International Journal of Academic and Applied Research (IJAAR)
ISSN: 2643-9603
Vol. 7 Issue 5, May - 2023, Pages: 39-43

The Effect of Applying Realistic Mathematical Education Problem Based Instruction Model on Mathematics Learning Outcomes The Subject of Fractional Computing Operations for Class IV Students of Sumbersari 1 Bondowoso

Muhammad Barokatus Shofar[1], Masyhud Sulthon[2], Ridho Alfarisi[3]

University of Jember, PGSD Study Program, Faculty of Education, Jl. Kalimantan No.37, Jember, Indonesia
E-mail:alfarisi.fkip@unej.ac.id

Abstract: *Education is one form of embodiment of dynamic human culture and has an important role in educating. The efforts made by the Indonesian government to advance the quality of education are by renewing the curriculum as well as the facilities and infrastructure that meet it. The research was conducted at SDN Sumbersari 1 Bondowoso Regency, with a Quasi Experimental research design in this study, before determining the required test first, namely by testing homogeneity with the criterion if the significance value is > 0.05 then it is said that the two sample groups are homogeneous, if the significance value is <0.05, it is said that the two sample groups are not homogeneous. Based on the t-test with sig. (2-tailed) of 0.000 < 0.*

Keywords: Model Problem Based Instruction based RME, Learning Outcomes

1. INTRODUCTION

Education is one form of embodiment of dynamic human culture and has an important role in educating the life of the nation. Therefore, changes or developments in education are things that are supposed to happen in line with changes in the culture of life. The efforts made by the Indonesian government to advance the quality of education are by renewing the curriculum as well as the facilities and infrastructure that meet it. The current curriculum is the 2013 curriculum. The 2013 curriculum places more emphasis on aspects of knowledge, attitudes and skills.

The problem that occurs in learning mathematics to date is that students still feel lazy to study mathematics because they consider too many formulas.The difficulty of students in solving mathematical problems also depends on their understanding of mathematical concepts.

Based on the results of an interview with teacher Mutma'innah S.Pd on April 7 2022 homeroom teacher for class IV SDN Sumbersari 1 Bondowoso, learning by the teacher uses the lecture method of the jigsaw type learning model through a structured approach. The problem faced at school is the difficulty of students understanding story problems about fraction material. Students' ability to solve math problems is relatively low, students feel quickly bored with the jigsaw type learning model applied at SDN Sumbersari 1 Bondowoso. Given the important role of mathematics in the process of improving the quality of human resources, especially in Indonesia, there are efforts to improve the quality of learning mathematics. One method that is in accordance with the problems above is the instruction-based learning model.

Researchers chose the problem-based instruction learning model because in learning it helps students to process information in their minds, and compile their own knowledge about the social world. Problem based instruction learning is a learning model that is based on the principle of using problems as a starting point for the acquisition and integration of new knowledge (Trianto, 2008). Learning helps students to process information in their minds, and construct their own knowledge about the social world and so on.

The advantages of previous research are research(Margana, 2016)with the title "The Effect of Using the Problem Based Instruction Learning Model on Students' Mathematical Problem Solving Ability" obtained an average pre-test score in the experimental class of 8.65 while the achievement score of the control class was 8.29 with a difference of 0.36. The advantages of this learning model are that it emphasizes students to think creatively by associating new problems around the student's environment and involves the active role of students in working with other students in the problem solving process so that researchers are interested in replacing the previous conventional model used at SDN Sumbersari 1 Bondowoso.

Based on the background of the problems described above, the formulation of the problem in this study is whether there is an effect of applying the problem-based instruction model based on realistic math education on mathematics learning outcomes on the subject of arithmetic operations on fractional numbers for fourth grade students at Sumbersari 1 Sdn.

Based on the formulation of the problem that has been described, the purpose of the research is to reveal whether or not there is an effect of applying the problem-based instruction model based on realistic mathematics education on mathematics learning outcomes on the subject of arithmetic operations on fractional numbers for fourth grade students at SDN Sumbersari 1.

2. LITERATURE REVIEW

2.1 Learning Outcomes of Mathematics

Learning outcomes are changes in behavior based on learning outcomes in a broader scope, covering the cognitive, affective, and psychomotor fields. According to Nana Sudjana (2006: 22) says that learning outcomes are abilities possessed or mastered by students after receiving experience in their learning.

According to Freudental (Susanto, 2013: 189) mathematics is a human activity and must be related to reality. Thus, a logical way of thinking that is presented in numbers, space and form with existing rules and is inseparable from the individual's activities. In essence, mathematics cannot be separated from life, meaning that mathematics has practical uses in everyday life, many problems that require careful and thorough solutions inevitably have to turn to mathematics. One of the objectives of implementing the teaching and learning process in schools is to achieve student learning outcomes in the evaluation and observations made by the teacher towards students.

