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The Effect of Realistic Mathematic Approach on Students' Learning Motivation

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Abstract

This research is to determine the effect of realistic mathematical approach on students' learning motivation. The research method is pre-experiment of one group pretest posttest design. This study was conducted with 34 fifth grade students from a public school in Pekanbaru, Indonesia. The results indicate that students' learning motivation significantly increases. Among six indicators measuring students' learning motivation, the indicator of interesting activities in learning is the most increase, from 80.76% in pre-test to 86.40% in post-test. The average score of pretest in form of students' learning motivation questionnaire before applying treatment was 90.56 while score posttest after treatment was 95,09 and the results of the research hypotheses using the comparative t-test t_{count} (6.997) > t_{table} (2.039). This means that there is an effect of applying the realistic mathematical approach to students' learning motivation.

Keywords: *realistic mathematical approach, students' learning motivation, learning activities*.

1. INTRODUCTION

Mathematics has an important role in the development of science, and it begins to be taught from kindergarten to university levels. Mathematics education aims to educate, train critical thinking and expand insight so that mathematics can be implemented in everyday life. Mathematics is known as an abstract subject that is form of ideas, concepts, symbols, and a system of linkages between elements in a set. Therefore, the teaching needs to be delivered with an appropriate approach so that the learning purposes can be achieved.

Based on Piaget's theory (1976), elementary school students, at the age of 7 - 12 years, are at a concrete operational stage, which psychologically means that the level of cognitive development of students at the elementary school level is still in the stage of concrete understanding. Therefore students have not been able to fully think abstractly.

According to the Minister of National Education of the Republic of Indonesia (Permendiknas, 2007), the implementation of learning must be carried out interactively with a reciprocal relationship between

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teachers and students, inspiring, fun, motivating students to actively participate, and providing space for students to be independent according with interests, talents, physical and psychological development. To achieve those goals, it is necessary to have plans and concrete efforts in the form of innovative learning activities for students. For this reason, the importance of a learning approach is used in the learning process that is in accordance with the standard competencies to be achieved and creates a pleasant learning atmosphere in order to increase students' learning motivations. With those conditions students will have some motivation to learn to achieve their goals because they are confident and aware of the goodness, interests, and benefits that will be obtained for their future. For students, motivation is very important because it can change the students' behaviour so they are able to deal with all demands and difficulties (Hamdu & Agustina, 2011).

Motivation is inner factor serves to generate, underlie, and direct the activity of learning. Students with high motivation will actively try, look persistent, do not want to give up, and actively read to improve their achievement and problem solving. Conversely, students with low motivation seem indifferent and easily discouraged, and they do not focus their attention on the lessons which consequently student will experience learning difficulties (Supardi, 2012).

The lack of students' learning motivation can be seen from the lack of students' activities in learning (Yanti, Erlamsyah, Zikra & Ardi, 2013). The students tend to pay less attention to the material delivered by the teacher, students are sleepy, not even interested in doing the assignments given by the teacher, and lack of enthusiasm in attending mathematics learning because it is considered difficult and uninteresting.

Teachers need to make efforts that can raise and provide motivation for students to actively engage in learning activities. For this reason, learning needs to be supported by the use of the right approach. One approach that has effect to student learning motivation is the use of the realistic mathematical approach (Supardi, 2012) because it provide students the opportunity to be active and creative in constructing their own knowledge and helping teachers to make learning fun by involving realistic problems in learning. This is in accordance with one of the indicators of learning motivation, namely the existence of interesting activities in the learning process (Uno, 2016:19). An interesting activity in study is the use of realistic mathematical approach that links mathematics to real conditions. The learning process becomes meaningful because of the attraction from the activity close to students, then students are capable to abstract thinking. Therefore, we are interested to carry out the research about the effect of realistic mathematical

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approach on students' learning motivation.

2. THEORETICAL FRAMEWORK

Realistic Mathematics Approach

According to Freudenthal (1991), mathematics is a human activity. It means that the learning mathematics should begin from a real life situation, and it is closed to what students could experience. The contextual situations are chosen from phenomena related to the mathematical learning concepts.

