

THE EFFECT OF *THE PROBLEM BASED LEARNING MODEL* ON LEARNING ACTIVITIES AND MATHEMATICS LEARNING OUTCOMES OF GRADE IV STUDENTS OF SDN 03 KOTO BALINGKA WEST PASAMAN

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Abstract

This research is based on the low learning activities and mathematics learning outcomes of grade IV students of SDN 03 Koto Balingka West Pasaman. The learning process that is still teacher-centered causes students to be less active, less cooperative, and have difficulty understanding mathematical concepts. One of the efforts that can be made to overcome these problems is to apply the Problem Based Learning (PBL) learning model. This study aims to determine the influence of the Problem Based Learning model on learning activities and mathematics learning outcomes of grade IV students of SDN 03 Koto Balingka West Pasaman. This study uses a quantitative approach with a quasi-experimental type of research using a posttest-only control design. The research population was all grade IV students of SDN 03 Koto Balingka West Pasaman, with the sample consisting of experimental classes that applied the Problem Based Learning model and control classes that used conventional learning. Data on student learning activities was obtained through observation sheets, while data on learning outcomes was obtained through mathematics learning outcome tests. The data obtained was analyzed using statistical analysis techniques to see the difference in learning activities and learning outcomes between the experimental class and the control class. The results of the study show that (1) there is an influence of the Problem Based Learning learning model on activities in mathematics learning in grade IV of elementary school. (2) there is an influence of the Problem Based Learning model on student learning outcomes in mathematics learning in grade IV of elementary school; (3) there is a relationship between activities and student learning outcomes using the Problem Based Learning learning model in mathematics learning in grade IV of elementary school.

Keywords: Problem Based Learning, Learning Activities, Learning Outcomes, Mathematics, Elementary School



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INTRODUCTION

According to Law No. 20 of 2003, education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, control, personality, intelligence, noble morals, and the skills needed by themselves, society, nation and state.¹ The purpose and function of national education described in article 3 is to develop maturity and form the character and civilization of the nation in order to educate the life of the nation, aiming to develop the potential of students to become human beings who believe and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens.

Education has a very important role in shaping a person's character.² A good education will lead a person to become a competent and innovative person and vice versa. The role of education in humans is when problems, benefits and everything related to them can be addressed wisely and wisely and critically in various subjects taught, especially in Mathematics education.³ Through a planned and systematic educational process, students are expected to be able to develop their cognitive, affective, and psychomotor potential optimally. In the context of basic education, mathematics learning has a strategic role because it not only emphasizes mastery of concepts and procedures, but also trains logical, critical, systematic, and creative thinking skills.⁴ Mathematics is an important foundation for mastering science and technology as well as problem-solving skills in daily life.⁵

However, the reality on the ground shows that mathematics learning in elementary schools still faces various problems. The learning process is often teacher-centered, where the teacher is more dominant in explaining the material while students tend to passively receive information. This learning pattern has an impact on low student learning activities, lack of involvement in the learning process, and learning outcomes that have not reached optimal completion.⁶ Low learning activities can be seen from the lack of student participation in asking questions, expressing opinions, discussing, and solving problems independently. This condition

¹ Muh Akhyar Syam et al., "Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Operasi Bilangan," *Pendas : Jurnal Ilmiah Pendidikan Dasar* 10, no. 3 (2025).

² Sabrina Mufida, "Peran Guru Dalam Pembentukan Karakter Siswa," *JURNAL MEDIA AKADEMIK (JMA)* 2, no. 6 (2024), <https://doi.org/10.62281>.

³ Maxinus Jaeng, "Pendidikan Karakter Melalui Pendidikan Matematika," *AKSIOMA Jurnal Pendidikan Matematika* 5, no. 3 (2016).

⁴ Neneng Mutmainnah et al., "Peran Logika Untuk Membangun Kemampuan Siswa Smpn 2 Labuapi Dalam Berpikir Kritis," *Pendas : Jurnal Ilmiah Pendidikan Dasar* 10, no. 01 (2025).

⁵ Yusuf Safari and Pina Nurhida, "Pentingnya Pemahaman Konsep Dasar Matematika Dalam Pembelajaran Matematika," *Karimah Tauhid* 3, no. 9 (2024).

