DE_JOURNAL (Dharmas Education Journal)
http://ejournal.undhari.ac.id/index.php/de_journal
E-ISSN : 2722-7839, P-ISSN : 2746-7732
Vol. 5 No. 1, 1659-1666

THE PROBLEM BASED LEARNING (PBL) LEARNING MODEL ON STUDENTS' LEARNING INTEREST IN QUADRATIC FUNCTION MATERIAL FOR CLASS X

Romayana Gloria Silitonga[1], Golda Novatrasio Sauduran[2], Simon M. Panjaitan[3]

Email : romayanagloria.silitonga@student.uhn.ac.id[1], golda.sauduran@uhn.ac.id[2], simon.panjaitan@uhn.ac.id[3]
[1,2,3]Pendidikan Matematika, Fakultas Keguruan Dan Ilmu Pendidikan, Universitas HKBP Nommensen, Medan, Indonesia

Abstract

Study This aim for know the influence of the Problem-Based Learning (PBL) model on interest Study students in the eye lesson function square. The type of research used is study quantitative with approach experiment. Population study is all over student class X of State Senior High School 14 Medan, with sample as many as 36 students. The instruments used researchers is questionnaire interest learning and observation study. Research results show existence significant influence of the PBL learning model on interest Study students. Based on analysis regression simple obtained equality regression $\hat{Y} = 6.265 + 1.180X$, with t - value of 33.616 and the t table value amounting to 2,032. This is show existence positive and significant relationship between variables free (PBL model) with variables bound (interest Study students). More further, significance test regression show that calculated F value more than 1130 big than F table value of 4.13 at the level significance of 5%. This is show that the regression model the in accordance For predict interest Study students. Coefficient determination (R^2) of 0.971 indicates that 97.1% of the variation in interest Study student can explained by the application of the PBL learning model. With thus, it can concluded that the PBL model has very large and significant influence to improvement interest Study students in the eye lesson function square.

Keywords: *Problem Based Learning, Interest In Learning, Function Square, Learning Model*

Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh model Problem Based Learning (PBL) terhadap minat belajar siswa pada mata pelajaran fungsi kuadrat. Jenis penelitian yang digunakan adalah penelitian kuantitatif dengan pendekatan eksperimen. Populasi penelitian adalah seluruh siswa kelas X SMA Negeri 14 Medan, dengan sampel sebanyak 36 siswa. Instrumen yang digunakan peneliti adalah angket minat belajar dan observasi belajar. Hasil penelitian menunjukkan adanya pengaruh yang signifikan model pembelajaran PBL terhadap minat belajar siswa. Berdasarkan analisis regresi sederhana diperoleh persamaan regresi $\hat{Y} = 6,265 + 1,180X$, dengan nilai t sebesar 33,616 dan nilai t tabel sebesar 2,032. Hal ini menunjukkan adanya hubungan yang positif dan signifikan antara variabel bebas (model PBL) dengan variabel terikat (minat belajar siswa). Lebih lanjut, uji signifikansi regresi menunjukkan bahwa nilai F hitung lebih dari 1130, lebih besar dari nilai F tabel sebesar 4,13 pada taraf signifikansi 5%. Hal ini menunjukkan bahwa model regresi sesuai dengan prediksi minat belajar siswa. Koefisien determinasi (R^2) sebesar 0,971 menunjukkan bahwa 97,1% variasi minat belajar siswa dapat dijelaskan oleh penerapan model pembelajaran PBL. Dengan demikian, dapat disimpulkan bahwa model PBL memiliki pengaruh yang sangat besar dan signifikan terhadap peningkatan minat belajar siswa pada materi kuadrat fungsi.

Kata Kunci*: Pembelajaran Berbasis Masalah, Minat Belajar, Kuadrat Fungsi, Model Pembelajaran*

INTRODUCTION

Education plays a role role key in increase quality source Power human (Halean, S., Kandowangko, N., et al., 2021). Quality education give contribution positive for development ability think critical, skills analytical and problemsolving problem, which is essential in life everyday. In the curriculum Indonesian education, mathematics hold role important in develop ability mentioned. Learning mathematics is knowledge much needed foundation in the learning process (Nasution, 2021).

