



# The Effect of Realistic Mathematics Approach on Learning Outcomes of Elementary School Students

Teni Tutiareni<sup>(✉)</sup>, Budi Hendrawan, Mohammad Fahmi Nugraha, Anggia Suci Pratiwi, Milah Nurkamilah, and Mujiarto

University of Muhammadiyah Tasikmalaya, Tasikmalaya, Indonesia  
tenitutiareni37@gmail.com

**Abstract.** This study aims to describe the effect of a realistic mathematical approach on student learning outcomes in fractional arithmetic operations in class V SDN 2 Tuguraja, Cihideung, Tasikmalaya City. In this study, learning with a realistic mathematical approach that will be carried out is using a concrete mathematical stage with the help of real object media and teaching aid models in the form of play-doh and origami paper. This research is a quasi-experimental research (quasi-experimental) using the Pretest-Posttest Nonequivalent control group design. The population in this study were all fifth grade students of SDN 2 Tuguraja, with a total of 18 students. Sampling using the Saturated Sampling technique, the sampling method was random, which resulted in 9 experimental class students and 9 control class students. The object of this research is the result of learning the operation of counting fractions using realistic mathematics learning. To test the validity of the instrument in this study using construct validity using expert opinion (experts judgment) and content validity by testing it with different schools. The research data were obtained from learning outcomes tests, and were analyzed descriptively quantitatively. The results show that the t count is 2.456 with a significance probability (two tailed) 0.000, because the significance (two tailed)  $< 1/2 \alpha$  (0.05), then  $H_0$  is rejected and  $H_a$  is accepted, meaning that there is an effect of realistic mathematics learning approach on the learning outcomes of fifth graders at sdn 2 tuguraja on the matter of fraction stories. This is also supported by the posttest average value of the experimental class which is 77.56, which is greater than the control class, which is 62.78.

**Keywords:** realistic mathematics · elementary school

## 1 Introduction

Education is a very important and strategic aspect for human life. Education plays a role in providing provisions for every human being to achieve future goals. Knowledge education is defined as a person's activity to gain knowledge with the aim of forming good human character. This is in accordance with the goals of education in Indonesia as stated in Law Number 20 of 2003, namely "the development of students into human

beings who believe and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become citizens of the state. Democratic and responsible. One strategy for implementing education is through learning activities.

Learning is a teaching and learning activity in which there is interaction between education staff and students to develop behavior in accordance with educational goals. In order for educational goals to be achieved, guidelines for the implementation of learning activities are needed, namely the curriculum. According to Law Number 20 of 2003 concerning the National Education System, it is stated that: "The curriculum is a set of plans and arrangements regarding the objectives, content, and learning materials as well as the methods used as guidelines for the implementation of learning activities to achieve certain educational goals." Mathematics is one of the disciplines listed in the curriculum, including the elementary school/madrasah Ibtidaiyah education curriculum. The curriculum currently used in elementary schools is the 2013 curriculum. The curriculum requires students to study mathematics. Based on the Content Standards of the Minister of Education and Culture Number 68 of 2013 states that: "Mathematics as one of the compulsory subjects is expected to not only equip students with the ability to use calculations or formulas in doing test questions, but also to be able to involve their reasoning and analytical abilities in solving everyday problems." The demand for students' ability in mathematics is not only to have the ability to count, but the ability to reason logically and critically in problem solving. Solving this problem is not merely a problem in the form of routine questions but rather the problems faced daily. Objects in mathematics are abstract. Therefore, it is not uncommon for teachers and students to experience several obstacles in the learning process. So far, the process of learning mathematics is carried out in the following order: 1. explaining the mathematical object, 2. giving examples of the mathematical object he just explained, 3. asking students to solve problems similar to the example, and 4. giving practice questions. Such mathematics learning tends to make students feel bored, uninterested, less creative, their abilities are less developed, and the saddest thing is that the results of learning mathematics so far have not been satisfactory. Because there are too many formulas that must be memorized, as a result, students lack the ability to reason logically and critically in problem solving which has an impact on student learning outcomes.