⁶ Abigael Simbolon et al., "Pengaruh Metode Pembelajaran Yang Berpusat Pada Guru Dalam Proses Pembelajaran Siswa," *JHIC: JURNAL INTELEK INSAN CENDIKIA* 2, no. 11 (2025), <https://jicnusantara.com/index.php/jiic>.

ultimately has implications for low understanding of concepts and achievement of mathematics learning outcomes.

Based on initial observations made in grade IV of SDN 03 Koto Balingka, West Pasaman Regency, it was found that most students still had difficulties in understanding mathematics concepts in depth. Students tend to memorize formulas without understanding their meaning and application in a real context. In addition, student involvement in the learning process is still limited, so learning does not fully reflect an active, innovative, creative, effective, and fun process. The results of the daily test show that there are still students who get scores below the Minimum Completeness Criteria (KKM), which indicates the need for innovation in the learning process. The mathematics learning results obtained are low, that is, there are students who have not completed it, this can be seen from the following table:

Table 1. Recapitulation of mathematics learning results in the daily test of grade IV SDN 03 Koto Balingka West Pasaman in the 2024/2025 school year

No	Classes	Number of Students	KKM	Completeness			
				completed	Persentase (%)	Incomplete	Persentase (%)
1	IV A	24	75	10	42%	14	58%
2	IV B	24	75	11	46%	13	54%
Quantity		48		21		27	

Source: Teachers of grades IVA and IVB of SDN 03 Koto Balingka West Pasaman

So far, the learning model that is mostly used by teachers in schools is conventional learning, namely learning with lecture methods and written assignments, so that students become bored and less interested in taking lessons. The same thing happened to the fourth grade students of SDN 03 Koto Balingka. Therefore, learning mathematics in the classroom becomes less effective learning.

One of the alternative learning models that can be applied to overcome these problems is the Problem Based Learning (PBL) model. The PBL model is a learning model that is oriented towards real problems as the starting point of learning, so that students are encouraged to actively seek, process, and find solutions through critical thinking processes and group cooperation.⁷ In PBL, teachers play the role of facilitators who guide students in identifying problems, formulating

⁷ Nurul Yuli Rachmawati and Brilliant Rosy, "Pengaruh Model Pembelajaran Problem Based Learning (PBL) terhadap Kemampuan Berpikir Kritis dan Pemecahan Masalah pada Mata Pelajaran Administrasi Umum Kelas X OTKP di SMK Negeri 10 Surabaya," *Jurnal Pendidikan Administrasi Perkantoran (JPAP)* 9, no. 2 (2020), <https://doi.org/10.26740/jpap.v9n2.p246-259>.

hypotheses, collecting data, analyzing information, and drawing conclusions.⁸ Thus, students not only acquire knowledge conceptually, but also develop higher order thinking skills.

The application of PBL in mathematics learning is very relevant because of the characteristics of mathematics that are closely related to problem solving. Through the presentation of contextual problems that are close to students' lives, learning becomes more meaningful (meaningful learning).⁹ Students are encouraged to actively discuss, ask questions, put forward ideas, and present the results of group work. These activities can directly increase student learning activities both physically and mentally. In addition, active involvement in the problem-solving process has the potential to improve students' understanding of concepts and learning outcomes.¹⁰

Theoretically, the PBL model is based on the theory of constructivism which states that knowledge is built by students themselves through experience and interaction with the environment.¹¹ Learning is no longer seen as a process of transferring information from teachers to students, but as an active process of building meaning. Therefore, the implementation of PBL is expected to be able to create a more interactive and collaborative learning atmosphere, so that students become active subjects in the learning process.

Several previous studies have also shown that the application of the PBL model has a positive effect on improving student activities and learning outcomes at various levels of education. This model has been proven to be able to increase motivation, activeness, critical thinking skills, and understanding of mathematical concepts. However, the effectiveness of PBL implementation is greatly influenced by the school context, student characteristics, and teachers' readiness to design and implement problem-based learning.¹² Therefore, further research is needed to examine the influence of the PBL model on mathematics learning activities and outcomes, especially in grade IV elementary school students.