2.2 Problem Based Instruction Learning Model

The learning model kaffah can be interpreted as an object or concept that is used to represent something. Something that is real and converted to a more comprehensive form (Mayer, W..J., 1985:2). Problem Based Instruction is a learning model that is based on constructivist understanding to support student involvement in learning and authentic problem solving(Muah, 2016). Characteristics of Problem Based Instruction: problems are the main point, focusing on interdisciplinary interrelationships, problems challenging the knowledge possessed by students. The purpose of Problem Based Instruction: to help students develop thinking skills and problem solving skills, making students independent, learning the role of authentic adults.

The advantages of the Problem Based Instruction learning model: can challenge the abilities of students and also provide experience to discover new knowledge. After understanding, of course there are weaknesses, namely: in successful learning through problem solving requires sufficient time as preparation.

3. RESEARCH METHODS

The research design applied in this study was a Quasi-Experimental design with a "Non-Equivalent Control Group" experimental research pattern, namely to compare the results of educational program interventions in a similar control, but did not require exactly the same group. The research subjects in this study were all class IV of SDN Sumbersari 01 Bondowoso Regency, which numbered 48 students and respectively, namely class IVA consisting of 24 students and class IVB consisting of 24 students. These two classes were used as groups to be able to do research. The group will be tested for homogeneity before setting the research group. The purpose of the homogeneity test is to find out whether the sample is homogeneous or has the same ability.

Table. Homogeneity Test Results

Levene Statistics	df1	df2	Sig.
,681	1	46	,414

The results of the homogeneity test calculation in the table above show a significance value of 0.414. Significant results show greater than 0.414 > 0.05, so the two groups are declared homogeneous. Methods of data collection in this study using learning achievement tests, observation, documentation.

The instrument is said to be able to meet the validity requirements if the instrument can measure everything that should be measured. The validator was asked to provide an assessment of a score of 1-5 which is used to obtain an overview of the feasibility of the questions. Furthermore, the data above is calculated using the formula for the feasibility value of the instrument.

$$V_{valpro} = \frac{S_{rt}}{S_{mt}} \text{x} 100$$

$$V_{valpro} = \frac{59,9}{65} \text{x} 100$$

$$V_{valpro} = 92,1\% \ (Sangat\ Layak)$$

The calculation results above are adjusted to the table of instrument feasibility test criteria. The result is 92.1% and classified as "Very Eligible" criteria, so the test instrument is feasible to be tested on students.V_{valpro}

Based on the results of the validity test at SDN Sumbersari 1 in class IV, it can be seen from the 24 multiple choice items with 48 respondents that there are 3 invalid items, namely questions no. 19,22 and 24. In this study, it shows R table N = 48 = 0.284 with a significant 5% which is used as a reference in decision making.

The instrument reliability test in this study used the Test and Retest method. The researcher conducted two tests, in this case the first test was carried out and then the results were tabulated. Then in a few days the researcher re-tested with the same instruments and subjects, and the results were also tabulated. 0.433. Based on these results, it shows that the correlation results are greater than the r-table. Thus the instrument is said to be reliable. (Masyhud, 2014:303).

The data analysis technique used in this study was the t-test. Data analysis techniques were used to determine whether or not there was an influence between the experimental group and the control group after receiving treatment. The results of the two groups were then analyzed by comparing the mean values using the separate sample t () test.t_{test}

Calculate the t test using the Masyhud formula (2016: 382) as follows:

Analysis for hypothesis testing

$$t=\frac{M_2-M_1}{\sqrt{\frac{\sum x_1^2+\sum x_1^2}{N(N-1)}}}$$

Information :

M-₁ = Group mean value X-₁ (Experimental Group)

M-₂ = Average valueX-₂ group (Control Group)

X-₁ = Deviation of each value X-₁ from mean X-₁

X-₂ = Deviation of each value X-₂ from the mean X-₂

N = Number of research subjects/samples

To find out how much the level of relative effectiveness of mathematics learning outcomes taught using the problem based instruction learning model compared to being taught using conventional methods, it is necessary to calculate the level of relative effectiveness using the Masyhud formula (2016: 353) as follows:

$$ER=\frac{MX_1-MX_2}{\left(\frac{MX1+MX_2}{2}\right)}x100\%$$

Information :

ER = Relative level of effectiveness of an action compared to other actions

MX_1 = Mean or average value in the control class

MX_2 = Mean or average value in the Experiment class

4. RESULTS AND DISCUSSION

The data used in the t-test uses the difference value or the difference between the pre-test and post-test values that have been tested in class IVA and class IVB. The results of the t-test can be seen in Table 4.5 as follows.

