The Role of Problem-Based Learning Using Google Meets in Fraction Materials to Understanding Basic School Mathematics

Sanusi[1], and Sufyani Prabawanto[2]✉

[1] Departmen Pendidikan Dasar, Sekolah Pascasarjana Universitas Pendidikan Indonesia
[2] Departemen Pendidikan Matematika, FPMIPA, Universitas Pendidikan Indonesia

sanusi1974@upi.edu; ✉sufyani@upi.edu

Abstract: This research is motivated by the low ability to understand mathematical problems to fraction material in elementary schools. The purpose of this study was to determine whether there is a difference in the ability of students to understand mathematical problems between the class using the Problem Based Learning model and the class using conventional methods. The research method used was quasi-experimental with a pretest-posttest control group design. The population of the study was class IV in one of the SD Jatisari with a sample of class IVA and IVC class students. The sampling technique used is purposive sampling. The instrument used was a test of the ability to understand the problem given before and after the treatment. The data analysis used is descriptive statistics and inferential statistics. Based on the results of the research, the experimental class value is classified as moderate, consisting of the N-gain score and the N-gain average, and the average value of the control class is classified as low. And the results of the t-test with a confidence level of 95% indicate a difference in the ability of students to understand mathematical problems between the experimental class using the Problem Based Learning model and the control class using conventional learning methods. It takes an understanding of mathematical concepts to be able to solve problem-solving skills.

Keywords: Mathematical Problem Understanding Ability, Problem Based Learning (PBL) Learning Model, Conventional Learning Method.

How to Cite: Sanusi, S. & Prabawanto, S. (2021). The Role of Problem-Based Learning Using Google Meets in Fraction Materials to Understanding Basic School Mathematics. *The 3rd International Conference on Elementary Education*, *3*(1). 334-341.

INTRODUCTION

21st-century learning is learning that leads to 4C which contains Communication, Collaboration, Critical Thinking, and Problem Solving and Creativity and Innovation (Rahman et al., 2018). Problem-solving is an interesting learning model to explore in teaching and learning activities, especially in elementary schools, problem solving is the ability to discuss, connect between concepts and connect concepts with other fields (Maulyda et al., 2019). This discussion ability is applied to improve speaking skills, especially as a form of action as a provision for students to undertake studies in the next class (Susanti, 2014). The ability to connect between concepts is needed because connecting concepts in mathematics is an important part that must be emphasized at every level of education (Maisyarah & Surya, 2017). Also, the ability to connect mathematics with other concepts due to the connection between mathematics and other fields will not be abandoned as a separate part but is used as a new concept in understanding knowledge (Maisyarah & Surya, 2017).

The ability of students to solve mathematical problems is one of the objectives of learning mathematics which is contained in the Standard Content of Permendiknas Number 20 of 2006 (Putri et al., 2020). Students' ability to solve problems includes the ability to understand problems, design mathematical models. Solving problems that include the ability to understand problems, designing mathematical models, solving models, and interpreting the solutions obtained is one of the goals in learning mathematics in elementary school because problem-based learning methods encourage students to think creatively in the learning process and can make students retain or store more knowledge. long compared to traditional classes, (Zuliana, 2015).

In the era of globalization, teachers have an important role in the development of education in Indonesia. The activity of students in learning is much lower than that of the teacher (Tarigan, 2014), this argues that: (1) Students are not included in the learning process, but the teacher explains more about the learning material so that learning becomes boring; (2) Mathematics is a difficult subject to understand because it studies abstract ideas or concepts; (3) Teachers do not motivate students to be active when participating in mathematics learning in class. (Parjayanti and Wardono, 2012).