Moreover, based on the results of the experience in PLP II (Introduction to School Field II) which was held from November 16, 2020 to January 23, 2021, with the aim of experiencing the learning process first hand and strengthening prospective educators. During PLP II, there were many activities in schools that involved students, including the AKM (Minimum Competency Assessment) program. According to the Assessment Center (2021: 4), the National Assessment is a program to assess the quality of each school, madrasah, and equality program at the primary and secondary levels. The AKM program aims to develop student competence and character. The National Assessment will be attended by some students in grades V, VIII, and XI who are randomly selected by the Ministry of Education and Culture. The National Assessment will also be followed by all teachers and heads of education units. Information from students, teachers, and heads of education units is expected to provide complete information about the quality of learning processes and outcomes in each education unit. There are two basic competencies measured by AKM, namely reading literacy and mathematical literacy

(numbering). Numeration is the ability to think using concepts, procedures, facts, and mathematical tools to solve everyday problems in various types of contexts that are relevant for individuals as citizens of Indonesia and citizens of the world. AKM can produce skill maps on reading literacy and numeracy of students in grades V, VIII, and XI that can be used to improve the learning process in education units. Therefore, the questions developed for AKM are contextual in nature, take various forms of questions, measure problem-solving competence, and stimulate students to think critically. Assessment in the AKM refers to the benchmarks contained in the Program for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS). Regarding mathematics education, according to Wijaya (2011:1) Indonesia has participated in the Program for International Student Assessment (PISA) since PISA was first implemented in 2000. PISA is an international scale assessment program that aims to determine the extent to which students (15 years old) can apply the knowledge they have learned in school. In PISA 2000, Indonesia was ranked 39 out of 41 countries in the field of mathematics; with a score of 367 which is far below the OECD average score of 500 (OECD, 2003). The achievement in mathematics of Indonesian students in PISA 2003 is still not satisfactory, namely ranking 38 out of 40 countries; with a score of 361 (OECD, 2004). In PISA 2006, Indonesian students' math scores rose significantly from 361 (PISA 2003) to 391; however, Indonesia is still in the lower ranking, namely the 50th position out of 57 countries (OECD, 2007). In PISA 2009, the mathematics score of Indonesian students dropped to 371 and Indonesia was in position 61 of 65 countries (OECD, 2010).

Based on interviews with teachers at SDN 2 Tuguraja, one of the materials that students find difficult to understand is fractions. The author finds problems in learning mathematics including the number of student scores that are still below the Minimum Graduation Criteria (KKM), which can be seen in the attachment of student learning outcomes. Students have difficulty in operating fractions, especially when it is associated with everyday problems in story problems. Based on the teacher's experience, these problems occur due to several factors, including students having difficulty interpreting the form of story questions into the form of a mathematical model. When given other similar questions, students find it difficult to do it because students only rely on the examples given by the teacher. Based on the results of interviews with several students, mathematics is considered difficult and boring because there are many formulas that must be memorized. The material that is difficult for students to understand is fractional material because students are always inverted between the numerator and denominator, it is difficult to operate such as equating the denominator first, especially fractional material in the form of story questions (can be seen in the attachment to the results of interviews with students). There are several appropriate learning approaches so that logical and critical reasoning skills in solving students' mathematical problems can be achieved. According to Idris & Devi (2016), "one of the learning approaches involving students playing an active role in learning with real-life contexts is realistic mathematics learning". Realistic Mathematics Approach (PMR) brings mathematics closer to the students' environment. In PMR, teachers must relate mathematical concepts to students' experiences in everyday life and re-apply mathematical concepts that students have in everyday life. For example, students are given problems they face in everyday

life, then they are asked to solve them in their own way. Teachers can guide students by asking some questions about the mathematical concepts that exist in the problem. According to Andriani (2014) “a realistic mathematics learning approach starts with contextual problems which are then transformed into mathematical language and then solved mathematically”.

Realistic mathematics learning is also a learning developed specifically for mathematics subjects. This concept is in accordance with current learning needs which is a solution for improving mathematics education in Indonesia which is also dominated by problems to improve students' reasoning power and understanding of mathematics Hadi (2017). This learning approach also encourages students to think critically, focus and systematically which makes students take longer to remember the substance of a reading so that student learning outcomes can also increase. Based on the description that has been explained, the author intends to examine this problem with the title of the effect of a realistic mathematical approach on student learning outcomes in the subject matter of fraction stories for class V SDN 2 Tuguraja.

