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THE EFFECT OF LEARNING APPROACH AND THINKING ABILITY ON MATHEMATIC LEARNING OUTCOMES OF GRADE 5 AT SD NEGERI KOTA BINJAI

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Abstract

The purpose of this research was to determine : (1) the Mathematical learning outcomes of primary students taught by Realistic Mathematics Approach and Scientific Approach; (2) the differences between the learning outcomes of students who have high abstract thinking ability and students with low abstract thinking ability; (3) the interaction between learning approach and abstract thinking ability on students' Mathematical learning outcomes. The population of this research was all grade 5 of SD Negeri 028289 and SD Negeri 025282 Kota Binjai. There are 4 classes of grade 5, with the total number of students being 98. Cluster Random Sampling was used to find the total sample, and this research sample consisted of 48 students. The Measurement of Mathematics learning outcomes instrument was an objective test with four possible answers, consisting of 26 items that have been tested the validity and reliability. To obtain data on students' creative thinking ability was done by using a questionnaire tested for validity and reliability. Point Biserial Correlation Formula was used to analyze the Mathematical learning outcome, and Product Moment Formula was used to analyze the abstract thinking ability. The research method was Quasi experiment with 2 x 2 factorial design. The technique of data analysis using ANOVA two ways at the significance level = 0.05. Before the data is analyzed using ANOVA, tdata distribution data should be normal and homogeneous. The Lilifors Provision

measures the Normality of data, and the homogeneity of data was measured based on the Fisher and Barlett Test. Based on the results, the researcher obtained that: (1) the Mathematics learning outcomes of students taught by Realistic Mathematics Approach were higher than the mathematics learning outcomes of students taught by Scientific Approach with Fcount = 8.56 > Ftable = 4.06; (2) the Mathematics learning outcomes of students with high abstract thinking ability were higher than students with low abstract thinking ability with Fcount = 20.4 > Ftable = 4.06 ; (3) there is an interaction between learning approach and creative thinking ability on students' Mathematical learning outcomes with Fcount = 7.58 > Ftable = 4.06. From the data analysis, it can be concluded that using the Realistic Mathematics Approach in learning Mathematics is more effective for students with high abstract thinking ability. This is also a good opportunity for students with low abstract thinking ability to increase their ability. The implication of this research is to appoint Mathematical teachers to apply the Realistic Mathematics Approach in teaching Mathematics and recognize students' characteristics like abstract thinking ability.

Keywords: *realistic, scientific, abstract, learning outcomes*

A. Introduction

In 2013, the government, through the Ministry of Education and Culture (Kemendikbud), began to design and want to implement a new curriculum as a substitute for the 2006 curriculum (KTSP) called the 2013 Curriculum, which emphasizes that every student is not only brilliant, but this curriculum emphasizes In addition to having high intellectuality, students must also have good morals and character.

To achieve the success of the objectives of the 2013 curriculum, the role of a teacher is urgently needed because learning development is a series of activities in designing learning that teachers must develop as a form of accountability for their professional activities to the community, peers, and students.

As an important component of education personnel, teachers

have the task of realizing educational goals through the learning process. Teachers also play a significant role in the nation's intellectual life. According to Shah (2010: 1), "To carry out their profession, educators, especially teachers, really need a variety of adequate teacher knowledge and skills following the demands of the times and advances in science and technology."

From the above opinion, there is an emphasis that a teacher must have scientific skills and has skills in classroom management and learning. Classroom management and learning are related to teachers' approaches, models, strategies, and methods in learning. It is not uncommon for teachers to lack mastery of the approaches, models, strategies, and learning methods they use to make learning monotonous/boring. This can happen for all subjects in each education unit. One of them is Mathematics.

Mathematics is one of the most critical subjects in life so that from basic education units to higher education, mathematics education subjects are always there. Even the time given for learning mathematics in each academic unit is relatively more.