Teachers have an important role in the development of education in Indonesia. It is spelled out in Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System Chapter I Article I state that: Education is defined as a conscious and planned effort to create an atmosphere of learning and student processes so that students actively develop their potential to have religious-spiritual strength, self-control, personality, intelligence, noble character and skills needed by themselves, society, nation, and state. In this case, of course, a professional teacher is needed. (Sumiati, 2018). In the era of globalization, teachers have professional requirements to create professional profiles of Indonesian teachers in the 21st century, namely; (1) Has a developed and mature personality; (2) Sufficient scientific mastery; (3) Skilled in arousing students in science and technology; and (4) Continuously in professional development (Desilawati, 2014). These four aspects constitute a complete unity that cannot be separated and added to by other efforts that influence the development of the professional teaching profession. This is related to the current shortage of teachers, please explain first the ideal teacher that must exist in the era of globalization besides that, the learning that is conveyed by the teacher is less related to the daily life of students. Teachers have not applied meaningful learning to students, students only listen, take notes, and memorize, so that students are not active and creative in solving math problems resulting in the low achievement of mathematics learning outcomes. This is due to the quality of education, so educators are required to be able to adjust competencies in learning according to these developments, one of which is competence in learning mathematics. (Yelvalinda et al., 2019). Creativity and the ability to carry out reforms in the 21st century is needed to increase the competence of a decent life (Rini & Wasitohadi, 2020). A teacher needs creativity in the learning process in the classroom so that students can think critically and dare to express their ideas and ideas, and students want to show or demonstrate their understanding of important topics in the curriculum in their way. (Pentury, 2017). To improve the competence of a decent life, improving the quality of education is a process of developing the talents of customers (students), evaluating the educational process that increases the need to achieve, and at the same time meet the accountability standards set by clients (stakeholders) for processes or outputs. in education (Muzakir, 2013). Besides, educators are also required to be able to adjust the learning competencies needed. Competent educators will be better able to create an effective, fun learning environment, and will be better able to manage the class so that the process of student teaching and learning activities will be more optimal (Novauli. M, 2015).

According to Karunia (2015, p. 81) says: Understanding mathematical concepts is an ability related to understanding comprehensive and functional mathematical ideas. Understanding the concept is much more important than memorizing. Therefore, do not be mistaken in providing explanations to students. Because a little wrong has an impact on students who will not understand it (Karunia & Mulyono, 2016). According to Fahrudin et al., in Rahayu (2012, p. 11) "conceptual understanding is an action and situation of a class or category, which has general characteristics that it knows in mathematics". Meanwhile, according to (Fitri & Sari, 2017) in Susanto (2013, p. 10) "understanding the concept is the ability to explain a situation with different words and can interpret or conclude from an image and so on". In the discussion of this article, the author raises the material of fractions, because shards of material require a lot of understanding. This time, many students misunderstood problems related to fraction material, in learning many students were found confused in assembling concepts in the form of symbols to solve fraction problems (Permadi & Irawan, 2016). For example, in presenting the problem of understanding the problem of adding and subtracting fraction numbers, some of the students were fixated on the fraction symbol but did not understand the meaning of the problem. This results in difficulties for students when answering questions on understanding the problem of fractions.

METHOD

The research method used was a quasi-experimental method with a nonequivalent pretest-posttest control group design. The study population was class IV in an SD Jatisari District. The sampling technique used was purposive sampling. The selection of classes IVA and IVC as samples is based on considerations that do not have a significant difference based on the t-test with the average value of initial basic mathematics abilities. To make a comparison the selection of the two classes will be the control and experimental class. Students in class IVA 15 students as the experimental class and class IVC 14 students as the control class, so the sample is 29 students. The written test is an instrument used to collect data. The experimental class and the control class were given tests of mathematical problem-solving abilities, before treatment (pretest) and after treatment (posttest), as many as 10 multiple-choice questions. The instrument used as a pre-test and post-test item was prioritized by the expert judgment by elementary school math expert teachers in the field of mathematics education as many as 10 items, and tested for validity, reliability, distinguishing power, and difficulty level to determine the feasibility of the questions. (Widodo & Kartikasari, 2017).

According to Netriwati in Polya (1973) indicators of problem-solving abilities that are measured are: Understand the problem, devise a resolution plan, carry out the completion plan, and review the steps for completion. Meanwhile, according to Widodo & Kartikasari in Sumaryanta (2015) the guidelines for scoring students' mathematical problem-solving abilities are as follows:

Table 1. Guidelines for Scoring the Ability to Understand Mathematical Problems

Indicators of the ability to understand mathematical problems	0	1	2
Understand the problem	Do not understand	Lack of understanding	Understanding
Formulate problem-solving	Not able to formulate a solution	Able to formulate solutions to problems, but imprecise	Able to formulate solutions appropriately
Carry out problem-solving	Not able to carry out problem-solving	Not able to carry out problem-solving	Able to carry out problem-solving
Make conclusions (re-examine)	Incapable of making any conclusions	Capable of making conclusions, but not quite right	Be able to make conclusions

The results of the pretest and posttest, processed and analyzed by the formulation of the problem using descriptive statistics and inferential statistics. Descriptive statistics are data processing used to analyze data by describing or describing the data that has been collected. Descriptive statistics consist of average, minimum score, maximum score, standard deviation, and variance, while inferential statistics are data processing used to analyze data by making generalizations on sample data so that the results can be used in the population. Inferential statistics consists of parametric and non-parametric statistics. Parametric statistics are statistics used to test the normality and homogeneity of data. Meanwhile, non-parametric statistics are as broad as statistics that are used when one of the data or both is not normal or homogeneous (Ruseffendi, 1998). The final result of this research analysis can answer the problem formulation and research hypothesis.