Table 4.4 T-test results

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	df	Sig. (2-tailed)
Learning outcomes	Equal variances assumed	.242	.625	4,949	46	.000
	Equal variances not assumed			4,949	45,665	.000

The results of the analysis of the t-test using the Independent Samples Test on the Equal variances assumed section show that the sig. (2-tailed) of 0.000 <0.05, as a basis for decision making in the independent samples t-test it can be concluded that Ha stated that there was a significant difference between classes taught using the Problem Based Instruction model based on realistic mathematics education and the model taught to use the jigsaw type on the results of learning mathematics on the subject of arithmetic operations on fractions for class IV SDN Sumbersari 1 Bondowoso.

The average comparison of student learning outcomes, namely the experimental class is better than the control class, because the experimental class is given a treatment using the problem based instruction learning model with an average result of 24.58 while the control class is not given treatment which only uses the conventional type method jigsaw with an average value of 14.50.

Statistical analysis of the t-test was used to answer the problems formulated in this study. The calculation of the t-test was carried out with the help of the SPSS application.

Based on the calculation results, it was obtained that the average value of the difference between pre-test and post-test in the experimental class was 24.58 while the control class obtained an average of 14.50. The results of calculations with the help of the SPSS application obtained a t-count value of 4.949 while for the t-table value at a significance level of 5% two tailed test with a df of 46, a t-table of 2.012 was obtained.

Based on this analysis, t-count > t-table (4.949 > 2.012) is obtained, thus the alternative hypothesis () is accepted and the null hypothesis () is rejected. So the result of testing the hypothesis is that there is a significant difference between classes taught using the Problem Based Instruction model based on realistic math education and models taught using the jigsaw type on mathematics learning outcomes on the subject of arithmetic operations on fractional numbers in class IV SDN Sumbersari 1 Bondowoso.$H_a H_0$

After knowing the results of the t-test, it is necessary to carry out a relative effectiveness test to find out how much the level of relative effectiveness of mathematics learning outcomes taught using the problem based instruction model is compared to those taught using the jigsaw type method. In calculating the relative effectiveness test using the following formula.

$$ER=\frac{mx_2-mx_1}{\left(\frac{mx_1+mx_2}{2}\right)}\text{ x }100\%$$

$$ER=\frac{24,58-14,50}{\left(\frac{24,58+14,50}{2}\right)}x100\%$$

$$ER=\frac{10,08}{19,54}\text{ x }100\%$$

$$ER=0,5158\text{ x }100\%$$

ER = 51.58 %

The results of the relative effectiveness test, namely obtaining an ER value of 51.58% where the result of this value is a medium effectiveness criterion, so that the conclusion from the learning outcomes of experimental class students namely class IVA which is given a treatment of the Problem Based Instruction model shows learning outcomes more effective 51.58% compared to with the learning outcomes of students in the control class, namely class IVB, which only uses conventional jigsaw type learning.

Student learning outcomes outside the Problem Based Instruction learning modelbased on realistic mathematics education with fraction material of 48.42% obtained from other factors outside the model*Problem Based Instruction.*The existence of a positive influence on student learning outcomes is influenced by learning outcomes factors. According to Slameto (2016: 54) the factors that influence learning outcomes are divided into two, namely: internal factors and external factors. Learning with the Problem Based Instruction model based on realistic math education the level of effectiveness can be increased from medium to high category by taking into account other factors that affect student learning outcomes. In this research, the factors that influence learning outcomes are internal factors including: intelligence, interest, and attention, learning motivation, perseverance, attitudes, study habits, and physical and health conditions. External factors that influence student learning outcomes are parental attention, family circumstances, and the Problem Based Instruction model based on realistic math education. encourage students to be more active in higher-order thinking than classes that do not apply this model during learning.

5. CONCLUSION

From the results of the research analysis, hypothesis testing and discussion, it can be seen that there is a difference in the pre-test and post-test scores and the results of the t-test with a sig. (2-tailed) of 0.000 <0.05 so that the alternative hypothesis () is accepted and the null hypothesis () is rejected, stating that there is an effect of applying the problem-based instruction model based on realistic math education on the results of learning mathematics on the subject of arithmetic operations on fractional numbers for class IV SDN students Sumbersari 1. The average score for the experimental class is 24.58, while for the control class it is 14.50, so the average score for the experimental class is better than that of the control class.$H_a H_0$

6. BIBLIOGRAPHY

[1] Al-Tabany, Trianto Ibn Badr. 2014. Designing Innovative, Progressive, and Contextual Learning Models. Surabaya : DATE

[2] Dwij, P. 2017. Building Student Character Through the Problem Based Instruction Learning Model Assisted by LKS with a Scientific Approach to Heat Matter and Changes in Form. UPEJ Unnes Physics Education Journal, 6(2), 64–73.https://doi.org/10.15294/upej.v6i2.16077

[3] Fatona, Fh, Hartono, Y, et al. 2019. The Effect of the Problem Based Instruction (PBI) Learning Model on Mathematical Problem Solving Ability. Journal of Mathematical Innovation (Inomatics). 1(2):144-151.