Realistic mathematics approach is a theory of learning mathematics by using real-world contexts, meaning giving real life situations that are relevant to everyday life (Freudenthal, 1991; Hadi, 2017). However, abstract mathematics can be real when it becomes meaningful for students. For instance, university students may use numbers, such as integers, to understand mathematical topics such abstract algebra.

Treffers (1991) describes five major principles of realistic mathematics teaching and learning approach. We discuss those principle with the context used in this study, namely geometry.

a. Use of Context

Realistic contexts or problems are used as the starting point for learning mathematics. A context does not have to be a real-world problem but it can be in the form of games, props, or other situations as long as they are meaningful and can be imagined in the minds of students (Putra, Darmawijoyo, Putri, & den Hertog, 2011). Another benefit of using context in the beginning of learning is to increase the motivation and relevance of students in understanding mathematical concepts later (Kaiser in De Lange, 1987 Wijaya, 2012:22).

The context in this study is the situation in which the school will hold a class competition for which each class is asked to decorate using several 2-D shapes, so the students are asked to think what types of 2-D shapes should be.

b. Use of models for Progressive Mathematics

The use of the model serves as a bridge to teach students from concrete to abstract level of mathematical knowledge. Modeling a real phenomenon that students can imagine, mathematically in the sense of looking for mathematics that is relevant to a phenomenon or constructing a mathematical concept of a phenomenon so that the learning process becomes meaningful.

An example of activity related to this tenet is the teacher displays concrete objects, namely monopoly, toy paper money, ruler in an equilateral triangle, boxes, dice and birthday hats, the teacher asks students to mention the shape of the object displayed by the teacher in front their class. From the teacher's question the students mention that the monopoly is square, toy banknotes are rectangular, rulers in the form of equilateral triangles, beam-shaped boxes, cuboid dice and cone shaped birthday hats.

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c. Utilization of Student Construction Results

Students are given the opportunity to develop strategies for solving problems independently so that the strategies are expected to be obtained according to their cognitive level. Students' work and construction is then used for the foundation of developing mathematical concepts.

In this study, all students work in small groups to classify some objects such as flat building and then attaching the object on the paperboard. Group of students categorise several objects based on their shape, volume, and size.

Then the students are asked to describe the objects in each group. After that, they mention which objects are 2D shapes. Using a ruler and an arc, the students are asked to determine the properties of the objects, and the teacher functions as a facilitator to support the students' learning.

d. Interactivity

A person's learning process is not only an individual process but also simultaneously a social process between teacher and students. The learning process of students will be shorter and meaningful when students communicate with each other about the results of their work and ideas. Then the students are given the opportunity to respond to the work of their friends according to their understanding. The use of interactions in mathematics learning is useful in developing cognitive and affective abilities.

At this stage after the entire group has finished solving the contextual problem, each group representative presents his/her work. When a group of students delivers their work, other groups pay attention to the explanation. For students who want to respond to the work of their friends, they are allowed to raise their hands and respond when the teacher gives permission to speak.

e. Interweaving

Realistic mathematics education places an intertwinement between mathematical concepts with something tangible both in the form of problems and objects that can be observed or imagined by students. This must be considered in the learning process. Through this connection, a learning trajectory is expected to introduce and build more than one mathematical concept simultaneously.

As an example from our study, the teacher displays concrete objects, namely origami paper. The object displayed by the teacher is a square; if the origami paper is tilted to the left then each end of the paper is given a diagonal line whether the origami paper held by the teacher is still categorized as square. From a concrete object displayed by the teacher, it can build more than one concept, such as interweaving between a rectangle and a rhombus.