Mathematics and skills think critical each other related, where to think critical practice student For used to do something through steps small before become proficient in think critical level high (Farida et al., 2019)

One of material crucial in hone ability think critical in learning mathematics is function square, which functions as base for various draft mathematics level further and its application in life real. Function square is function polynomial with rank variables highest is 2 (Simangunsong, 2015). However, the material This often considered complicated by students Because involving concepts abstract like determine equations, drawing graphs, and understanding connection between variables in function. Understand function square need skills analysis and capabilities solution good problem (Khofshoh et al., 2023).

In fact, many student experience difficulty in understand concepts those. The difficulties This often caused by understanding base students who have minimal knowledge of draft mathematics, less effective learning models interesting, and low involvement student in the learning process teaching. One of the factor main reason difficulty student in understand function square is lack of interest Study they to material said. The lack of interest Study This can influenced by several factors, such as method delivery monotonous material, inadequate learning models relevant with need students, and the lack of relatedness between theory mathematics with the application in life everyday. When students feel material studied difficult or No relevant, they tend lost motivation learn, so that results learning is also less than optimal (Huda & Khotimah, 2023).

In general, the learning model used in education Still applying the conventional model, namely student listen and take notes what the teacher said, with learning teacher -centered classical model. Although this model can give understanding basic, this model tend not enough effective in increase involvement active student in learning, especially for student with interest Study low (Noervadila & Astidari, 2019). Learning kind of This teacher -centered and less capable create atmosphere interactive learning. As a result, students not enough motivated For think critical and creative, especially when face materials that are needed understanding deep, like function square (Nababan et al., 2024).

Other contributing factors is the use of learning models that are less than optimal stimulate desire know students. Desire know is key important in build interest learning. When students No interested or feel what they learn No relevant, motivational they For understand and explore material will decrease in a way significant. Innovation in the learning model necessary for students No only interested but also involved active in the learning process, especially in understand concepts that are considered difficult like function square (Simangunsong, 2023).

One of the learning models that is considered effective in increase interest and involvement student is a learning model Based Problem Based Learning (PBL) (Sandi et al., 2024). According to Howard Barrows, a learning expert education that first developed PBL concept, learning model This is a learning model in which students Study through experience solve open real world problems. Barrows stated that PBL is not only help student understand material but also train they For become learners independent and thoughtful critical. In PBL, students faced with a problem and given freedom For explore various method For solve problem The role of the teacher in PBL is as facilitator or the mentor who provides directions when needed, so that student can develop his understanding in a way independent (Panuntun, 2020).

In context learning mathematics on the material function square, PBL can give experience learn more interesting and challenging. Students invited For solve problem related function square through real world context, which is expected can interesting interest they For explore material This more in (Sismayani et al., 2019). For example, teachers can give questions that require understanding about properties function square, like look for point maximum or a minimum of relevant functions with situation everyday. With method this, students No only learn draft function square but also understand its relevance in life real, so that potential increase interest Study they. Interest in learning is one of the factor important things that influence success of the learning process (Fuadi & Jalaluddin, 2020). Interest in learning covers interest, attention, and motivation student to material or activity Study certain. When students feel difficulty in understand material, they tend become passive during learning. Attitude passive This marked with lack of participation student in discussion class, minimum courage For ask or put forward opinions, and reluctance For finish assigned tasks.

Based on observation the initial research conducted at State Senior High School 14 Medan, the researcher find student problems related class X material function square. From the analysis sheet

answer students, found that student only can complete 2-3 of the 5 questions given, with mark range between 40-60 of the total 100 points. Condition This reflect that student tend not enough interested in learning mathematics, in particular material function squared, so that cause lack of interest learning that impacts outcomes Study students. In addition, the lack of interest Study This reflected from lack of participation active student in activity learning and lack of enthusiasm in accept learning, especially on the material function square (Simamora, 2018).

Various study has show that PBL has impact positive to interest and involvement student in learning. According to research conducted by Novi et al. (SALSABILA & MUQOWIM, 2024) use of PBL in learning mathematics proven increase interest Study students. Research results show that students who study using PBL feel more challenged and motivated For solve problem compared to with students who study using conventional models. PBL in learning mathematics give convenience for student For understand various draft mathematics. Approach This push student For play a role active in the process of finding answer on problems given by the teacher, while still get necessary direction and guidance. However, the implementation of PBL in schools also requires thorough preparation. Teachers must capable designing relevant and interesting problems so that students interested For solve it. In addition, PBL requires enough time Because student need chance For explore and discover solution in a way independent. Although Thus, the benefits are obtained from the learning model This comparable with the effort required, because PBL can give experience deep learning and improving interest Study student (Dian Eka Saputri1, Septiyati Purwandari2, 2023).