Based on this description, this study is focused on the influence of the Problem Based Learning model on the learning activities and learning outcomes of mathematics students in grade

⁸ Septi Hariyani, "Penerapan Model Problem-Based Learning untuk Meningkatkan Kemampuan Berpikir Kritis," *Buletin Pengabdian Multidisiplin* 1, no. 1 (2024), <https://doi.org/10.62385/budimul.v1i1.97>.

⁹ Lulut Suhermi et al., "Pembelajaran Kontekstual sebagai Inovasi Kreatif dalam Menjadikan Materi Ajar Lebih Bermakna," *JISPENDIORA: Jurnal Ilmu Sosial, Pendidikan Dan Humaniora* 4, no. 2 (2025), <https://doi.org/10.56910/jispendiora.v4i2.2197>.

¹⁰ Pande Made Aditya Pramana et al., "Relevansi Teori Belajar Konstruktivisme dengan Model Inkuiri Terbimbing terhadap Hasil Belajar Siswa," *Ideguru: Jurnal Karya Ilmiah Guru* 9, no. 2 (2024), <https://doi.org/10.51169/ideguru.v9i2.875>.

¹¹ Rosita Rosita et al., "Pendekatan Konstruktivisme Terhadap Peningkatan Hasil Belajar Siswa SD," *Jurnal Review Pendidikan Dasar: Jurnal Kajian Pendidikan dan Hasil Penelitian* 10, no. 3 (2024), <https://doi.org/10.26740/jrpd.v10n3.p238-247>.

¹² Andri Kusnandar and Iskandar Mirza, "Eksplorasi Implementasi Problem-Based Learning (Pbl) Dalam Meningkatkan Keterampilan Berpikir Kritis Siswa," *Islamic Management: Jurnal Manajemen Pendidikan Islam* 8, no. 02 (2025), <https://doi.org/10.30868/im.v8i02.8729>.

IV of SDN 03 Koto Balingka, West Pasaman Regency. This research is important to be carried out as an effort to innovate mathematics learning in elementary schools as well as as an empirical contribution to the development of learning models that are effective and relevant to the needs of students.

RESEARCH METHODS

In this study, the research method used is an experimental method. Experimental research methods can be defined as "research methods used to find the effect of certain treatments on others under controlled conditions".¹³ The design used in this study is a "*Quasi Experimental Design*" research, namely "*Posttest-Only Control Design*". "*Posttest-Only Control Design*" is a sample divided into two groups, namely the experimental class and the control class".¹⁴

Table 2. Posttest Only Control Design research design.

Select Control Group	No Treatment	Posttest
Select Experimental Group	Experimental Treatment	Posttest

The population in this study is all grade IV students of SDN 03 Koto Balingka, West Pasaman in the even semester of the 2025/2026 school year. The sampling technique used in this study is saturated sample which is a sample determination technique when all members of the population are used as samples.¹⁵ In this case, class IV A is used as an experimental class, namely using a *problem-based learning model*, and class IV B is used as a control class, namely a class that does not receive treatment and only uses the lecture method.

Data Collection Techniques

1. Observation, Observation is a complex process, a process composed of various biological and psychological processes". Observation is divided into two, namely *participant observation* and *non-participant observation*.¹⁶

¹³ Ramlan Sinaga, "Pengaruh Pendekatan Matematika Realistik Terhadap Hasil Belajar Matematika Siswa," *Algebra: Jurnal Pendidikan, Sosial dan Sains* 3, no. 1 (2023), <https://doi.org/10.58432/algebra.v3i1.834>.

¹⁴ Ramadhani Wahyuningtyas and Zulherman, "Model Pembelajaran Kooperatif Type Index Card Match Terhadap Hasil Belajar IPA Kelas IV SD," *Journal of Instructional and Development Researches* 2, no. 3 (2022), <https://doi.org/10.53621/jider.v2i3.130>.

¹⁵ Rika Niswara and Mei Fita Asri Untari, "Pengaruh Model Project Based Learning Terhadap High Order Thinking Skill," *Mimbar PGSD Undiksha* 7, no. 2 (2019).