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Learning Motivation

Motivation to learn is internal and external encouragement to student to have behavioral changes (Uno, 2016:23). Uno (2016: 23) classifies learning motivation indicators as follows:

a. A desire to succeed is the motivation existing within students to carry out learning activities because they have the desire to succeed by completing the task to get grades.
b. There is encouragement and need for learning. Students are motivated to work on the tasks because of the urge to avoid failure and have a fear of the impact of such failures such as bullying from friends or even punishing from their parents.
c. Hope and aspiration for the future. Students are motivated to learn because they want to be intelligent students in their classrooms, and they know the benefits they do for their future.
d. Appreciation in learning. Motivation to learn can be increased from verbal statements or awards in other forms of good behavior or good student learning outcomes.
e. Interesting activities in learning process. The students are motivated when a learning process creates an attractive atmosphere, it will be meaningful, such as the media displayed, games and student contributions.
f. Conducive learning environment. The learning environment such as physical conditions and situations in the learning process affect student learning motivation.

We use those indicators to develop the instruments to measure students' learning motivation.

3. METHODS

The type of research used in this study is an experiment with a pre-experiment method which is a dependent variable not solely influenced by independent variables. This is because we conducted a study with one group without the comparison to a control group. We used one group pretest posttest design. The samples were given questionnaires about their learning motivation before and after the learning experiment using the realistic mathematics approach.

The subjects of this study were 34th fifth grade students consisting of 14 male and 20 female students. To determine the experimental class in this study using a sampling technique that is simple random sampling in taking sample members from the population is done randomly regardless of the strata that exist in the population, carried out if members of the population are considered homogeneous. The simple random sampling was carried out by lottery (Sugiyono, 2017: 120).

Research that uses the treatment of the Realistic Mathematics Approach was carried out in 4 meetings, where each meeting consisted of three lesson hours (3x35 minutes).

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Before conducting the research, researchers first made the research instruments in the form of learning motivation questionnaires, teaching plans, students' worksheets, and evaluation questions. Learning motivation questionnaire is based on learning motivation indicators according to Uno (2016: 23) then validated through two stages, namely Expert Judgments, then tested to class sixth students were then processed using SPSS version 20 and Microsoft Excel 2010. The questionnaires consists of 28 items with four choices based on the Likert Scale. The results of the research obtained in this study consists of percentage indicators and questionnaire scores of student learning motivation between before (pretest) and after (posttest) given treatment (treatment) for applying the realistic mathematical approach.

4. RESULT

Learning Activities using Realistic Mathematics Approaches in the Experimental Class

The following explanation is an example of a learning activity using realistic mathematics approach. the teaching and learning activity begins with the class preparation. At this stage, the teacher asks students to prepare the learning materials and infrastructure, such as student books, worksheets, and mathematical tools. Then, the teacher groups the students into 6 groups, there are 2 groups of 5 students and 4 groups of 6 students. Student groups are formed heterogenic because students have different abilities. After that, the teacher asks students to observe objects in the class and mentions the shape of the objects. Some students mention objects such as a blackboard, student desks, a teacher's desk (rectangular shape), crafts on a square wall, A watch hanged on the wall (circle), a ruler in the form of an equilateral triangle. From students' answers, the teacher conveys the learning objectives or basic competencies expected to be achieved.

The teacher continues the learning activities by providing a contextual problem that the school will hold a class competition. Each class is asked to decorate the classroom using some 2 and 3-D shapes that can be posted on the classroom wall. Then the teacher displays concrete objects, namely monopoly, toy paper money, a ruler in an equilateral triangle, boxes, dice and birthday hats, the teacher asks students to mention the shape of the object displayed by the teacher on the front.

The teacher explains the activities carried out by students are to make decorations that will be affixed to the classroom walls. Each group of students is asked to group objects including flat builds with different shapes, sizes, and volumes. The students have to attach those objects to paperboards, and they their work affixed to the classroom wall.

The students are asked to describe the objects they have grouped. They

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mention the types of 2D shapes. After that, the students are asked to determine the properties of 2D shapes using a ruler and an arc. Many students experience obstacles using the arc, so the teacher as the facilitator provides instructions on how to use the arc to determine the angle of a 2D shape.

In the final stage, each group representative presents the results of his work. When a group of students deliver their work, other groups of students pay attention to the explanation from their friends.