At the elementary school level, the time duration for mathematics subjects is divided into two groups, namely: the first group, 3 hours of mathematics in grades I – III SD/week, and the second group, 5 classes of mathematics in grades IV – V. hours/week. This shows that mathematics gets attention in the primary school education curriculum.

Several aspects are taught in elementary school level mathematics education, including numbers, geometry, and measurement. The scope of numbers includes numbers, figures, data interpretation, calculations, and estimates. The scope of geometry includes two-dimensional, three-dimensional, location, and arrangement related to coordinates. The scope

of measurement relates to comparing the quantity of an object, the use of units of measure and measurement.

Meanwhile, the specific objectives of teaching mathematics in elementary schools are to grow and develop numeracy skills as a tool in everyday life. Second, foster student abilities that can be transferred through mathematical activities. Third, developing a basic knowledge of mathematics as a provision for further learning in junior high school, and fourth, forming a logical, critical, careful, creative, and disciplined attitude. This is in line with the objectives of learning mathematics at the primary and secondary education levels, namely to prepare students to be able to face changing circumstances in life and an ever-evolving world through training in acting based on logical, rational, critical, careful, honest, efficient and practical thinking. (Puskur, 2002)

Based on the things above, it can be concluded that mathematics is so important for life and should be an exciting lesson for students. However, many students have difficulty with mathematics, including at the elementary school level.

One of the most influential factors on the difficulties faced when learning mathematics is the teacher. Ass a critical component of education personnel, teachers have the task of realizing educational goals through the learning process. Teachers also play a critical role in the nation's intellectual life.

Teachers must be able to carry out their duties as educators following the demands of the times. The teacher's learning process must be able to explore the interest in learning and the creative power of students. This interest and creative power must be nurtured from the start. To achieve this, we need a learning process carried out in schools.

Learning activities in schools are the main activity in the

educational process, which aims to bring students or students to a better state. The success of a learning process is from students' achievement in participating in learning activities. The success in question can be observed from two sides, namely from the level of understanding and mastery of the material provided by the teacher (Sudjana, 2001). However, in reality, teachers are less successful in optimizing learning activities, including learning mathematics. This can be influenced by the teacher's lack of understanding about approaches, models, strategies, methods, and learning techniques.

So far, the learning approach used is more of a traditional approach that teaches numbers without understanding numbers. Learning activities begin with the introduction of numbers and mathematical formulas. Furthermore, there is a learning process about arithmetic operations of addition, subtraction, multiplication, and division based on the principles of fractions. The teacher writes down examples and explains them. After it is considered that students have understood, the teacher writes several questions and explains them. After that, the teacher walks around the class looking at students' work and helps the process of working on students who need more attention. The same thing happened to students. They see, listen, remember, write and process arithmetic operations from numbers. This means that there is a process of learning numbers here.

The important thing is not to understand the numbers. However, it should be realized that numbers represent most of the substance of mathematics teaching material. However, it is not numbers that are the goal of learning mathematics. Instead, it teaches the substance of the teaching material, namely the understanding of numbers.

Based on the preliminary studies that researchers have carried out at SD Negeri 028289 and SD Negeri 025282 Binjai Utara, Binjai City, it shows that student learning outcomes in Mathematics subjects, especially data interpretation materials for class V SD, are still far from expected.

Table 1. Recapitulation of UAS Results for Class V . Students SD Negeri, North Binjai District, Binjai City

No	School year	Score Lowest	Score Highest	Percentage Completeness
1	2015/2016	33.7	81.3	50.25%
2	2016/2017	30.2	80.2	50,40 %
3	2017/2018	38.3	82.5	50.56%

Based on Table 1 above, it can be seen that mathematics learning outcomes are still relatively low. This, of course, requires significant improvement and attention from the school. Based on the researcher's observations, several factors influence the low learning outcomes of mathematics, including the learning approach used by the teacher and the thinking ability of students. These two things are interrelated and influence each other, so they must be given attention.