[4] Hadi, Khairil, and Neka Vidarma Susanti. 2017. The Effect of the Problem Based Instruction (Pbi) Learning Model on Student Learning Outcomes in the Material of the Human Digestive System in Class VIII of SMP Negeri 2 Meureubo. 4(1), 46–55.

[5] Haryanti, Susi, and Arnida Sari. 2019. The Effect of Applying the Problem Based Instruction Model on Mathematical Problem Solving Ability in View of. 2(1), 77–87.

[6] Indriyani, PI, Sunita NW 2019. The Effect of the Problem Based Instruction (PBI) Learning Model on Creativity and Mathematics Learning Outcomes for the 2018/2019 Academic Year. Jurnal Emasains: Journal of Mathematics and Science Education. 8(2), 186-195.

[7] Khairi, Nidaul Husna. 2018. The Effect of the Problem Based Instruction (PBI) Learning Model on Students' Mathematics Learning Outcomes in Sequences and Sequences Material in Class IX MTS Muallimin UNIVA Medan TP 2017/2018. Journal of Mathematics Education FITK North Sumatra, (5), 31-42.

[8] Margana, A. 2016. The Effect of Using Problem Based Instruction Learning Models on Students' Mathematical Problem Solving Ability. Journal of Mathematics Education STKIP Garut, (5), 18–25.

[9] Masyhud, M. Sulthon. 2014. Educational Research Methods (4th Edition). Jember : Educational Management and Professional Development Institute (LPMPK)

[10] Muah, T. 2016. The Use of the Problem Based Instruction (PBI) Learning Model to Increase the Activeness and Mathematics Learning Outcomes of Class 9B Students in Odd Semester 2014/2015 Academic Year, SMP Negeri 2 Tuntang-Semarang. Scholaria : Journal of Education and Culture, 6(1), 41.https://doi.org/10.24246/j.scholaria.2016.v6.i1.p41-53

[11] Muh.Nurhidayat A. 2019. The Effect of Applying the Problem Based Instruction (Pbi) Learning Model on the Learning Outcomes of Grade VII Students in View of Logical-Mathematical Intelligence at Mts. As'adiyah Kampiri Kab. Wajo.

[12] Normalita, Santi. 2017. Analysis of the Difficulty of Solving Math Problems in the Form of Fractions Material Stories in Class IV Public Elementary Schools in the Imam Bonjl Cluster, Tegal City. Tegal : Semarang State University.

[13] Pardomuan NJM Sinambela, M.Pd. 2008. Determinants of Learning Effectiveness in Problem Based Learning Models (Problem Based Instruction). Journal of Campus Generations 1(2), 74–85

[14] Permatasary, Yuni et al. 2018. The Effect of the Problem Based Instruction Learning Model on Learning Outcomes in View of Student Learning Styles. Journal of Science Education Research (4), 56-58.

[15] Putri, REM 2021. Meta-Analysis of the Effectiveness of the PBI (Problem Based Instruction) Learning Model in Mathematics at the Elementary School Level. Scientific Journal of Educational Forum. 7(4): 519-525.https://jurnal.peneliti.net/index.php/JIWP

[16] Rayana, Nurdalilah, Lubis, SS 2022. THE EFFECT OF THE PROBLEM-BASED INTRUCTION (PBI) LEARNING MODEL ON STUDENTS' MATHEMATICS LEARNING OUTCOMES IN THE SUBJECT OF LINEAR EQUATIONS OF ONE VARIABLE. JURNAL MathEdu (Mathematic Education Journal). 5(2), 44-50.http://journal.ipts.ac.id/index.php/MathEdu

[17] Suhita. 2019. Analysis of Mathematical Critical Thinking: The Impact of the Problem Based Instruction Learning Model. Journal of Mathematics, (2), 189-195.

[18] Yulia, P & Dewi, EK 2018. The Effectiveness of the Tai and Pbi Learning Models on the Mathematics Learning Outcomes of Grade VIII Students. Journal PYTHAGORAS. 7(2):42-4