RESULTS and DISCUSSION

Description of Research Data

Pretest, posttest, N-gain data were analyzed using descriptive statistics, this is to answer the first problem formulation, namely "how to describe learning outcomes between classes that apply the Problem Based Learning (PBL) learning model. and a class that applies conventional methods? " To answer this, the data calculation of the pretest score and the posttest score of the students' mathematical problem-solving abilities in the experimental class and the control class was used as well as an increase in the pretest-posttest score (N-gain).

To find out the initial ability of students' mathematical problem solving, a test was carried out on the two-sample classes by giving pretest questions. The results of the test are:

Table 2. Descriptive Statistics of the Recapitulation of Pretest Results

Class	N	Minimum	Maximum	Mean	Std. Deviation
Experiment	15	15	30	23.67	4.419
Control	14	15	30	22.14	4.258
Valid N (listwise)	14				

The calculation of these results shows that the average pretest score for the experimental class was 23.67 and the average for the control class was 22.14. From the average pretest results, the experimental class was higher than the control class by a difference of 1.53.

After pretesting the two classes, the experimental class was treated with the Problem Based Learning model and the control class with conventional methods. Learning is carried out online (google meet) with an allocation of 3 hours of lessons (3 x 35 minutes) then students are given posttest questions to determine the ability of students to understand mathematical problems after being given treatment. In table 3 are the results of the posttest descriptive statistical calculation of the experimental class and control class students.

Table 3. Descriptive Statistics of Posttest Result Recapitulation

Class	N	Minimum	Maximum	Mean	Std. Deviation
Experiment	15	70	90	82.33	5.627
Control	14	35	50	43.21	5.041
Valid N (listwise)	14				

Based on the results of the above calculations, it is known that the experimental average value is 82.33 and the average value for the control class is 43.21. The average value indicates that the experimental class is higher than the control class with a difference of 39.12. The increase in the pretest and posttest scores of the experimental class and control class can be seen in Figure 1.

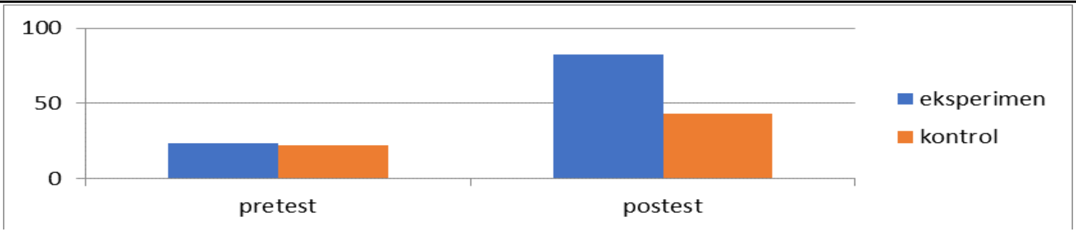

Figure 1. Diagram of the Improvement of Mathematical Problem Understanding Ability based on the Pretest and Posttest Scores

The picture above shows the difference and increase seen from the average value. The difference between the posttest and pretest mean scores of the experimental class was 58.66, while the difference between the posttest and pretest mean scores of the control class was 21.07. There was an increase because students began to understand the steps of working on the problem of understanding mathematical problems.

Table 4. Descriptive Statistics of N-Gain Result Recapitulation

Class	N	Minimum	Maximum	Mean
Experiment	15	64.71	85.71	77.15
Control	14	29.41	42.86	27.16
Valid N (listwise)	14			

Based on the table above the average value of N-Gain in the experimental class is 77.15 or in percent 0.77 shows the criteria for high improvement and the N-Gain average value for the control class is 27.16 or 0.27 percent shows the criteria for the low increase. The difference in the average value of the N-Gain score for the experimental class and the control class is 49.99 or 0.50 percent. The incremental difference between the pretest and posttest scores in the control class is not much different, but the comparison between the experimental class and the control class has a higher increase.

Differences in Students' Mathematical Problem Understanding Ability

The statistical calculation of the independent sample t-test can answer the second problem formulation, namely, "Is there a significant difference in the students' ability to understand mathematical problems between classes using the Problem Based Learning (PBL) learning model and those using conventional methods?" To answer the second problem formulation, the mean difference test was carried out on the pretest, posttest, and N-gain score data of students' mathematical problem-solving abilities in the experimental class and the control class.