The approach is our starting point or point of view on the learning process. This approach is still general; the strategies and methods used can be sourced or dependent on a particular approach.

The learning approach is the path that teachers and students will take in achieving learning objectives. The learning approach is also the teacher's activity in choosing learning activities, whether the teacher will explain a learning material that has been arranged in a particular order, or by using material that is related to one another in different levels of depth, or even is material that is integrated into a single unit. Multi-disciplinary.

The learning approach can be interpreted as our starting point or point of view on the learning process, which refers to the view of the occurrence of a process that is still very general, in which it accommodates, inspires, strengthens, and underlies learning methods with a specific theoretical scope. Mission and Nurdyansyah (2015: 37) revealed that the learning approach could be interpreted as a collection of methods and methods used by educators in carrying out learning.

Judging from the approach, there are two types of learning approaches, namely: a student-centered approach to learning (student-centered approach) and a teacher-centered learning approach (teacher-centered approach). When viewed from the variety, learning has many approaches such as constructivism approach, contextual approach, realistic mathematical approach, and scientific approach. Of the many kinds of approaches, nowadays, the mathematics learning approach often used is the realistic mathematics learning approach and the scientific learning approach.

The realistic Mathematics Learning Approach (PMR) is a mathematics learning approach that emphasizes mathematical problems in real life. The PMR approach was developed in 1971 by mathematicians from the Freudenthal Institute, Utrecht University in the Netherlands. This PMR approach emphasizes the process of mathematizing the real world rather than the results, so that this PMR approach is also called mathematization.

For Freudenthal, mathematics is a form of human activity that is the basis for PMR development. Many people think that PMR is an approach to learning mathematics that must always use everyday problems, but actually, it refers more to using imaginable situations by

students. In other words, in PMR, students must have the ability to think abstractly.

In addition to PMR, learning with a scientific approach, also known as a science-based approach, is also a mainstay in today's mathematics learning. The latest curriculum development (Curriculum Year 2013 revision) emphasizes the use of learning with a Scientific approach in every subject. Musfiqon and Nurdyansyah (2015: 37) reveal that a scientific learning approach is an approach that uses scientific steps and rules in the learning process. The scientific steps applied include finding problems, formulating problems, proposing hypotheses, collecting data, analyzing data, and drawing conclusions.

Musfiqon and Nurdyansyah (2015: 38) quote Sudarwan who revealed that the scientific approach is intended to provide understanding for students to know, understand, and practice what is being studied scientifically. Fathurrohman (2015: 109) revealed that applying this scientific approach is expected to be used as a golden footbridge for the development and development of students' attitudes, skills, and knowledge.

In addition to the learning approach, the thinking ability of students also influences learning outcomes. Each student certainly can think differently. One ability related to learning mathematics is the ability to think abstractly because there are many abstract things learned in learning mathematics.

The ability to think abstractly is the ability to think at a higher level when compared to the ability to think concretely because the ability to think abstractly cannot be separated from knowledge of concepts that require the ability to imagine or describe objects or events that are not always physically present.

This abstract thinking ability consists of word skills (verbal), numerical ability (numeric), imageability (abstract reasoning), clerical speed and accuracy (to measure the speed of giving answers or responses), mechanical reasoning, spatial relations, language use (spelling).) and the use of language (grammar) (Sukardi, 2009: 113). This abstract thinking ability can help students understand and explore mathematical problems better.

Based on the description above, the writer wants to examine the effect of learning approaches and thinking skills on mathematics learning outcomes at SD Negeri Binjai City. Learning approach as an independent variable, thinking ability as a moderator variable and learning outcome as a dependent variable.

B. Method

This research is classified as quasi-experimental research. This study involved two sample groups, each assigned as a treatment group. Group, I am applied first by usingapproachPMR is then continued by using learning with a scientific approach, while group II is applied first by using learning with a scientific approach, then continue by usingapproachPMR.