Students' Learning Motivation

Learning motivation indicators are developed into statements to measure the effect of the realistic mathematical approach. First, we describe the result of students' learning motivation before giving the learning instruction using the realistic mathematics approach. The results of students' learning motivation before given the treatment are presented in table 1.

Table 1. Students' learning motivation before the treatment (pretest):

Indicators	Score Percentage
Students' desire to succeed	76.91%
Students'encouragement and needs for learning	85.78%
Students' hopes and aspirations of the future	82.35%
Students' appreciation in learning	78.49%
Interesting activities in learning	80.76%
Conducive learning environment	87.25%

The results of students' learning motivation after following the learning instruction using the realistic mathematical approach is presented in table 2.

Table 2. Students' learning motivation after the treatment (posttest)

Indicators	Score Percentage
Students' desire to succeed	81.32%
Students'encouragement and needs for learning	82.72%
Students' hopes and aspirations of the future	86.21%
Students' appreciation in learning	81.98%
Interesting activities in learning	86.40%
Conducive learning environment	88.23%

Based on table 1 and table 2, students' learning motivation slightly increases. Among those indicators, the indicator of interesting activities in learning is the most increase, from 80.76% in the pretest to 86.40% in

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the posttest. This may indicate that the realistic mathematical approach support students' learning motivation.

Analysis of Students' Learning Motivation

The average difference score of the pretest and posttest in the form of students' learning motivation questionnaire can be seen in table 3.

Table 3. The average score of students' learning motivationn

Test	The numbers of students	Average
Pretest	34	90.56
Posttest	34	95.09

The steps in the analysis of differences in pretest and posttest scores of students' learning motivation using the One Group Pretest Posttest design.

a. Normality Test

Normality test of data in this study used is the Liliefors test to determine the normality of data from the pretest and posttest. With the formulation of the hypothesis as follows:

H_0: Data have normal distribution, against

H_1: Data do not have normal distribution with testing criteria:

Reject H_0 if $L_{count} > L_{table}$, and Accept H_0 if $L_{count} < L_{table}$. Hypothesis testing uses a significant level α = 0.05 and L_{table} = 0.154 with the criteria if $L_{count} < L_{table}$ means H_0 is accepted and it can be concluded that the data is normally distributed.

The results of the calculation of the normality test use the Liliefors test for the initial test (pretest) and the final test (posttest) can be seen in table 4.

Table 4. Results of Pretest and Posttest Normality Tests for Students' Learning Motivation

Test	Sample	L_{max}	L_{table}
Pretest normality	34	0.104	0.154
Posttest normality	34	0.084	0.154

Based on table 4, it can be seen that both data are normally distributed.

b. Test Data Homogeneity

The data homogeneity test was carried out using the F test (Fisher). Homogeneity test was used to test the similarity of variance in a data on pretest and posttest scores. The formulation of the homogeneity testing hypothesis is as follows:

H_0: Both homogeneous variances (v1=v2)

H_a: Both variances are not homogeneous (v1≠v2)

Hypothesis testing uses a significant level α = 0.05, and we obtain F_{count} = 1.188 and F_{table} = 1.788, then $F_{count} \leq F_{table}$ so that H_0 is accepted, meaning that the data of

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both pretest and posttest variances are homogeneous.

c. Hypothesis Test

The t test was conducted to determine the significant difference between score the initial test (pretest) and the final test (posttest) in the form of students' learning motivation. To analyze the differences in students' learning motivation in this study using the one group pretest posttest design, the comparative hypothesis testing was carried out as follows:

Reject H_0 : if $t_{count} > t_{table}$

Accept H_0 : if $t_{count} < t_{table}$

Meaning:

Reject H_0 : There is the effect application of the realistic mathematical approach on student learning motivation.

Accept H_0 : There is no effect application of the Realistic Mathematical Approach on student learning motivation.