Although study previously has show effectiveness of PBL in various context education, still there is gap in understand impact specifically to interest Study student in function square at level school medium above, especially in context Indonesian education. Most of existing research focused on results Study mathematics general than inspect connection between PBL implementation and interest student in topic mathematics certain like function squared. Therefore that, research This aim For analyze the influence of learning models *Problem Based Learning* (PBL) towards interest Study student in function squares in Class X of SMA Negeri 14 Medan in the year academic year 2024/2025. Through investigation this research This make an effort For give proof empirical about effectiveness of PBL in increase involvement and interest student in understand draft complex mathematics, especially function square, in environment education school medium above in Indonesia.

METHOD

Study This use approach descriptive quantitative with using One Group Post-test Only Design, which was conducted at SMA Negeri 14 Medan in the even semester year 2024/2025 academic year. Population study consists of of 364 students Class X is studying material function square, with purposive sample of 36 students from Selected Class X-4 based on condition academic and level the same activity. Data collection using questionnaire 4- point Likert scale For measure interest Study student in four aspect : power attraction, enthusiasm, desire For learning and satisfaction learning (Wondo & Meke, 2021), in addition observation systematic towards 15 aspects activity Study during implementation of PBL. Before implementation, instruments undergo validity testing use Pearson Product Moment correlation and reliability test use Cronbach's Alpha formula follows guidelines Arikunto (Kodariyati & Astuti, 2016). Data analysis using statistics descriptive (mean, deviation) standard, variance) and analysis inferential includes normality tests using the Kolmogorov-Smirnov test, simple linear regression, analysis correlation use Product Moment correlation, and calculation coefficient determination that all processed through device SPSS 25.0 software for know influence *Problem Based Learning* to interest Study students in the eye lesson function square (Silaban, R., Panggabean, F. T. M., Hutapea, F. M., Hutahaean, E., & Alexander, 2020)

RESULTS AND DISCUSSION

Before conducting statistical analysis, a normality test was performed to determine whether the collected data followed a normal distribution. The normality test was performed using SPSS 25.0 for Windows with a significance level of 5% or 0.05. Data were considered normally distributed if the sig value was > 0.05.

Table 1. Normality Test Results

Variables	Kolmogorov-Smirnov test	Meaning	Distribution
Interest in Learning	0.200	0.200	Normal

Normality test using the One-Sample Kolmogorov-Smirnov Test showed a significance value of learning interest of 0.200 > 0.05. Based on these results, it can be concluded that the data is normally distributed, thus allowing the use of parametric statistical analysis.

Linear regression analysis was conducted to determine the relationship between the Problem Based Learning (PBL) model and students' learning interest in quadratic functions.

Table 2. Simple Linear Regression Coefficients

Model	Unstandardized Coefficients		Coefficient Standard	T	Signature.
	B	Error Standard	Beta		
(Constant)	6,265	1,615		3,880	.000
PBL Model	1,180	.035	.985	33,616	.000

Based on the regression analysis, the equation Y = 6.265 + 1.180X is obtained. The constant value of 6.265 indicates that if there is no application of the PBL model (X = 0), student learning interest will remain at 6.265. The regression coefficient of 1.180 indicates that every one unit increase in PBL application will result in an increase in student learning interest of 1.180 units.

Table 3. Linearity Test Results

Source	F- calculated	Table F	Decision	Interpretation
Linearity	2,891	4.13	Accept H_0	linear relationship exists

linearity test shows F count = 2.891 < F table = 4.13, this indicates that H_0 is accepted. This confirms the existence of a linear relationship between the application of PBL and students' learning interest in a quadratic function. Significance Test Regression

Table 4. Regression Significance Test

Source	F- calculated	Table F	df1	df2	Signature.	Decision
Regression	1130	4.13	1	34	0.000	Thank you H_a

The regression significance test yielded F count = 1130 ≥ F table = 4.13, so H0 was rejected.$_a$ This indicates a significant influence between the Problem-Based Learning model on students' learning interest in the subject of quadratic functions.