The end of this experiment is expected to get information about the differences in students' mathematics learning outcomes who were first taught using approach PMR, which is compared with the mathematics learning outcomes of students who were previously taught using approach Scientific with each group consisting of a group that has high abstract thinking ability and students who have low abstract thinking ability.

The design or research design that will be used is a 2 x 2 factorial design, ign will be compared the influence between PMR approach and

Scientific approach on mathematics learning outcomes in terms of high abstract thinking ability and low abstract thinking ability. The data table of this research is shown in Table 3.3 below:

Table 2. 2 x 2 . Factorial Research Design

Thinking Ability (B)	**Learning Approach (A)**	
	PMR (A1)	**Scientific (A2)**
High Abstract (B1)	A1 B1	A2 B1
Low Abstract (B2)	A1 B2	A2 B2

Information :

A1 B1 : The group of students treated with PMR approach (realistic) and students who have high abstract thinking skills.

A2 B1 : The group of students treated with a scientific approach and students with high abstract thinking skills.

A1 B2 : The group of students treated with PMR approach (realistic) and students who have low abstract thinking skills.

A2 B2 : The group of students treated with a scientific approach and students with low abstract thinking skills.

C. Finding and Discussion

1. Differences in Mathematics learning outcomes between students who are taught with the PMR Approach and students who are taught with the Scientific Approach

From the results of data processing what has been done, it can be concluded that there are differences in the learning outcomes of students who are taught using the PMR approach and the learning outcomes of students who are taught using the scientific approach. This finding proves that the use of the PMR Approach is better in improving students' mathematics learning outcomes than the Scientific Approach.

Mathematics learning becomes fun if the teacher involves students actively using the natural world as a starting point for developing mathematical ideas and concepts. The realistic Mathematics Learning Approach is a learning approach that places problems in everyday life, making it easier for students to receive material and provide direct experience with their own experiences. Real problems are used to generate formal mathematical concepts or knowledge, where students are invited to think about solving problems and organizing issues. Suryadi (2007: 177 -179) reveals that PMR reflects a view of mathematics as a subject matter, De Lange in Hadi (2007: 37) divides learning Mathematics with the PMR approach into four aspects, namely:

1. Start the lesson by posing real problems (questions) for students according to their experience and level of knowledge so that students are immediately involved in meaningful lessons;
2. The problems given must, of course, be directed following the objectives to be achieved in the lesson;
3. Students develop or create formal symbolic models of the problems/problems posed;
4. Teaching takes place interactively: students explain and give reasons for the answers they give, understand the answers of their friends (other students), agree with their friends' answers, express disagreements, look for other alternative solutions: and reflect on each step taken or on the results of the lesson.

The four aspects above are translated into PMR learning steps. According to PISA (Program for International Student Assessment) in Wijaya (2012: 45) explains the PMR steps, among others: first, starting with real-world problems. Second, identify the mathematical concepts relevant to the problem and then organize the problems according to the

mathematical concepts. Third, gradually leaving the real-world situation through formulating assumptions, generalizations, and formalization. Fourth, solve math problems—moreover, fifth, re-translating mathematical solutions into the real world, including identifying the solution's limitations.

In PMR learning, students should not be viewed as empty bottles filled with water. Students must be seen as human beings who already have knowledge and experience gained through interaction with their environment.

If we compare the mathematics learning outcomes of students taught with the ApproachScientifically with a lower score than the PMR approach, we can conclude that the fifth-grade students of SD Negeri Binjai City, especially SD Negeri 028289 and SD Negeri 025282 are more effective using the PMR approach. The scientific approach can be applied to elementary school students, but only for specific times. Learning with a scientific approach is designed so that students actively construct concepts, laws, or principles through the stages of observing, asking questions, trying/gathering information, reasoning/associating, and communicating. In the learning process, the Scientific approach can be matched with a scientific process that is believed to be the golden footbridge for developing students' attitudes, skills, and knowledge.

