The Effect of the Realistic Mathematical Approach Towards the Result of Learning Mathematics Reviewed from the Ability of Numerical Students

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Abstract. This study aims to determine the effect of realistic mathematical approach to mathematics learning outcomes in terms of numerical ability of students of class VII SMPN 1 Enrekang. This research is quasi experimental research with research design used by researcher is treatment by levels of design. Methods of data collection used were the test of learning outcomes and numerical ability tests. Analytical techniques used are descriptive statistics and inferential statistical analysis with hypothesis testing using two-track anova and Tukey's advanced test. The results showed that: (1) there was a difference of mathematics learning outcomes between students who followed the learning with realistic mathematics approach and conventional learning in grade VII students SMPN 1 Enrekang (F arithmetic = 39,215 > Ftable = 4.08), (2) there is interaction effect between realistic mathematics approach with numerical ability to mathematics learning result (F arithmetic = 4,730 > F table = 4.08); (3) there is difference of mathematics learning result of student having high numerical ability following realistic mathematics approach and conventional learning of class VII SMPN 1 Enrekang (MD = 7,09; p <0,05); (4) there is difference of mathematics learning result of student with low numerical ability following realistic mathematics approach and conventional learning of grade VII student SMPN1 Enrekang (MD = 14,64; p <0.05).

Keywords: Realistic Mathematical Approach, Numerical Ability, Learning Result of Mathematics

1. Introduction
Education is a responsibility that is maintained by every human beings meant for government, teachers, parents to the students. Education is able to change one's lifestyle to be better, orderly, independent, intelligent, responsible, disciplined, skilled and more importantly increasing one's piety and faith. The national education system in UU No.20 of 2003 states that "Education is a conscious and planned effort to create an atmosphere of learning and learning process so that learners actively develop their potential to have spiritual strength, self-control, personality, intelligence, noble character, as well as the skills required by himself, society, nation and state [1].

The core education process is related to the activities of educators and learners, where the main holder in the learning process is the teacher [2]. Thus, the achievement of an educational goal depends on how to design and implement professionally that can not be separated from the most active actors are students (taught) and teachers (teaching).
The way teachers in implementing learning, is a matter that must be considered in education. Submission of materials that tend to be monotonous and the lack of variation of teaching can make learners tired of learning math so that it can have a big effect on the learning outcomes of students. Almost most all of the learners are less fond of mathematics, because the students' view of mathematics is difficult and hard to understand. Therefore if learners are faced with mathematical problems, they will feel lazy to do it. Therefore, in order to overcome the low mathematics learning outcomes, a teacher needs to pay attention to the factors that influence the learning outcomes of mathematics. In general, the factors that influence learning outcomes come from internal factors and external factors of each individual. Internal factors are divided into two, namely physical factors that include the five senses and psychological factors include non-cognitive variables (interest, motivation, personality) and cognitive variables (talent and intelligence). External factors are divided into two factors: physical and social factors [3].

The ability of teachers to manage learning activities is the key to success, where teachers should have knowledge and skills on math and RME to apply on learning. The results study show that learning outcomes are better with the RME approach. With the existence of an approach which is done respectively, the teacher is able to see the development of learning ways experienced by learners in learning. Teachers are also a moral figure for learners, therefore the teacher's attitude must be maintained in order to keep on an example for learners in school. Learning outcomes of learners is a reflection of how to teach teachers. Therefore, a teacher's learning approach can affect the learning outcomes.

Realistic mathematical approach is expected to solve various problems in the world of mathematics education, so as to learning outcomes can be improved and more effective. This is reinforced by the results of research which suggests that a realistic mathematical approach influences learning outcomes [4]. One of the research suggests that a realistic mathematical approach is better than the conventional approach seen from the learning outcomes [4].