Table 5. Group Statistics *Posttest*

	Group	N	Mean	Std. Deviation	Std. Error Mean
Learning outcomes	Experiment	15	82.3333	5.62731	1.45297
	Control	14	43.2143	5.04104	1.34727

Based on the Group Statistics Pretest output table above, it is known that the amount of data on learning outcomes for the experiment was 15 students, while for Control was 14 students. Then the average value of student learning outcomes for the Experiment was 82.33, while for Control was 43.21. Thus, statistically descriptive, it can be concluded that the average student learning outcomes between Experiment and Control are different. Furthermore, to prove whether these differences are significant or not, it is necessary to interpret the following "Independent Simples Test" output;

Table 6. Independent Samples Test *Posttest*

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Learning outcomes	Equal variances assumed	0.108	0.744	19.665	27	0.000	3.911.905	198.926	3.503.743	4.320.067
	Equal variances not assumed			19.742	26.960	0.000	3.911.905	198.148	3.505.311	4.318.499

Based on the output above the sig value. Levene's Test for Equality of Variances is 0.744 > 0.05, so it can be interpreted that the data variant between Experiment and Control is humogen, according to Dari & Manusia in (V. Wiratna Sujarweni, 2014). So that the interpretation of the Independent Samples Test output table above is guided by the value contained in the "Equal variances assumed". Thus, it can be concluded that there is a significant difference between the average student learning outcomes in the experimental class and the control class. Furthermore, from the output table above, it is known that the value of "Mean Difference" is 39.11905, this value shows the difference between the average student learning outcomes in the Experiment class and the Control class (results from 82.3333 - 43.2143) and the difference between these differences is 35.03743 to 43.20067 (95 % Confidence Interval of the Difference). Thus, the value of t count > t table is 19,665 > 2,052 then H0 is rejected and Ha is accepted, which means that there is a difference in the average student learning outcomes between Experiments using the Problem Based Learning (PBL) learning model which is very well applied compared to controls using learning. Conventional.

CONCLUSION

Based on the processing of research results through data using descriptive statistics and inferential statistics as well as discussion of the results of research that has been carried out regarding the role of problem-based learning using google meet on fraction material on elementary school mathematics understanding, it is concluded that The description of learning outcomes is higher in the experimental class using the Problem Based Learning (PBL) learning model than the control class using conventional methods can be seen in the pretest mean score of the experimental class 23.67 is almost the same as the control class average score of 22.14; The posttest means a score of the experimental class 82.33 is greater than the control class average value of 43.21; And the average value of N-Gain in the experimental class is 0.77 greater than the control class average value of 0.27. There is a significant difference in the students' ability to understand mathematical problems, between the Problem Based Learning (PBL) learning model in the experimental class and conventional method learning in the control class, which can be seen from the results of the independent t-test, namely; In the Independent Samples Test Posttest, the value of t count > t table is 19,665 > 2,052 then H0 is rejected and Ha is accepted.

REFERENCES

Dari, D., & Manusia, G. (2019). *Perbedaan Konsep Matematika Dan Pengetahuan*. *1*(1).

Desilawati, A. (2014). Guru Profesional di Era Global. *Jurnal Pengabdian Kepada Masyarakat*, *20*(77), 1–4. https://jurnal.unimed.ac.id/2012/index.php/jpkm/article/viewFile/3415/3067

Fahrudin, A. G., Zuliana, E., & Bintoro, H. S. (2018). Peningkatan Pemahaman Konsep Matematika melalui Realistic Mathematic Education Berbantu Alat Peraga Bongpas. *ANARGYA: Jurnal Ilmiah Pendidikan Matematika*, *1*(1), 14–20. https://doi.org/10.24176/anargya.v1i1.2280

Fitri, E., & Sari, P. (2017). Pengaruh K Emampuan P Emahaman K Onsep M Atematika. *Jurnal Mosharafa, 6*(2), 25–34.

Karunia, E. P., & Mulyono. (2016). Analisis kemampuan pemahaman konsep siswa kelas VII berdasarkan gaya belajar dalam model knisley. *Prosiding Seminar Nasional Matematika*, 339. https://doi.org/10.1016/j.ijmecsci.2014.08.026

Maisyarah, R., & Surya, E. (2017). Kemampuan Koneksi Matematis (Connecting Mathematics Ability) Siswa dalam Kemampuan Koneksi Matematis (Connecting Mathematics Ability) Siswa dalam Menyelesaikan Masalah Matematika. *Jurnal Pendidikan Matematika*, *2*(1), 0–8.