Then for testing hypotheses, the value t_{count} is compared with the value t_{table}. The method for determining the value of t_{table} is based on a significant level (α = 0.05) and dk = n - 1 (dk = 34 - 1 = 33). The results of the t-test on scores pretest and posttest can be seen in table 5.

Table 5 Test t scores Pretest and Posttest

N	M_d	Σxd^2	t_{count}	Hypothesis
33	4,529	470,47	6,997	Reject H_0

Based on table 5, it can be seen that t_{count} = 6.997 > t_{table} = 2.039 which is reject H_0. It means that there is the effect of applying the Realistic Mathematical Approach on fifth grade students' learning motivation.

5. DISCUSSION AND CONCLUSION

Based on the results of the research and analysis of the data obtained, it can be concluded that there is the effect of applying the realistic mathematical approach on students' learning motivation. The percentage of indicators questionnaire motivation learning student totaling 28 items was given before (pretest) and after (posttest). Learning motivation questionnaires are developed from six indicators adjusted for intrinsic and extrinsic motivation.

Obtaining the questionnaire score of students' learning motivation at the pretest is 90.56. The pretest is given before the treatment of the Realistic Mathematical Approach. The students have already had good motivation but the students tend to pay less attention to the material delivered by the teacher, and they were not even interested in doing the assignments given by the teacher, and lack of enthusiasm in following mathematics learning because it is considered difficult and uninteresting. Adam and Hamm (in Wijaya, 2012: 5) explain that students need to connect a

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mathematical concept with the knowledge that they already have. Therefore it is necessary to use an interesting approach in the learning process so that it can motivate students to learn.

The use of an approach to motivate students in learning is an approach that presents something realistic based on student experience and involves students in finding concepts or strategies to solve problems in their own way. One approach applied in the learning process to increase student motivation is the Realistic Mathematical Approach. This approach uses realistic problems or something close and in accordance with student experience while involving student contributions in finding their own way.

Then the students were given posttest in the form of a motivation questionnaire as a test of the research hypothesis. The results of the posttest analysis note that students learning motivation using the Realistic Mathematics Approach has increased with an average gain of 95.09. Based on the difference in average between pretest and posttest that there is an increase in learning motivation in mathematics subjects, namely flat-woke material by applying the Realistic Mathematics Approach of 4.53.

From the research conducted there is the influence of realistic mathematical approaches to student learning motivation, seen from the percentage of indicators and questionnaire scores of students' learning motivation between the pretest and posttest.

This is because interesting activities in learning by applying realistic mathematical approaches begin by giving realistic situations, the presence of concrete objects is displayed and students contribute to finding problem solving strategies in their own way, making students interested and creating and fun learning processes so as to increase their learning motivation.

The research conducted by Supardi (2012) has the effect of the Realistic Mathematical Approach on student learning motivation because of activities that attract students to find strategies to solve problems in their own way. This is also in accordance with the opinion of Dhoruri (in Supardi, 2012) arguing that the Realistic Mathematics Approach is one of the learning approaches that can activate and condition students to construct their own knowledge by using models that are developed by students themselves.

But there are some challenges when applying the Realistic Mathematical Approach, including:

1. The tendency of students to receive material that is usually explained by the teacher.
2. The lack of time for students to find out, because of the limitations of the research time.
3. There are some students who disturb their friends when working together in groups.

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However, the existence of the effect a Realistic Mathematical Approach on student learning motivation. Realistic Mathematics Approach uses real problems and involves students in the learning process so that it trains students to think because students are required to find resolution strategies.

Thus the hypothesis in this study is accepted, namely: there is the effect of applying the Realistic Mathematical Approach to the learning motivation of fifth grade students between before (pretest) and after (posttest). This is also proven based on research conducted by Wahyuni and Jailani (2017) conduct research using the Realistic Mathematical Approach, the study shows that there is an increase in motivation and student achievement.

The results showed that the Realistic Mathematics Approach proved effective against students learning motivation, from the beginning to the end of learning, the steps presented by the Realistic Mathematics Approach direct students to find concepts and strategies for solving problems in their own way with the basic knowledge they have.

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