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THE EFFECT OF INTERACTION BETWEEN LEARNING MODELS AND CRITICAL THINKING ON STUDENTS' MATHEMATICAL COMMUNICATION ABILITY IN ELEMENTARY SCHOOL

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Abstract. The purpose of this study is to determine whether there is an interaction between learning models and critical thinking in the mathematical communication skills of elementary school students. This type of research is experimental quantitative research. This research was conducted in two schools, namely SD Islam At Taubah and SD Islam At Taqwa in East Jakarta. The sample of this study consisted of 60 students with 2 classes, namely the control class and the experimental class. The results of the analysis of the mathematical communication ability test show that the data is normally distributed and has a homogeneous variance. This study used two-way ANOVA analysis. From the ANOVA calculation, there is an interaction between the learning model and critical thinking in students' mathematical communication skills.
Keywords. Interaction; Learning Model; Critical Thinking, Mathematics Communication

A. INTRODUCTION

Mathematics is one of the subjects in school that gets the largest portion of attention from educators, parents, and students. Mathematics is currently one of the keys to shaping how individuals deal with various things in everyday life. The fact that is happening today, students have difficulty with mathematics, and often mathematics becomes an obstacle in learning. Students have difficulty, especially in terms of converting mathematical ideas into pictures, tables, and diagrams. Mulyadi et al analyzed the difficulties of students in learning mathematics because students had difficulty communicating with words, identifying examples presented, using pictures and symbols to be presented, and difficulties in using principles in solving mathematical problems. The difficulty of students in learning mathematics is caused by a lack of understanding of the material/lesson materials and the interaction between teachers and students that is not good so it has an impact on the low student learning outcomes.

The low learning outcomes of mathematics in Indonesia can be seen from the results of the Program for International Student Assessment (PISA) and Trends In International Mathematics And Science Study (TIMMS) in 2018. The results of the PISA in learning Mathematics show that Indonesia has an average of 379. While the results of TIMSS 2018 show that Indonesia ranks 72 out of 78 participating countries with an average of 489. The results achieved in learning mathematics in Indonesia have not yet achieved maximum results.

In accordance with the vision and purpose of The National Council of Teachers of Mathematics (NCTM) document, namely Principles and Standards for School Mathematics, all students should have the opportunity to learn, appreciate, and apply skills, concepts, and principles. mathematics both inside and outside of school. The NCTM standard as the main standard in learning mathematics is the problem-solving ability, communication ability, connection ability, reasoning ability, and representation ability. The five standards have an important role in the mathematics curriculum. In addition, according to Habsah (2017), mathematical communication is the courage of students in expressing their thoughts or opinions visually, explaining, visually representing, and

giving meaning to their mathematical thoughts and opinions. In line with what was conveyed by Lomibao, Luna & Namoco (2016) said that mathematical communication skills are the ability to express ideas, describe, and discuss mathematical concepts coherently and clearly.

Regarding the expectations needed in learning mathematics, Sumarmo (2012) suggests that mathematical communication skills include the ability to: express a situation in mathematical language, symbols, ideas, and mathematical models; explain and read meaningfully, state, understand, interpret, and evaluate a mathematical idea and mathematical presentation orally, in writing, or visually; listening, discussing, and writing about mathematics; and state the argument in their own language. In line with what was conveyed by Wahyudin (2008: 527) who stated that communication is an essential part of mathematics and mathematics education. The low ability of mathematical communication is reinforced by research conducted by Windha Hermawati in 2015 learning mathematics in one of the class X Vocational High Schools totaling 31 students. The problems found can be seen from the ability of students who respond to questions from the teacher, only 5 students who respond (16.13%)), 3 students who dared to convey their thoughts (9.68%), 6 students who could collaborate with groups were 19.35%), and only 4 students who dared. Problem-solving planning, stating the problem, and compiling steps to solve the problem is part of mathematical communication, and in the process, if the information obtained is still lacking, it requires another ability, namely critical thinking

Based on the statement above, the question arises, what model is used to overcome the problem of the mathematics learning process so that it is as expected One answer that can be put forward is of course a reform in learning mathematics. The reform is seen from the model or approach that can be done in learning mathematics. From the results of observations and interviews with researchers in schools, it was found that students' mathematical communication was still weak. This can be seen when students are given a math problem, but students look confused to solve the problem. Students are still less confident in expressing their mathematical ideas. In addition to mathematical communication factors, other factors are also influenced by learning models that still use conventional learning. Therefore, an appropriate learning model is needed to improve students' mathematical communication. In accordance with what Ansari (2012) stated that to develop mathematical communication skills, a strategy or learning model is needed that requires students to think, discuss, and write answers to the problems posed by the teacher.

In addition to mathematical learning and communication models, the assumption that students' critical thinking is distinguished into high and low groups also has an influence on the mathematical abilities of elementary school students. Based on the National Education Standards Agency (BSNP) in 2006 it is recommended that in learning it is necessary to create an active, critical, analytical and creative atmosphere in problem-solving. Mathematics learning actually fosters critical thinking skills and communicates it as an important aspect of learners' life skills. Not only good at counting but what is more important is how students understand what is being counted. Mathematics learning has very complex characteristics, so critical thinking is needed to conduct analysis in communicating mathematics lessons. Sudiarta (2008) revealed that critical thinking skills involve the ability to make reasonable reasons in complex situations. Ennis also revealed that critical thinking includes five activities, namely giving simple explanations, building basic skills, drawing conclusions, providing further explanations, and making strategies and techniques. In addition, according to Presseisen (in Rochaminah, 2008) gives an understanding of thinking as a mental activity in an effort to acquire knowledge.