Maulyda, M. A., Hidayati, V. R., Rosyidah, A. N. K., & Nurmawanti, I. (2019). Problem-solving ability of primary school teachers based on Polya's method in Mataram City. *Pythagoras: Jurnal Pendidikan Matematika*, *14*(2), 139–149. https://doi.org/10.21831/pg.v14i2.28686

Netriwati. (2016). Analisis Kemampuan Pemecahan Masalah Matetamtis Berdasarkan Teori Polya Ditinjau dari Pengetahuan Awal Mahasiswa IAIN Raden Intan Lampung. *Jurnal Pendidikan Matematika*, *7*(9), 181–190.

Novauli. M, F. (2015). Kompetensi Guru Dalam Peningkatan Prestasi Belajar Pada Smp Negeri Dalam Kota Banda Aceh. *Jurnal Administrasi Pendidikan : Program Pascasarjana Unsyiah*, *3*(1), 45–67.

Pentury, H. J. (2017). Pengembangan Kreativitas Guru. *Faktor Jurnal Ilmiah Kependidikan*, *4*(3), 265–272.

Permadi, W., & Irawan, E. (2016). Memahamkan Konsep Pecahan pada Siswa Kelas IV Sdn Sumberejo 03 Kabupaten Malang. *Jurnal Pendidikan - Teori, Penelitian, Dan Pengembangan*, *1*(9), 1735–1738. https://doi.org/10.17977/jp.v1i9.6740

Prof . H. E. T. Ruseffendi, S. (1998). *Statistika Dasar untuk Penelitian Pendidikan.* Bandung.

Rahman, F., Yurniwati, Y., & Bintoro, T. (2018). Pengaruh Model Problem Based Learning (PBL) terhadap Kemampuan Pemecahan Masalah Matematika ditinjau dari Metakognisi Belajar Siswa Sekolah Dasar. *Indonesian Journal of Primary Education*. https://doi.org/10.17509/ijpe.v2i1.11648

Rini, D. S., & Wasitohadi, W. (2020). The Effect of Problem Based Learning Model And Discovery Learning Toward Problem Solving Skills in Mathematic of Grade 5 Elementary. In *Primary: Jurnal Pendidikan Guru Sekolah Dasar*. https://doi.org/10.33578/JPFKIP.V9I2.7890

Subakthi Putri, I. P., Dantes, N., & Suranata, K. (2020). Model Pembelajaran Quantum Teaching Tipe TANDUR Berbantuan Permainan Tradisional Terhadap Hasil Belajar IPA. *Jurnal Ilmiah Sekolah Dasar*.

Sujana, A., & Sopandi, W. (2018). *Model-model Pembelajaran Inovatif.* Bandung: UPI Press.

Sumiati, S. (2018). Peranan Guru Kelas Dalam Meningkatkan Motivasi Belajar Siswa. *TARBAWI : Jurnal Pendidikan Agama Islam*, *3*(02), 145–164. https://doi.org/10.26618/jtw.v3i02.1599

Susanti. (2014). Penerapan Metode Diskusi Dalam Meningkatkan Kemampuan Berbicara Siswa Kelas IV SDN Ogogili. *Jurnal Kreatif Tadulako Online*, *4*(8), 159–172. http://jurnal.untad.ac.id/jurnal/index.php/JKTO/article/view/3390

Tarigan, D. (2014). Meningkatkan Aktivitas Belajar Siswa dengan Menggunakan Model Make A Match Pada Mata Pelajaran Matematika di Kelas V SDN 050687 Sawit Seberang. *Kreano: Jurnal Matematika Kreatif-Inovatif*, *5*(1), 56–62. https://doi.org/10.15294/kreano.v5i1.327

Ully Muzakir. (2013). Manajemen Peningkatan Mutu Pendidikan Tinggi. *Visipena Journal*, *4*(2), 130–145. https://doi.org/10.46244/visipena.v4i2.218

Widodo, S., & Kartikasari, K. (2017). Pembelajaran Pemecahan Masalah Matematis Siswa Sekolah Dasar dengan Model Creative Ppoblem Solving (CPS). *PRISMA*. https://doi.org/10.35194/jp.v6i1.28

Yelvalinda, Y., Pujiastuti, H., & Fatah, A. (2019). Pengaruh Model Pembelajaran Problem Based Learning terhadap Pemahaman Matematis Ditinjau dari Kemampuan Awal Matematika. *Edumatica : Jurnal Pendidikan Matematika*. https://doi.org/10.22437/edumatica.v9i1.6108.

Zuliana, E. (2015). Pengaruh Model Problem Based Learning Berbantuan Kartu Masalah Terhadap Kemampuan Pemecahan Masalah Matematika Siswa Sekolah Dasar. *REFLEKSI EDUKATIKA*. https://doi.org/10.24176/re.v5i1.440