In addition to the teacher's teaching-learning style, a student's aptitude can influence the learning outcomes of mathematics. This is based on the findings of that students who have good numerical talent will be able to improve mathematical logical intelligence [5]. Therefore, one of the efforts to improve students' mathematical logical intelligence is to develop their numerical talents. It is the learner’s ability in processing numbers, both accuracy and precision in basic mathematical calculations. Based on the portrayal, the purpose of the researcher is to attain information related to the influence of the application of realistic mathematical approach to mathematics learning outcomes in terms of numerical ability of students in grade VII SMP Negeri 1 Enrekang.

2. Method
The type of research used is quasi experimental with research design treatment by levels design. The population in this study is all students of class VII Junior High School 1 Enrekang which is divided into six classes amounted to 165 students. While the sample amounted to 22 students per class, sample selection technique is done by simple random sampling.

Instruments used in this study are the test results of learning outcomes and numerical ability students. The test result of learning used is essay form as much as 8 items that are valid and reliable. To know the numerical ability of the students then tested the ability of multiple choice numerals as many as 22 valid questions are also reliable. Data analysis techniques used are divided into descriptive analysis techniques and inferential analysis one. Descriptive analysis techniques include mean and standard deviation. While inferential analysis techniques using two way anova but previously had to be tested in normality and homogeneity test all using SPSS 20.0 program aid and Tukey test if there is significant difference of second hypothesis.

3. Result and Discussion
3.1. Descriptive Student Numerical Ability In Experiment 1 And Experiment 2
Based on numerical ability tests given in experiment 1 and experiment 2 classes used to
categorize the numerical abilities of each student.

**Table 1. Description of Student Numerical Ability in Experiment 1 and Experiment 2**

| Statistics          | Experiment 1 | Experiment 2 |
|---------------------|--------------|--------------|
| Total Sample        | 22           | 22           |
| Lowest Value        | 6            | 7            |
| Highest Value       | 14           | 14           |
| Middle Value        | 9.50         | 9.50         |
| Average Value       | 9.95         | 9.95         |
| Standard Deviation  | 9.310        | 7.733        |

The following is the result of categorizing numerical ability of students in experiment 1 and experiment 2.

**Table 2. Categorization of Student Numerical Ability in Experiment 1 and Experiment 2**

| Numerical ability | Experiment 1 | Experiment 2 |
|-------------------|--------------|--------------|
| High              | 11 people    | 11 people    |
| Low               | 11 people    | 11 people    |

3.2. Description of Pretest and Posttest on Teachers Taught Using Realistic Mathematics Approach
Class VIIC SMP Negeri 1 Enrekang
Based on the pretest and posttest tests given to the control class, taught using a realistic
mathematical approach to the class VIIIC students of SMP Negeri 1 Enrekang on the set material. The
following is the result of student learning in experiment 1.

**Table 3. Description of Pretest and Posttest of Experiment Class 1**

| Statistic            | Experimental Statistics Value 1 | Pretest | Posttest |
|----------------------|---------------------------------|---------|---------|
| Total sample         | 22                              | 22      |
| Lowest value         | 30                              | 65      |
| Highest value        | 68                              | 95      |
| Average value        | 50.73                           | 81.23   |
| Standard Deviation   | 9.310                           | 7.733   |

3.3. The result and description of Student’s Pretest dan Posttest taught used Conventional Learning
Class VIIID SMP Negeri 1 Enrekang
The following is the result of pretest and posttest value to experimental 2 in this table.

**Table 4. The description of Pretest dan Posttest Experimental 2**

| Statistic            | Experimental Statistics Value 1 | Pretest | Posttest |
|----------------------|---------------------------------|---------|---------|
| Total sample         | 22                              | 22      |
| Lowest value         | 34                              | 55      |
| Highest value        | 69                              | 90      |
Results of Student Mathematics Study with High Numerical Ability in Experiment 1 and Experiment 2