Table 5. Correlation Coefficient Results

Variables	Coefficient Correlation (r)	Meaning	N	Strength Connection
PBL Model - Learning Interest	0.985	0.000	36	Very strong

Correlation analysis shows a correlation coefficient of r = 0.985 with a significance value of 0.000 < 0.05. Based on the Guilford classification, this value indicates a very strong positive relationship between the implementation of PBL and student learning interest.

Table 6. Significance Test of Correlation Coefficient

t- calculated	table -t	df	Meaning	Decision
33,616	2,032	34	0.000	Thank you H_a

The results of the t-test show that t count = 33.616 > t table = 2.032 with a significance of 0.000 < 0.05, so it can be concluded that H0 is rejected. $_o$ is rejected and H_a This shows that there is a significant relationship between the application of the PBL model and students' learning interest.

Table 7. Results of the Determination Coefficient

Model	R	R Square	Adjusted R Squared	Contribution Percentage
PBL- Learning Interest	0.985	0.971	-	97.1%

The analysis of the coefficient of determination shows an R^2 value of 0.971, which means that 97.1% of the variation in students' learning interests can be explained by the application of the *Problem Based model. Learning,* while the remaining 2.9% is influenced by other factors outside this learning model (Putri Fatimah, Muhammad Makki, 2022).

The Influence of *the Problem Based Learning* (PBL) Model on Interest in Learning Student

Research result show that the learning model Based Problem (PBL) has significant influence to interest Study students on the material function squares in class X of SMA Negeri 14 Medan. This proven with significance test results regression showing F count = 1130 > F table = 4.13 at the level of significance of 0.05, so H is rejected. $_o$ and acceptance H_a Findings This in line with characteristics of the PBL model that emphasizes student - centered learning and using real world problems as context learning. In its implementation, PBL provides chance for student For involved active in the learning process through identification problem, search solutions and construction knowledge in a way independent. This process in a way experience increase desire knowledge, involvement, and motivation student in Study mathematics (Nuralita et al., 2020).

Equality The regression obtained, Y = 6.265 + 1.180X, shows connection positive between application of PBL model and interest Study students. Coefficient regression of 1,180 indicates that every improvement one unit of PBL model implementation will increase interest Study student amounting to 1,180 units. Although improvement This looks numeric, in context education, effects Consistent positivity is very meaningful for development interest Study term long (Herzon et al., 2018).

Linear relationship between PBL and interest Study students, as shown by the results of the linearity test with F count = 2.891 < F table = 4.13, confirming that implementation of the PBL model consistent contribute to improvement interest learning. Linearity This show that the more intensive implementation PBL principles in learning, increasingly tall interest demonstrated learning student (Kamid & Sinabang, 2019).

Coefficient correlation of 0.985 with mark significance 0.000 < 0.05 indicates very strong relationship between the PBL model and interest Study students. Category very strong relationship This show that the PBL model has sufficient contribution big in to awaken and maintain interest Study students (Nofziarni et al., 2019). Strong connection This can explained through PBL features that encourage involvement active, such as learning collaborative, discussion groups, and solving relevant issues with life everyday life. Significance influence this is also confirmed through significance testing coefficient correlation that produces t- count = 33.616 > t- table = 2.032 with mark significance 0.000 < 0.05. This result strengthen conclusion that the PBL model is proven in a way statistics influential real to interest Study students on the material function square (Siregar & Aghni, 2021).

Info Artikel : Diterima Juni 2025 | Disetui Juli 2025 | Dipublikasikan Agustus 2025

Findings This consistent with Lubis's research (Maulina et al., 2019) stated that that students who study through learning models Based Problem show more interest tall compared to with students who study through approach conventional. In his research at the level of school basic, students become more active and enthusiastic because of the learning process demand they For involved in solution interesting and meaningful problems. This matter strengthen that learning based problem can increase motivation student with give experience Study contextual (Krismayanti & Mansurdin, 2020)

Research by Yesya, R. et al. (Astindari & Noervadila, 2019) also found that implementation Learning Based Problems with the material function square impact positive to involvement and understanding students. Students become more active discuss, explore problem, and show enthusiasm in the learning process. Concept abstract function the usual square difficult understood become more easy understood Because delivered through relevant context with life real.