¹⁶ Hasyim Hasanah, "Teknik-Teknik Observasi (Sebuah Alternatif Metode Pengumpulan Data Kualitatif Ilmu-ilmu Sosial)," *At-Taqqaddum* 8, no. 1 (2017), <https://doi.org/10.21580/at.v8i1.1163>.

2. Learning Outcome Test, The test that is prepared is objective based on the subject matter that has been studied.
3. Documentation, Documentation is a research study related to learning conditions and learning outcomes.¹⁷ Researchers can collect data related to student learning outcomes such as ability test results and worksheets

Data Analysis Techniques

1. Analysis Prerequisites Test

- a. Normality Test, Normality test is carried out to find out whether the research data is normally distributed.¹⁸ The assumption of normality is important in regression analysis because it relates to the validity of testing the significance of the regression coefficient. Normally distributed data allows the use of parametric statistical tests.
- b. Homogeneity Test, Homogeneity test is performed to investigate whether the variance of the two samples is the same or not. The researcher uses *SPSS Software* to further validate the research data in determining the homogeneity of the sample, the data is called homogeneous, if the P-value is greater than the real level of $\alpha = 0.05$ and not homogeneous if it is the opposite.

2. Uji Hypothesis

Final data analysis is an analysis used to test hypotheses or conclude research results.¹⁹ The hypothesis test used for student activities and learning outcomes is the T test. The researcher chose this formula because there were two classes of samples and had the same number, and the variants of the samples were homogeneous.

RESULTS AND DISCUSSION

A. Description of Student Learning Activity Data

1. Learning activities in learning 1 in the experiment and control class

The following is described the data on student learning activities in learning 1. This data aims to see the effect of activity on learning 1 in the experimental class and the control class. The data can be seen in table 3.

¹⁷ Ika Kartika and Opan Arifudin, "Upaya Guru Dalam Meningkatkan Mutu Pembelajaran Pendidikan Agama Islam Di Sekolah," *Jurnal Al-Amar (JAA)* 4, no. 2 (2023).

¹⁸ Atmira Qurnia Sari et al., "Batasan Prasyarat Uji Normalitas Dan Uji Homogenitas Pada Model Regresi Linear," *Unnes Journal of Mathematics* 6, no. 2 (2017), <http://journal.unnes.ac.id/sju/index.php/ujm>.

¹⁹ Reza Akbar et al., "Analisis Data Penelitian Kuantitatif: Pengujian Hipotesis Asosiatif Korelasi," *Jurnal Pelita Nusantara* 1, no. 3 (2024), <https://doi.org/10.59996/jurnalpelitanusantara.v1i3.350>.

Table 3. Data Description Learning Activities in Learning 1

Class	Quantity	Average
Eksperimen	1849,91	77,08
Kontrol	1686,57	70,27

2. Learning activities in learning 2 in the experiment & control class

The following is described the data on student learning activities in learning 2. This data aims to see and compare activities to learning 2 in the experimental class and the control class. The data can be seen in table 4.

Table 4. Data Description Learning Activities in Learning 2

Class	Quantity	Average
Eksperimen	1899,91	79,16
Kontrol	1713,23	71,38

B. Results of Data Analysis of Student Learning Activities

1. Analytical Prerequisite Testing

a. Test the Normality of Student Learning Activities in Learning 1

The results of the normality test of student learning activities in the experimental class and the control class are as follows:

Table 5. Normality Test of Learning Activities 1Control Experiment Class

Class	N	A	L(Count)	L table	Conclusion
Eksperimen	24	0,05	0,180	0,190	Normal Distribution
Kontrol	24	0,05	0,117	0,190	Normal Distribution

Based on table 5, the test was carried out at the significance level ($\alpha = 0.05$) for $n = 24$, the experimental class was calculated at 0.180 and the control class was 0.117 and the table was obtained at a significant level of $\alpha = 0.05$ of 0.190.

A comparison between the $L_{\text{calcul}} < L_{\text{table}}$ for the experimental class ($0.180 < 0.19$) and for the control class ($0.117 < 0.190$), thus it can be concluded that the data is normally distributed.

b. Test of Normality of Student Learning Activities in Learning 2

The results of the normality test of student learning activities in the experimental class and the control class can be seen in table 6.

