means Ends Analysis learning model had a positive effect on the mathematics learning outcomes of elementary students' data processing materials in Face-to-face Learning. This is because the application of the Means Ends Analysis learning model which is carried out in the experimental group makes students more focused in the learning process, because in the delivery of material it is always associated with problems that exist in students' daily lives. If students are able to relate a subject matter to the understanding they already have or to their daily life, then learning has been running meaningfully [19].

So that students are easier to imagine and understand these problems and of course learning becomes more meaningful for students themselves, and also when given a

problem students can work together with friends and find ways to solve problems easily. Thus the treatment in the form of the applied model, can be said to have a very good or positive impact for teachers and students because both parties benefit from each other, especially for students. Students play a direct role in finding information and constructing their own understanding because in solving these problems students alone or with their groups solve problems. This way of learning can require students to be more active in learning even though in learning they have to keep their distance. Meanwhile, the task of the teacher becomes easier in supervising or monitoring the development of student knowledge because in the implementation of this model it dominates active student learning (student center) while the teacher only becomes a facilitator. The Means Ends Analysis model can make students more familiar with story problems and students can also collaborate with other students [20].

Based on several studies on the Means End Analysis model, it was found that by using the Means End Analysis model, learning was more meaningful. Because the steps that must be taken are to work together as a group to solve the problems given by the teacher, so that students are active and skilled in solving problems, and the teacher only guides students when experiencing difficulties. In addition, students come forward to explain again how to solve the problem. After finishing presenting, students conclude the learning that has been completed with the teacher. The syntax of the Means End Analysis model is to identify the difference between the current state and the goal (goal state), develop subgoals to reduce these differences, and choose the right operator and apply it correctly so that the subgoals that have been set arranged can be achieved [21]. While the steps in the Means End Analysis model are to explain the learning objectives that will be studied today, increase students' enthusiasm to be active in learning by providing motivation, teachers provide assistance to students to find definitions and organize learning tasks related to problems [22]. In this case, students are grouped into 5 or 6 groups heterogeneously, then each group is given a task or problem solving problem, students are guided by the teacher in the implementation of their learning, such as identifying problems, simplifying problems, hypotheses, collecting data, proving hypotheses, and drawing conclusions, then the teacher helps students to reflect or evaluate their investigations and the processes they use, and finally, students are guided by the teacher to conclude the material that has been studied.

This study obtained the results that mathematics learning with the main discussion of data processing about the mode, median, and mean of single data in class VI which was applied by the Means End Analysis model had an effect on increasing students' cognitive learning outcomes compared to learning mathematics with the main discussion of

data processing about mode, median, and mean of a single data that applies the Direct Instruction model during Face-to-face Learning. Even though they keep their distance, students are more enthusiastic and enthusiastic when working on the Student Worksheet which is distributed to each group in the class that applies the Means End Analysis model. Pursuant to mundilarto he test is very appropriate to measure the ability to think high-order students [23]. In addition, after being given posttest questions, there is one student who is able to work on difficult questions in his own way, as shown in the Figure 1.

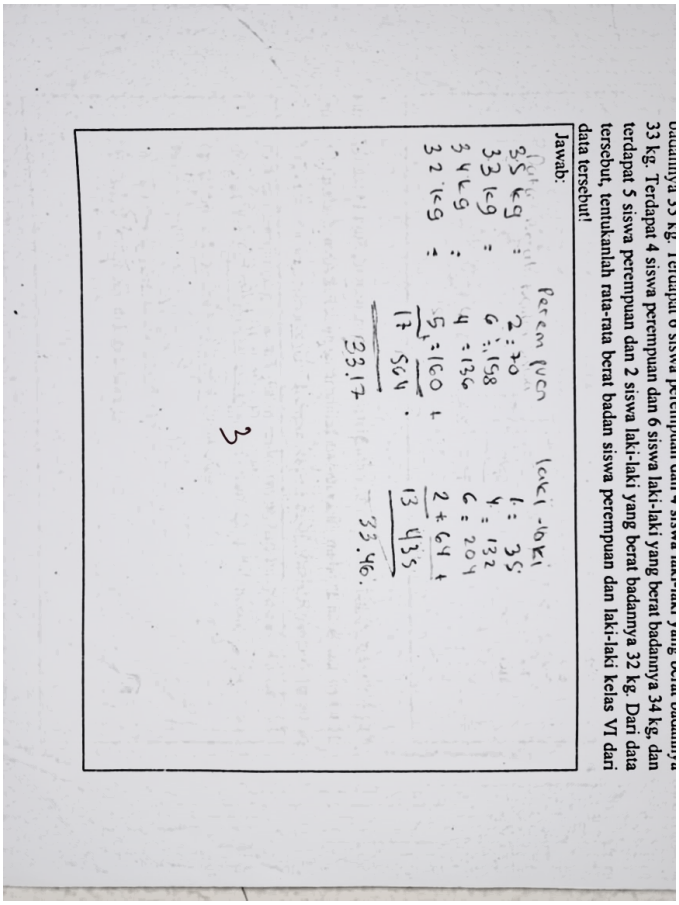

Figure 1: Student 1's answer to question number four posttest questions for experiment class.