The size The Influence of *the Problem Based Learning* (PBL) Model on Interest in Learning Student

Based on results analysis coefficient determination (R^2), obtained value of 0.971 or 97.1%. This figure show that the PBL learning model is capable explains 97.1% of the variation in interest Study students on the material function squared. In other words, almost all influencing factors interest Study student can associated with application of the PBL model in learning mathematics.

Magnitude effect by 97.1% including in category huge effect in context study education. This is show that the PBL model has magnitude very strong effect in increase interest Study students. The size effect This can understood through characteristics specifically PBL which provides experience meaningful learning for student (Rani et al., 2023).

Kusumawati, W. et al. (Wardani, 2022) stated that the use of GeoGebra as a medium in PBL increases effectiveness learning through combination visual understanding and engagement emotional students. When students understand draft visually, they feel more believe self and interest For explore material lesson more deep (Yuliana et al., 2020). This is prove that accompanying PBL learning with device proper learning can increase the impact to interest learning. findings This strengthen that the variation in implementation of PBL can increase its effectiveness in a way significant in awaken interest Study student.

CONCLUSION

Research result This show that the learning model Based Problem (PBL) has significant influence to interest Study function square student Class X of State Senior High School 14 Medan. Findings This show that PBL contributes in a way significant in increase involvement student in learning mathematics, especially in topics that require understanding more conceptual deep. This is show that implementation of PBL can in a way effective create environment learn more active and motivated.

Teachers are encouraged For in a way consistent implementing learning models Based Problem (PBL) in learning mathematics, especially For topics that require understanding deep conceptual, such as function square. School should provide training and workshops for teachers about effective implementation of PBL, as well as ensure availability supporting facilities and infrastructure learning based problem. Researchers furthermore recommended For do study more carry on with explore other factors that influence interest Study students outside the learning model, and apply the PBL model to the topic mathematics others to strengthen generalization findings study.

BIBLIOGRAPHY

Astindari, T., & Noervadila, I. (2019). Penerapan Problem Based Learning (Pbl) Guna Meningkatkan Hasil Belajar Mata Pelajaran Matematika Kelas X Semester Ganjil Di Smk Negeri 2 Situbondo Tahun Pelajaran 2018/2019. *Edusaintek: Jurnal Pendidikan, Sains Dan Teknologi*, *6*(2), 15–24. Https://Doi.Org/Https://Doi.Org/10.47668/Edusaintek.V6i2.25

Dian Eka Saputri1, Septiyati Purwandari2, G. I. (2023). *Peningkatan Hasil Belajar Ipa Kelas Middle B Sd Tumbuh 2 Yogyakarta Melalui Pembelajaran Problem Based Learning (Pbl) Berbantu Media Diorama*. *08*(2), 1003–1012.

Farida, N., Hasanudin, H., & Suryadinata, N. (2019). Problem Based Learning (Pbl) – Qr-Code Dalam Peningkatan Hasil Belajar Matematika Peserta Didik. *Aksioma: Jurnal Program Studi Pendidikan*

Matematika, *8*(1), 225–236. Https://Doi.Org/10.24127/Ajpm.V8i1.1894

Fuadi, C., & Jalaluddin, J. (2020). Perbedaan Pembelajaran Kooperatif Tipe Stad Dengan Model Problem Based Learning (Pbl) Untuk Meningkatkan Pemahaman Konsep Pada Materi Sistem Pencernaan Makanan Di Mtsn 1 Teunom Kabupaten Aceh Jaya. *Jurnal Biology Education*, *8*(1). Https://Doi.Org/10.32672/Jbe.V8i1.2017

Herzon, H. H., Budijanto, B., & Utomo, D. H. (2018). Pengaruh Problem-Based Learning (Pbl) Terhadap Keterampilan Berpikir Kritis. *Jurnal Pendidikan: Teori, Penelitian, Dan Pengembangan*, *3*(1), 42–46.

Huda, N., & Khotimah, N. (2023). Model Pembelajaran Problem Based Learning (Pbl) Untuk Meningkatkan Literasi Matematika Siswa. *Jurnal Pendidikan Sains Indonesia*, *5*(02), 27–32.