Table 6. Test of Normality of Student Learning Activities Learning
2 Experiment and Control Classes

Class	N	A	L(Count)	Ltable	Conclusion
Eksperimen	24	0.05	0,137	0,190	Normal Distribution
Kontrol	24	0.05	0,135	0,190	Normal Distribution

Based on table 6, the test was carried out at the significance level ($\alpha = 0.05$) for $n = 24$, the experimental class was calculated at 0.137 and the control class was 0.135 and the table was obtained at the significance level of $\alpha = 0.05$ of 0.190. A comparison between the $L_{\text{calcul}} < L_{\text{table}}$ for the experimental class ($0.137 < 0.190$) and for the control class ($0.125 < 0.190$), thus it can be concluded that the data is normally distributed.

c. Test of Homogeneity of Student Learning Activities in Learning 1

Table 7. Results of the Homogeneity Test of Student Learning Activities
Learning 1 Experimental and Control Class

Class	Varians	F Count	Ftable	Conclusion
Eksperimen	35,081	1,03	2,46	Homogen
Kontrol	33,737			

The test was carried out at a confidence level of $\alpha = 0.05$ with degrees of freedom $n_1 = 24$ and $n_2 = 24$. From table 7, it can be concluded that the learning activities of the experimental and control classes are homogeneous because they meet the criteria of $F_{\text{calcul}} < F_{\text{table}}$. Obtained a score of $1.03 < 2.46$, it can be concluded that the learning activities of the two classes have a homogeneous variance.

d. Test the homogeneity of student learning activities in learning 2

Table 8. Results of the Homogeneity Test of Student Learning Activities
Learning 2 Classes Experiment and Control

Class	Varians	F Count	Ftable	Conclusion
Eksperimen	44,37	1,30	2,46	Homogen
Control	34,06			

The test was carried out at a confidence level of $\alpha = 0.05$ with degrees of freedom $n_1 = 24$ and $n_2 = 24$. From table 18. it can be concluded that the learning activities of the experimental and control classes are homogeneous because they meet the criteria of

$F_{\text{calculus}} < F_{\text{table}}$. Obtained a score of $1.30 < 2.46$, it can be concluded that the learning activities of the two classes have a homogeneous variance.

2. Hypothesis Testing Results

a. Test Hypothesis of Student Learning Activities in Learning 1

The test was carried out to find out whether there was a significant influence between the learning activities of the experimental class students and the learning activities of the control class students in learning 1. The test is shown in table 19.

Table 9. Results of the t-test of student learning activities Learning 1

Experiment and Control Class					
Class	N	t Count	ttable	Comparison	Conclusion
Eksperimen	24	4,02	2,01	$t_{\text{(hitung)}} > t_{\text{(tabel)}}$	Ha diterima
Control	24				

Table 9 shows that the score of the student learning activity in learning 1 is 4.02. When compared to the ttable at a confidence level of 0.05 which shows the number 2.01, it can be seen that the results of the final test calculation are greater than the ttable, namely $t_{\text{calcul}} > t_{\text{table}}$, then H_a is accepted and H_0 is rejected, it can be concluded that there is an influence of *the problem-based learning* model on student learning activities in mathematics learning.

b. Test the Hypothesis of Student Learning Activities in Learning 2

The test was carried out to find out whether there was a significant effect between the learning activities of the experimental class students and the learning activities of the control class students in learning 2. The test is shown in table 10.

Table 10 Test Results of Student Learning Activities Learning 2

Experiment and Control Classes					
Class	N	T Count	Ttable	Comparison	Conclusion
Eksperimen	24	4,32	2,01	$t_{\text{(Count)}} > t_{\text{(table)}}$	Ha Accepted
Control	24				

Table 10 shows that the score of the student learning activity calculation in learning 1 is 4.32. When compared to the ttable at a confidence level of 0.05 which shows the number 2.01, it can be seen that the results of the final test calculation are greater than the

table, namely $t_{\text{calculus}} > t_{\text{table}}$, then H_a is accepted and H_0 is rejected, it can be concluded that there is an influence of the *problem based learning* model on student learning activities in learning 2.