Table 5. Description of Pretest and Posttest with High Numerical Capabilities

| Statistic       | Statistic Value | Statistic Value |
|-----------------|-----------------|-----------------|
|                 | Statistics High Numerical Capability | Statistics High Numerical Capability |
|                 | Eksperimen 1    | Eksperimen 2    |
| Pretest         | Posttest        | Pretest         | Posttest         |
| Total sample    | 11              | 11              | 11              | 11              |
| Lowest value    | 30              | 78              | 40              | 70              |
| Highest value   | 68              | 95              | 69              | 90              |
| Average value   | 53,09           | 85,91           | 55,73           | 78,82           |
| Standard deviation | 11,519       | 5,375           | 8,765           | 5,474           |

3.4. Results of Student Mathematics Study with Low Numerical Ability in Experiment 1 and Experiment 2.

The following is the result of student learning which has low numerical ability in experiment 1 and experiment 2:

Table 6. Description of Pretest and Posttest with Low Numerical Capabilities

| Statistic       | Statistic Value | Statistic Value |
|-----------------|-----------------|-----------------|
|                 | Statistics Low Numerical Ability | Statistics Low Numerical Ability |
|                 | Experiment 1    | Experiment 2    |
| Pretest         | Posttest        | Pretest         | Posttest         |
| Total sample    | 11              | 11              | 11              | 11              |
| Lowest value    | 40              | 65              | 34              | 55              |
| Highest value   | 58              | 86              | 67              | 70              |
| Average value   | 48,36           | 76,55           | 48,27           | 61,91           |
| Standard Deviation | 6,087        | 6,962           | 11,306          | 5,009           |

3.5. Normality test.

Table 7. Pretest and Posttest Normality Test

| Variabel       | Kolmogorov-Smirnov<sup>a</sup> | Shapiro-Wilk | Keterangan |
|----------------|-------------------------------|--------------|------------|
| Pretest Experiment 1 | 0,200                         | 0,679        | Normal     |
| Postest Experiment 1 | 0,127                         | 0,322        | Normal     |
| Pretest Experiment 2 | 0,168                         | 0,340        | Normal     |
| Postest Experiment 2 | 0,113                         | 0,224        | Normal     |

Based on the normality test using SPSS 20.0 program the four variables above are normal distributed because sig. greater than α (sig. > 0.05)
3.6. Homogenity Test

Table 8. Homogenity Test of Pretest Variance, Posttest of Experiment 1 and Experiment 2

| Variable  | Significant | Description |
|-----------|-------------|-------------|
| Pretest   | 0.307       | Homogen     |
| Posttest  | 0.089       | Homogen     |

Based on homogeneity test by using SPSS 20.0 program both of the above variable are said to be homogeny because sig. greater than 0.05 (sig. > 0.05)

3.7. Two-way Anova Test

Table 9. F Test (Anova) Posttest Result and Student Numerical Ability

| Source Variance | F Arithmetic | F Table | Sig. |
|-----------------|--------------|---------|------|
| Between columns | 39.215       | 4.08    | 0.0001 |
| Interaction     | 4.730        | 4.08    | 0.036 |

Based on the above table has answered the first hypothesis and the second hypothesis. (1) Inter-columns, indicating that there are significant differences in mathematics learning outcomes between students learning with realistic mathematics approach and students learning with conventional learning (F count > F table) (2) There is an interaction between realistic and conventional mathematics approaches numerical ability in the achievement of mathematics learning outcomes of students of class VII SMP Negeri 1 Enrekang (F arithmetic > F table).

3.8. Test Tukey

The advanced test used in this study is the Tukey test. The results of further test calculations by Tukey test can be seen using Statistical Program for Social Sciences (SPSS) version 20.0, as follows:

Table 10. Tukey Test Results Posttest and Student Numerical Ability

| I(Interaction) | J(Interaction) | Mean different (I-J) | Sig.  |
|----------------|----------------|----------------------|-------|
| Low Numerical  |                 |                      |       |
| (Experiment 1) | High numerical  | 7.09*                | 0.030 |
| Low numerical  |                 | 9.36*                | 0.002 |
| (Experiment 1) | Low Numerical   | 24.00*               | 0.0001|
| (Experiment 2) | High Numerical  | -7.09*               | 0.030 |
| High Numerical | Low Numerical   | 2.27                 | 0.791 |
| (Experiment 1) | Low Numerical   | 16.91*               | 0.0001|
| (Experiment 2) | Low Numerical   | -9.36*               | 0.002 |
| Low Numerical  | High Numerical  | -2.27                | 0.791 |
| (Experiment 1) | Low Numerical   | 14.64*               | 0.0001|
| (Experiment 2) | High Numerical  | -24.00*              | 0.0001|
| High Numerical | High Numerical  | -16.91*              | 0.0001|
| Interaction | Mean different (I-J) | Sig. |
|-------------|---------------------|------|
| Eksperimen 2 | -14.64*             | 0.0001 |
| (Experiment 2) |                     |      |
| Low Numerical |                     |      |
| (Experiment 1) |                     |      |

Based on the above table, then obtained conclusions related to some hypothesis proposed, the results show that:

a. There was a significant difference in learning outcomes between experimental high and high numerical experiments (MD = 7.09; p <0.05)

b. There was a significant learning difference between low experimental 1 and experimental numeric 2 (MD = 14.64; p <0.05)

The result of research with two way anova on F test table with SPSS 20.0 software aid, got the value of F count equal to 39.215 while value of F table with degree of freedom (dk) of numerator 1 and degree of freedom (dk) denominator 40 at significant level 0.05 is 4.08, thus the accepted alternative hypothesis is a hypothesis stating that there are differences in mathematics learning outcomes of students who were taught with a realistic mathematics approach with students taught conventional learning. This is in accordance with previous research which concluded with the different learning process applied between realistic mathematical approach and conventional learning [6].

Based on the two way anova with the help of SPSS 20 software, obtained the value of F arithmetic of 4.730 while the value of F table with degrees of freedom (dk) 1 and degrees of freedom (dk) denominator 40 at significant level 0.05 is 4.08. Thus, there is an interaction between a realistic mathematical approach with numerical ability to the results of learning mathematics class VII SMP Negeri 1 Enrekang. This is in accordance with previous research conducted concludes that there is an interaction effect between the realistic approach of mathematics used in the learning process and the numerical ability that students have on the achievement of learning mathematics in grade V SD Gugus 3 South Kuta, Bandung.

In an effort to improve students' mathematics learning outcomes, both high and low numerical skills need to be supported by selecting appropriate learning to match the characteristics and abilities of learners. The appropriateness of mathematics learning with realistic mathematical approach, where this approach emphasizes the problem of daily life in learning by giving clear understanding about the relation of learning material with daily life and general usage for human.

Based on the results of Tukey analysis with the help of SPSS 20 software obtained MD = 7.09 and sig = 0.030 <0.05 thus the null hypothesis (H0) rejected, namely the hypothesis that there is a significant difference between the students' mathematics learning outcomes in the experimental class 1 and experiment class 2 with high numerical ability in class VII of SMP Negeri 1 Enrekang. The results of this study is strengthened by the results of research examined the results of the study showed that there are differences in learning achievement between students who follow the realistic math approach with students who follow conventional learning on high numerical ability [6].

The better the numerical ability of students will have an effect on the students' mathematics learning achievement [7]. Thus, students with high numerical skills will gain good mathematics learning outcomes through a realistic mathematical approach rather than mathematics learning through conventional learning. Students with high numerical skills will be confident of solving problems, with realistic mathematical approaches making activities more interesting and also facilitating students to solve problems.

Based on Tukey's test to find out whether the null hypothesis (H0) is rejected or accepted. Based on Tukey analysis results with the help of SPSS 20 software obtained MD = 14.64 and sig = 0.0001 <0.05 thus null hypothesis (H0) is rejected, in other words acceptable alternative is hypothesis stating that there is significant difference between student learning outcomes in experimental class 1 and experiment 2 class with low numerical ability in class VII of SMP Negeri 1 Enrekang. This is in accordance with previous research which concludes that the low student learning outcomes are thought to be due to the low numerical ability of students which implies the low absorption of students
on mathematics learning materials. If it is associated with mathematics learning outcomes, then students with low numerical skills will have lower mathematics learning outcomes compared to students’ mathematics learning outcomes having high numerical skills [8]. Learning with a realistic mathematical approach emphasizes real issues that are closely related to the life of the student or often encountered in everyday life. By connecting real problems with mathematics learning will make it easier for students to understand the concept of mathematics and will make it easier to recall because it is often done in life. This is supported by the results which concluded that the mastery of the concept affects the ability to solve math problems [9]-[11].