The findings in this study are in line with the results of previous research by Purnamasari (2017) in his research entitled: "The Influence of Realistic Mathematics Learning Approaches on Mathematical Problem Solving Ability" conducted at MI Ma'arif NU Darur Abror Kedungjati in class V. mathematical problem-solving in the control class and experimental class, each class totaling 18 students. The experimental class has a higher average value than the control class average of the two

classes.

Research using Mathematics Learning Approach Irmayanti (2013) in his research entitled: "Improving Problem Solving Ability and Mathematical Self Efficacy of Elementary School Students Through Realistic Mathematics Learning Approaches," which was conducted at SD Negeri Pulo Jantan and SD Inpres Aek Kota Batu which consisted of 129 students as samples. Which consisted of 66 students as the experimental class and 63 students as the control class. Based on this research, it was found that there were differences in the improvement of students' mathematical problem-solving abilities with realistic mathematics learning approaches compared to conventional approaches.

2. Differences in mathematics learning outcomes between students with high abstract thinking abilities and students with low abstract thinking abilities.

In research, It was found that students who had high abstract thinking abilities obtained higher mathematics learning outcomes than students who had low abstract thinking abilities. This shows that students who have high abstract thinking skills better understand the accepted Mathematics learning materials, especially certain materials devoted to this research. Following the findings of this study, the average mathematics learning outcomes of students who have high abstract thinking abilities are higher than students who have low abstract thinking abilities influenced by the Realistic Mathematics Learning Approach.

For an educator, it is imperative to understand the characteristics of his students. The characteristics of students are undoubtedly diverse and different from one another because each student is unique. One of the characteristics of students is the ability to think abstractly. The ability

to think is different; that is why we distinguish between high abstract thinking ability and low abstract thinking ability. According to Kartono in Khodijah (2014: 104), abstract thinking ability is one of the thinking patterns of the six existing thinking patterns, namely: concrete thinking ability, abstract thinking ability, classifying thinking ability, analogical thinking ability, scientific thinking ability, and short thinking ability.

Furthermore, according to Kartono, the ability to think abstractly is to think in infinity because it can be enlarged or perfected in breadth. Meanwhile, Suryabrata (1995: 61) classifies the ability to think abstractly to develop a higher level of thinking compared to the ability to think concretely. This is because to think precisely and summarize, and people must learn to think abstractly and schematically. Meanwhile, Irham (2015: 51) defines abstract thinking ability as thinking about things in the form of ideas, verbal, numerical, and mathematical symbols. This is in line with the opinion of Irham (2013: 51), who reveals that the ability to think abstractly cannot be separated from knowledge of concepts because thinking requires the ability to imagine or describe objects or events that are not always physically present.

The quality of learning is an essential factor that teachers must consider. For students with high abstract thinking skills, the quality of learning will be a challenge that spurs them to be active in learning. Meanwhile, for students who have low abstract thinking skills, the quality of learning can be an opportunity to improve their abstract thinking skills.

Based on the findings in this study and the results of further testing with the Scheffe test, it can be concluded that the average mathematics learning outcomes of students who have high abstract thinking abilities are higher than students who have low abstract thinking abilities. The ability to think highly abstractly is seen prominently in the

Realistic Mathematics Learning Approach rather than the Scientific Approach. This can be explained through the learning steps of the Realistic Mathematics Learning Approach. The first step is to understand the contextual problem and ask students to understand the problem. The teacher allows students to ask questions/problems that have not been understood, and the teacher only provides necessary instructions for the parts of the situation and condition of the problem/question that the students have not understood. The characteristics of PMR that appear in this step are the first characteristic, namely using contextual problems as a starting point in learning, and the fourth characteristic, interaction. Students understand contextual problems showing one aspect of abstract thinking skills. The second step is to solve the problem. Students describe contextual problems, interpret the mathematical aspects of the problem in question, and think of problem-solving strategies.