C. Description of Research Results Data

After the trial was carried out and the results were known, then in the experimental class, mathematics learning was carried out with fractional material using the *problem-based learning* model for 2 meetings. In the control class, learning with the homeroom teacher was also seen by carrying out conventional learning in 2 meetings. After learning in the experimental class and the control class, then in both classes a *posttest* was carried out. This aims to find out the final ability of students after learning with different treatments.

The *posttest values* of the experimental and control classes can be seen in table 11.

Table 11. Description of *Experimental and Control Class* Posttest Data

Description	Posttest	
	Eksprimen	Kontrol
Nilai tertinggi	96	92
Nilai terendah	76	60
Rata-rata	86,67	75,83
Standar deviasi	5,615	8,127

Table 11 shows that it can be seen from the average value that the experimental class is higher than the control class. Then, when viewed from the highest and lowest values, it shows that the control class has the lowest minimum value in the *posttest result*. The comparison of standard deviation with the average shows that the standard deviation value is smaller than the average value. This means that the average value can be used as a representation of the overall data.

D. Hypothesis Testing Results

Based on prerequisite tests, the analysis of the final test data for both groups is normally distributed and has homogeneous variance. In other words, hypothesis testing can be carried out using the t-test. The test was carried out to find out if there was a significant influence between the experimental class and the control class. For the test, there are the following conditions:

Table 12. Test Results t Final Test Data Experimental and Control Class

Class	N	T Count	Ttable	Comparison	Conclusion
Eksperimen	24	5,39	2,01	$t_{\text{(hitung)}} > t_{\text{(tabel)}}$	Ha diterima
Kontrol	24				

Table 12 shows that the posttest calculation score is 5.39. When compared to the ttable at a confidence level of 0.05 which shows a figure of 2.01, it can be seen that the results of the final test calculation are greater than the ttable. Based on the test criteria that have been set, namely: if the $t_{\text{calculated}} > t_{\text{table}}$, then H_a is accepted and H_0 is rejected, it can be concluded that there is a significant influence between the *problem-based learning* model on learning outcomes before treatment.

CONCLUSION

Based on the analysis of the data and the results of the research and discussion that has been presented, the following conclusions are obtained: (1) The *problem-based learning* model has an effect on student learning activities which can be seen from its advantages. Student activities in learning are also categorized as active. This can all be seen from the enthusiasm and being active in the learning process. This is because each student in his study group has a different task. So that this allows no students who do not participate in their study groups. Students' seriousness and active involvement in learning automatically increase students' knowledge of the subject matter studied and of course affect their learning outcomes better than before. Student learning activities using *the problem-based learning model* in mathematics learning in grade IV elementary school increased, this was obtained from the results of the study that the average result of student learning activities given *problem based learning* model activities in learning 1 and 2 was 78.12 (active category). This conclusion means that there is an influence of *the problem-based learning* model on student learning activities. (2) The *problem-based learning* model affects student learning outcomes, this can be seen that *the problem based learning* model has learning steps that can actively involve students in learning both individually and in groups. Student learning outcomes using *the problem-based learning* model in mathematics learning in grade IV of elementary school showed that the average learning outcome was 86.67. From the average value, the experimental class is higher than the control class. After the hypothesis test was carried out, the $t_{\text{cal}} > t_{\text{table}}$ was obtained, namely $5.39 > 2.01$ with $\alpha=0.05$. So that *the problem-based learning* model can affect student learning outcomes. (3) There is a significant relationship between learning activities and student learning outcomes using *the problem-based learning model* in mathematics learning in grade IV of elementary school.

ADVICE

Based on the conclusions of this study, the researcher wants to provide the following suggestions, namely: (1) Teachers should be able to create a non-boring atmosphere in Mathematics learning, so that Mathematics learning becomes more fun and can improve student

activities and learning outcomes. (2) For other researchers who are interested, it is expected to conduct further research who wants to conduct similar research, should review and conduct research at the school level and materials that have not been reached by current researchers and should further researchers be able to design much better research instruments. (3) For school principals as information in coaching teacher personnel in making positive contributions to improve the learning process.

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