Based on this, it is suspected that a generative learning model will help students to think critically and communicate learning more easily. This is based on the idea that the steps contained in the generative learning model can make students learn to be active and construct their knowledge. In addition, through generative learning can create a climate where students are free to think and convey ideas so that learning is more active and meaningful.

B. METHODS

This research is a type of experimental research using a treatment by level 2x2 research design. In this study, there were two sample groups, namely the experimental group to see the effect of the generative learning model on mathematical communication skills and the control group using

the conventional learning model. In this study, the target population was all private SDIT students accredited A in Pulo Gadung sub-district, East Jakarta, namely At-Taqwa Islamic Elementary School, Al Amanah Elementary School, At-Taubah Islamic Elementary School and As Saadah SDIT with a total of 747 children. In this study, the sampling technique was carried out using a probability sampling technique, which is more precisely simple random sampling. The instrument used in this research is in the form of test questions to measure mathematical communication variables. The instrument to be tested is first tested for validity and reliability to ensure that the data obtained are in actual, fixed, and reliable conditions.

C. RESULT & DISCUSSION

Based on the results of the ANOVA calculation, it can be seen that the value of the results of the second hypothesis testing presented in the ANOVA table in the AxB interaction line shows that H0 is rejected based on the value that Fount (AB) = 6.91 > Ftable = 3.97. Thus, it can be concluded that there is a significant interaction effect. significant learning model and critical thinking on mathematical communication. Based on the research data, the average score of mathematical communication skills between groups of students who have high critical thinking skills who are given a generative learning model is 13 and a group of students who have low critical thinking skills who are given a generative learning model is 10. Summary of calculation results data via ANAVA 2 x 2 can be seen in the following figure:

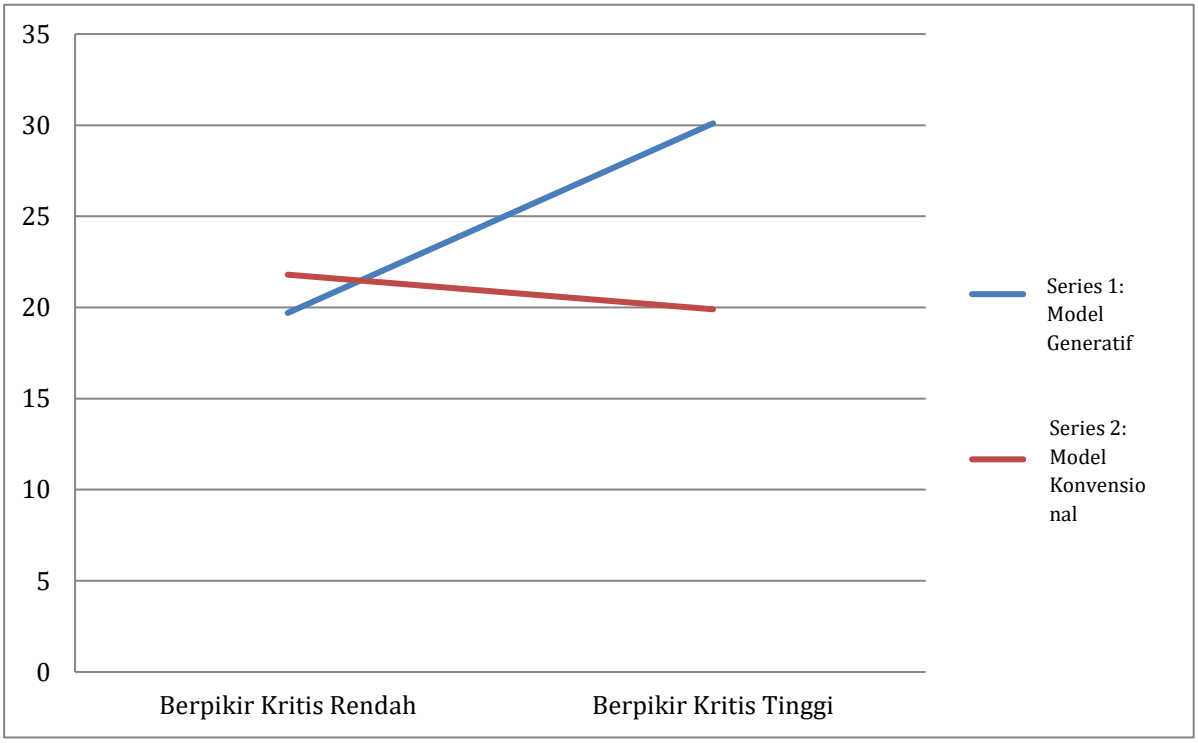

Figure 1. Graph of Interaction of Learning and Critical Thinking Models on Mathematical Communication Ability.

Based on the graph above, it can be seen that there is an interaction between learning models and critical thinking in mathematical communication skills. In addition, from the graph above, the average score of students' mathematical communication skills obtained from each group shows that students who use the generative learning model are higher than those who use the expository

learning model. In the group of students who use the generative learning model and have the high critical thinking, their mathematical communication skills tend to be higher. Meanwhile, in the group of students who use the same learning model but have the low critical thinking, their mathematical communication skills tend to be low. Previous research conducted by Eva M.Amin (2018) stated that there was an interaction between the learning model and the initial ability of students' mathematical communication.

D. CONCLUSION

Based on the results of hypothesis testing, this study proves that the overall score of students' mathematical communication skills who learn to use the generative learning model is better than students who learn to use the expository learning model. This can be explained that the generative learning model is a learning activity that is able to invite students to be more active in expressing ideas and be able to work well together. So the role of students is very dominant in the learning process. While the expository learning model prioritizes the learning process where the student's task is only to receive learning from the teacher. So it can be concluded that to improve students' mathematical communication skills, it is more appropriate to use a generative learning model.

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