## 2 Method

This research is an experimental research. The reason the researcher uses the experimental research method is because this method is in accordance with the research to be carried out by the researcher, namely to determine the effect of the special treatment that will be given by the researcher. As the opinion of Sugiyono (2015: 107) “Experimental research methods can be interpreted as research methods used to find the effect of certain treatments on others under controlled conditions”. Researchers will provide certain treatment, namely by applying a realistic mathematical approach to determine the effect of a realistic mathematical approach on student learning outcomes in elementary schools. Differentiating from the experimental group and the control group is that the experimental group is treated with a realistic mathematical approach, while the control group uses a conventional approach with the lecture method. This research uses the type of research quasi eksperimental Design.

## 3 Results and Discussion

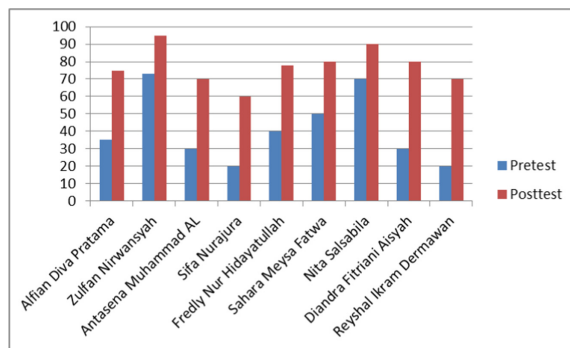
### 3.1 Results

The data from this study include data on student learning outcomes in each group, namely the experimental group which applies a realistic mathematics learning approach and the control class using the conventional method (lecture). The data analyzed were obtained from the pretest scores given at the beginning of the lesson and the posttest scores given at the end of the lesson. The results of the experimental class pretest and posttest can be seen in Table 1.

Based on the table above, the student's pretest score is below 70, the highest score from the pretest is 73, only 1 student and the lowest score is 20, totaling 2 students. The results of the posttest held after the treatment, the number of students who got a score

**Table 1.** Experimental Class Pretest and Posttest Results

No	Name	<i>Pretest</i>	<i>Posttest</i>
1	Alfian Diva Pratama	35	75
2	Zulfan Nirwansayah	73	100
3	Antasena Muhammad Al	30	70
4	Sifa Nurajura	20	60
5	Fredly Nur Hidayatulloh	40	78
6	Sahara Meysa Fatwa	50	80
7	Nita Salsabila	70	100
8	Diandra Fitriani Aisyah	30	80
9	Reyshal Ikram Dermawan	20	70

**Fig. 1.** Comparison of Pretest and Posttest Results of Experiment Class

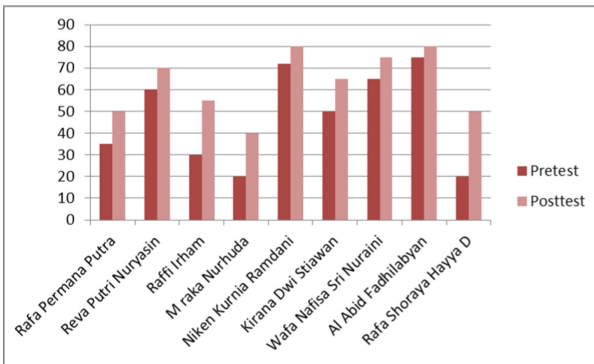
of 100 was 2 students, and the lowest score was 70 with 2 students. More details can be seen in Fig. 1.

Based on Fig. 1, there is a difference between the results of the pretest and posttest of the experimental class, namely the posttest value of the experimental class is higher than the pretest value of the Experimental class. This shows that the application of a realistic mathematical approach affects student learning outcomes. Next are the results of the pretest and posttest in the control class. The pretest was carried out before the treatment, while the posttest was carried out after the treatment. The results of the pretest and posttest in the control class can be seen in Table 2.

Based on the table above, the pretest score of students in the control class was below 70, the highest score from the pretest was 75, only 1 student and the lowest score was 20, totaling 2 students. The results of the posttest held after the treatment, the number of students who got a score of 80 was 2 students, and the lowest score was 40, amounting to 2 students. More details can be seen in Fig. 2.