Furthermore, students work to solve problems based on their prior knowledge so that it is possible for students to have different solutions to one another. The PMR characteristic in this step is the second character using the model. The third step, compare the answers. The teacher asks students to form groups in pairs with their classmates, work together to discuss solving problems that have been solved individually (negotiating, comparing, and discussing). After the pair discussion is done, the teacher appoints group representatives to write down each solution idea and the reason for the answer. The teacher as a facilitator directs students to discuss, guiding students to conclude to formulate concepts/principles based on formal mathematics (idealization, abstraction). The characteristic of PMR that emerges is interaction. The fourth step, conclude. From the results of class discussions, the teacher directs students to conclude a formula for a concept/principle from the topic

being studied. The PMR characteristic in this step is the interaction between students and teachers. The ability of students to conclude to formulate concepts/principles based on formal mathematics (idealization, abstraction) is one aspect that can be seen to measure students' abstract thinking abilities.

3. Interaction between Learning Approach and Abstract Thinking Ability on Mathematics Learning Outcomes

Through this research, it has been found that there is an interaction between the Learning Approach and Abstract Thinking Ability on the learning outcomes of Mathematics in the fifth-grade students of SD Negeri Binjai City. The PMR approach has a higher effect on learning outcomes in Mathematics than the Scientific Approach. Students with high abstract thinking skills taught with the PMR approach get higher learning outcomes than students who have low abstract thinking abilities taught with the Scientific Approach. Likewise, students with high abstract thinking skills, taught with the Scientific Approach, get higher learning outcomes than students who have low abstract thinking abilities.

Students with high abstract thinking skills like learning to involve themselves in doing, creating, and arguing actively. The PMR approach provides the most expansive possible space for students to do this. Such a learning environment helps students who can think abstractly to express ideas, questions, accept new ideas from classmates, answer the challenges given by the teacher to be creative in making their own questions, and even accept the challenge of making high-quality questions. Better. This learning approach does not rule out the possibility for students who have low abstract thinking skills to improve their thinking skills.

Research Limitations

This research has been carried out with maximum effort by following scientific research procedures to obtain accurate and valid conclusions. However, there may be limitations in its implementation. The limitations are:

1. The data in the study were obtained using multiple-choice tests and questionnaires to determine learning outcomes and grouping samples of abstract thinking skills. Therefore, it is possible that the answers given by the sample of respondents do not reflect the actual conditions. This is also influenced by the condition of the sample of respondents who do not understand the statement of the questionnaire or the statement/question of the test items when answering the test or questionnaire.
2. Based on the Calculation of the validity of the test items for learning outcomes obtained, as many as 26 items can be classified as valid questions while as many as 19 items are invalid. Of the nineteen items that are not valid, several questions can/fail to represent the achievement of indicators of data interpretation material in mathematics.
3. The limited understanding of the two teachers about these two types of learning approaches affects student learning outcomes.
4. The implementation of learning with two teachers from two schools where the research was held in which the different situations/conditions or the character of the students affected the teacher's style when carrying out learning.

5. The study was only conducted on two treatment classes, and it is better to do it on a larger sample.
6. Limited research time, so that learning outcomes do not cover learning outcomes from other materials, only limited to the specified material.
7. This research is only limited to the PMR Approach and Scientific Approach, even though many other factors affect students' abstract thinking skills, for example, previous student experiences, social conditions, and students' family environment.

D. Conclusion

Based on data processing and discussion of the research results that have been stated in the previous chapter, it can be concluded that:

1. The mathematics learning outcomes of students who were taught using the PMR approach were higher than those of students who were taught using the scientific approach.
2. Mathematics learning outcomes of students who have high-level abstract thinking skills are higher than mathematics learning outcomes of students who have low abstract thinking abilities.
3. There is an interaction between these two learning approaches and the ability to think abstractly on the mathematics learning outcomes of elementary school students in Binjai City. Students with high abstract thinking skills get higher mathematics learning outcomes if they are taught using the PMR approach compared to the scientific approach.

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