Based on Figure 1 above, there are results from the answers of students who completed question number four in their own way. The student writes his weight on the left side, then completes the data for women and men next to the weight data. However, in the results, students did not conclude the answers from the results that students had calculated. While classes that apply the Direct Instruction model, students only focus on listening to the teacher explain and try examples of questions given by the teacher independently without any interaction with other students, so that learning feels monotonous and students are less enthusiastic in working on Student Worksheets. So

that when students are given posttest questions, there is one student who is less precise in answering easy questions like the following Figure 2:

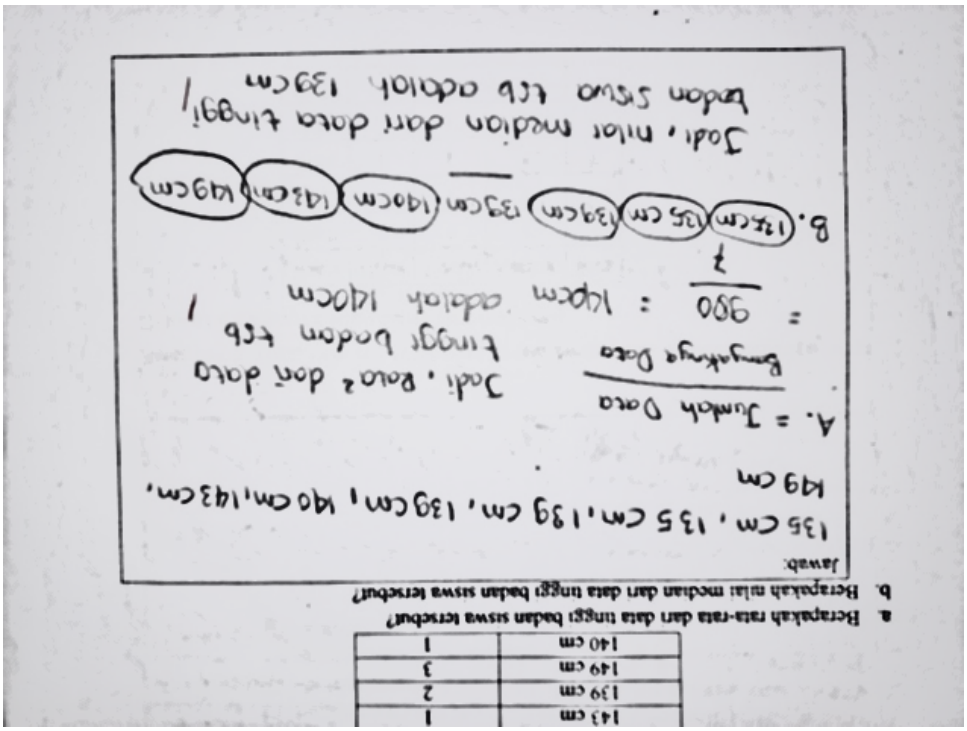

Figure 2: Student answer 1 on question number one posttest control class.

Based on Figure 2, there are results from student answers who completed question number one with the correct formula, but students were less careful in calculating the amount of data and the amount of data so that the final answer was not quite right. Likewise in part b, students understand what to do, but students are less careful in compiling data from the smallest to the largest data so that the final answer is less precise.

The results of this study are strengthened by previous research which suggests that students' mathematics learning outcomes using the Means End Analysis model and those using the conventional model have a significant average difference [24]. So that the application of the Means-Ends Analysis (MEA) learning model has a good effect on students' mathematics learning outcomes compared to conventional models. It was found that students with learning using the Means End Analysis model applied group learning settings to make students more responsible for their respective groups [24]. In addition, students get material by looking for the concepts of the material themselves, dare to express ideas and explain them to friends, and also students can solve problems related to the concepts being studied, so that learning is remembered by students. In line with this study, the other research concluded that students' mathematics learning

outcomes using the Means End Analysis model with classes treated with conventional learning had significant average differences [25]. So that the application of the Means Ends Analysis model has an effect on improving mathematics learning outcomes for fifth grade elementary school students. In his research, it was found that students can fully participate directly in learning, besides that in the learning process the teacher explains by connecting with problems that exist in everyday life. So that students can spell problem-solving questions, students are more active in conveying their ideas, and students gain experience from the results of discussions with their friends.

Based on this explanation, the conclusion is that meaningful learning is obtained through a learning process that applies the Means End Analysis model. Because in learning students are more active and learning is more meaningful for students so that the material that has been studied will continue to be remembered. So that there is a difference in the average cognitive learning outcomes of students who receive learning with the Means End Analysis model with students who use the Direct Instruction model.

4. CONCLUSION

There is a difference in the improvement of students' cognitive learning outcomes between those using the Means End Analysis model and the cognitive learning outcomes of students using the Direct Instruction model during Face-to-Face Learning. This is because students who follow the Means End Analysis learning model prioritize the creation of meaningful learning and students' understanding of the knowledge gained. It is different with students who use the Direct Instruction model, because the knowledge gained only from hearing the teacher explain is not the result of self-discovery so that students will forget the knowledge gained more quickly. there is an effect of using the MEA model in order to improve students' abilities even though the increase is on a low criterion.

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