**Table 2.** Control Class Pretest and Posttest Results

No	Name	Pretest	Posttest
1	Rafa Permana Putra	35	50
2	Reva Putri Nuryasin	60	70
3	Raffi Irham	30	55
4	M Raka Nurhuda	20	40
5	Niken Kurnia Ramdani	72	80
6	Kirana Dwi Stiawan	50	65
7	Wafa Nafisa Sri Nuraini	65	75
8	Al Abid Fadhilabyan	75	80
9	Rafa Shoraya Hayya D	20	50



**Fig. 2.** Comparison of Pretest and Posttest Results of Experiment Class

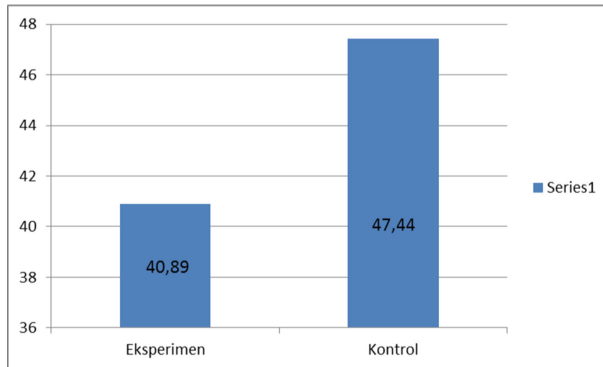
Based on the picture above, there is a difference between the results of the pretest and posttest of the control class. Seen from the posttest value is higher than the pretest value of the control class. However, when compared with the pretest and posttest scores in the experimental class, the pretest and posttest scores in the experimental class were higher. This pretest was carried out before the treatment was carried out using a realistic mathematics learning approach in the experimental class and the lecture method in the control class. The results of the average pretest of the experimental class and the control class can be seen in the following table.

From Table 3, it is obtained that the average pretest value of the experimental class is 40.89 and the control class is 47.44. The comparison can be seen in the image below 3 (Fig. 3).

Based on the picture above, the average value of the pretest in the control class is higher than the pretest value in the experimental class. It can be seen that the value in the experimental class is 40.89 and the value in the control class is 47.44. This posttest was carried out after being given treatment using a realistic mathematics learning approach

**Table 3.** Average Pretest Experiment Class and Control Class

No	Class	The number of students	Average
1	Experiment	9	40,89
2	Control	9	47,44

**Fig. 3.** Comparison of the Average Pretest of the Experimental Class and the Control Class**Table 4.** Posttest Average of Experiment Class and Control Class

No	Class	The number of students	Average
1	Eksperimen	9	77,56
2	Kontrol	9	62,78

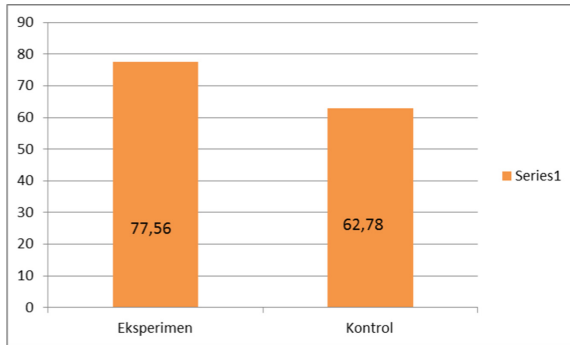
in the experimental class and the lecture method in the control class. This posttest aims to determine the effect of using a realistic mathematics learning approach on learning outcomes in class V fraction story questions. The following are the posttest results for the experimental class and the control class, which can be seen in Table 4.

From the table above, it is found that the average posttest value for the experimental class is 77.56 and the control class is 62.78. The comparison can be seen in Fig. 4.

Based on the picture above, the average posttest score in the experimental class is higher than the posttest score in the control class. It can be seen that the value in the experimental class is 77.56 and the value in the control class is 62.78. This shows that there is an effect of realistic mathematics learning approach on student learning outcomes.

### 3.2 Discussion

The results of hypothesis testing indicate that there is a significant effect of the mathematics learning approach on students' mathematics learning outcomes. The results of



**Fig. 4.** Posttest Average Results of Experiment Class and Control Class

learning mathematics with a realistic approach are more effective than conventional learning with lectures. This phenomenon indicates that mathematics learning outcomes will be further increased if students are taught with a realistic approach. That is, the better the application of a realistic approach, the better the students' mathematics learning outcomes will be. This happens because learning with a realistic mathematical approach will create a pleasant learning atmosphere for students. Mathematics is not perceived as something foreign to students, but something that is close to everyday life. This situation will make students interested and happy in learning mathematics. This is in accordance with what was stated by Oktaviandy (2011) that the right learning approach in instilling concepts in a fun way is a realistic approach.