4. Conclusion

Based on the results of previous research and discussion, the following conclusions are obtained: (1) there are differences in the results of mathematics learning of students taught by realistic mathematics approach with students taught using conventional learning class VII SMP Negeri 1 Enrekang, (2) there is an interaction effect between the learning approach and the numerical ability of the mathematics learning outcomes of the seventh grade students of SMP Negeri 1 Enrekang; (3) there is a significant difference between the mathematics learning result in the experimental class 1 and the experimental class 2 with the numerical ability of the high students; a significant difference between mathematics learning outcomes in experiment class 1 and experiment 2 class with low student numerical ability.

References

[1] W. Sanjaya, “Strategi pembelajaran berorientasi standar proses pendidikan.” Jakarta: kencana, 2006.
[2] M. Abdurrahman, “Pendidikan bagi anak berkesulitan belajar.” Jakarta: Rineka Cipta, 2003.
[3] S. Azwar, “Psikologi Intelegenesi. cetakan VIII,” Pustaka Pelajar. Yogyakarta, 2011.
[4] K. A. Setiawan, N. T. Renda, and N. W. Rati, “Pengaruh Pendekatan Pendidikan Matematika Realistik Terhadap Hasil Belajar Matematika Siswa SD,” Mimb. PGSD Undiksha, vol. 2, no. 1, 2014.
[5] I. G. S. T. A. N. T. JAYANTIKA, I. M. Ardana, and P. I. G. P. Sudiarta, “Kontribusi Bakat Numerik, Kecerdasan Spasial, dan Kecerdasan Logis Matematis Terhadap Prestasi Belajar Matematika Siswa SD Negeri di Kabupaten Buleleng,” J. Pendidik. Mat. Indones., vol. 2, 2013.
[6] I. A. K. Astuti and A. Marhaeni, “Pengaruh Pendekatan Matematika Realistik terhadap Prestasi Belajar Matematika ditinjau dari Kemampuan Numerik,” PENDASI J. Pendidik. Dasar Indones., vol. 3, no. 1, 2013.
[7] E. Gunarti, “Hubungan antara Kreativitas, Kemampuan Numerik dan Sikap Siswa Terhadap Prestasi Pelajaran Matematika dengan Prestasi Belajar Matematika Siswa Kelas VIII SMP Negeri Se-Kecamatan Pundong,” UNION J. Ilm. Pendidik. Mat., vol. 5, no. 1, pp. 1–10, 2017.
[8] Arsyad N Rahman A and Ahmar A S, 2017 Developing a self-learning model based on open-ended questions to increase the students’ creativity in calculus Glob. J. Eng. Educ. 19, 2 p. 143–147.
[9] S. Zaerani, M. Hasan, and S. Syam, “Pengaruh Penguasaan Konsep Teorema Pythagoras Terhadap Kemampuan Menyelesaikan Soal-Soal Bangun Ruang Siswa Datar pada Siswa Kelas VIII MTs Negeri Balang-Balang,” MaPan J. Mat. dan Pembelajaran, vol. 5, no. 2, pp. 279–292, 2017.
[10] Rahman A et al., 2018 The Implementation of APIQ Creative Mathematics Game Method in the Subject Matter of Greatest Common Factor and Least Common Multiple in Elementary School J. Phys. Conf. Ser. 954, 1.
[11] Ahmar A S Rahman A Minggi I Mulbar U Upu H and Tiro M A, 2018 The Profile of Creativity and Proposing Statistical Problem Quality Level Reviewed From Cognitive Style J. Phys. Conf. Ser. 954.