This realistic mathematical approach prioritizes real experience. Dhoruri (2010:9) suggests that the realistic mathematics approach is one of the learning approaches that can activate and condition students to construct their own knowledge developed by students. For most students, this situation is very pleasant and is a direct and close experience with everyday life. This kind of learning process will be closely embedded in the minds of students. This is an element of the strength of the realistic learning approach, students feel it as a personal experience and not the experience of others that they have not experienced. This learning atmosphere will make students happy and motivated in learning mathematics.

This condition is different from conventional mathematics learning with the lecture method which emphasizes more on mechanical patterns. Conventional learning does not involve students as learning subjects. Students take part in learning through explanations of concepts and examples of questions given by the teacher who are not in touch with everyday experience.

For this reason, the use of a realistic mathematical approach needs to be socialized and improved at every level of education. Realistic mathematics learning can be used as an alternative solution in order to improve student learning outcomes. Through the application of a realistic learning approach, students are expected to be happy and love mathematics.



## 4 Class Interpretation and Discussion

This study has proven that the realistic mathematics learning approach is better than the conventional method with lectures on the learning outcomes of fifth graders at SDN 2 Tuguraja in fraction story questions.

After the analysis was carried out, the pretest in the control class and the experimental class showed that the results were not too different because it could be seen from the average of each class that the difference was not too much, namely in the experimental class 40.89 and in the control class 47.44. While the average difference in the posttest results of the experimental class reached 77.56 and the control class 62.78, it can be concluded that there was a significant difference in the average student learning outcomes in the posttest experimental class and control class.

Based on the analysis described in the previous chapter, the results obtained with the experimental class using a realistic mathematics learning approach have an effect on student learning outcomes in fraction story questions, this can be concluded from the results of the hypothesis (two tailed)  $< \alpha$  (0.05) because significance  $< 1$  of a 0.05, it can be concluded that  $H_0$  is rejected, then the realistic mathematics approach has an effect on student learning outcomes on the subject matter of fractions story questions for class V SDN 2 Tuguraja.

This realistic mathematical approach makes students play an active role in learning, group students complete their math tasks or problems in groups with the help of a concrete model in the form of play-doh, then present it in front of their friends by showing the results of their group work. So that students are trained to be able to listen to information from their friends and students can also play an active role in the learning process.

While in conventional learning methods with lectures, the teacher plays a role and students listen to the teacher's explanation. Activity is limited in the learning process, thus causing students not to get the opportunity to develop their knowledge.

## 5 Conclusions and Suggestions

### 5.1 Conclusions

Based on the results of research and discussion, it can be concluded that the use of a realistic mathematics learning approach in the learning process with fractional arithmetic operations material can improve the learning outcomes of fifth grade students of SDN 2 Tuguraja. The use of a realistic mathematical approach can improve student learning outcomes in the learning process using the media of concrete objects and teaching aids in the form of fractional paper and Origami paper. According to the steps in learning using a realistic mathematical approach, namely the delivery of real problems, concrete operational stages, concrete model stages, formal model stages and formal mathematics stages. The results show that the  $t$  count is 2,456 with a significance probability (two tailed) 0.000, because the significance (two tailed)  $< 1/2 \alpha$  (0.05), then  $H_0$  is rejected and  $H_a$  is accepted, meaning that there is an effect of realistic mathematics learning approach on the learning outcomes of fifth graders at SDN 2 Tuguraja in the matter of fraction stories. This is also supported by the posttest average value of the experimental class which is 77.56, which is greater than the control class, which is 62.78.

## 5.2 Suggestion

There are several suggestions from the research that has been done by the author. It is better to try a realistic mathematical approach in learning mathematics, especially in the matter of counting fractions. Further researchers should be more critical in dealing with problems that arise in the world of education, especially in learning problems so that the results of this study can be used as a reference in providing information about the implementation of learning with a realistic mathematical approach and the results of this study are expected to be taken into consideration for other researchers to using appropriate learning methods, models or approaches.

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