Kamid, K., & Sinabang, Y. (2019). Pengaruh Penerapan Model Pembelajaran Problem Based Learning (Pbl) Terhadap Kemampuan Berpikir Tingkat Tinggi (Hots) Ditinjau Dari Motivasi Belajar Siswa. *Jurnal Manajemen Pendidikan Dan Ilmu Sosial*, *1*(1), 127–139.

Khofshoh, J., Zuhri, M. S., Purwati, H., & Wibawa, A. (2023). Efektivitas Model Dl Berbasis Pembelajaran Berdiferensiasi Dan Model Pbl Terhadap Hasil Belajar. *Jurnal Mathedu (Mathematic Education Journal)*, *6*(2), 1–7. Https://Doi.Org/Https://Doi.Org/10.37081/Mathedu.V6i2.5223

Kodariyati, L., & Astuti, B. (2016). Pengaruh Model Pbl Terhadap Kemampuan Komunikasi Dan Pemecahan Masalah Matematika Siswa Kelas V Sd. *Jurnal Prima Edukasia*, *4*(1), 93–106.

Krismayanti, W., & Mansurdin, M. (2020). Proses Pembelajaran Tematik Terpadu Dengan Model Problem Based Learning (Pbl) Di Sekolah Dasar. *E-Journal Pembelajaran Inovasi, Jurnal Ilmiah Pendidikan Dasar*, *8*(7), 102–110.

Maulina, D. N., Slamet, S. ., & Indriayu, M. (2019). *Model Pembelajaran Problem Based Learning (Pbl) Dan Kaitannya Dengan Kemampuan Berpikir Tingkat Tinggi Peserta Didik*. *Iv*(2012), 2–8.

Nababan, E., Maria Marbun, Y., Sihombing, B., Matematika, P., & Keguruan Dan, F. (2024). Efektivitas Model Pembelajaran Problem Based Learning (Pbl) Terhadap Pemahaman Konsep Dan Hasil Belajar Pada Materi Persamaan Garis Lurus Kelas Viii Di Smp Negeri 2 Tapian Dolok. *Innovative: Journal Of Social Science Research*, *4*(1), 2754–2766.

Nasution, I. A. (2021). Analisis Model Problem Based Learning (Pbl) Terhadap Kemampuan Pemecahan Masalah Matematika Siswa Sd/Mi. *Journal Of Islamic Primary Education*, *1*(1), 10–20.

Noervadila, I., & Astidari, T. (2019). Pengaruh Metode Pembelajaran Problem Based Learning (Pbl) Dan Keterampilan Metakognisi Terhadap Hasil Belajar Siswa Smk Negeri 2 Situbondo. *Jurnal Ika Pgsd (Ikatan Alumni Pgsd) Unars*, *7*(2), 165–179. Https://Doi.Org/Https://Doi.Org/10.36841/Pgsdunars.V7i2.497

Nofziarni, A., Hadiyanto, H., Fitria, Y., & Bentri, A. (2019). Pengaruh Penggunaan Model Problem Based Learning (Pbl) Terhadap Hasil Belajar Siswa Di Sekolah Dasar. *Jurnal Basicedu*, *3*(4), 2016–2024. Https://Doi.Org/10.31004/Basicedu.V3i4.244

Nuralita, A., Reffiane, F., & Mudzanatun. (2020). Keefektifan Model Pbl Berbasis Etnosains Terhadap Hasil Belajar. *Jurnal Mimbar Pgsd Undiksha*, *8*(3), 457–467.

Panuntun, F. (2020). Pengaruh Model Pembelajaran Kooperatif Teams Games Tournament (Tgt) Dan Problem Based Learning (Pbl) Terhadap Hasil Belajar Sepak Bola (Dribbling) Pada Siswakelas Xi Smk Hkti 2 Banjarnegara. *Journal Of Sport Coaching And Physical Education*, *5*(1), 19–23. Https://Doi.Org/10.15294/Jscpe.V5i1.36807

Putri Fatimah, Muhammad Makki, U. (2022). Pengaruh Model Pembelajaran Problem Based Learning (Pbl) Terhadap Hasil Belajar Matematika. *Jurnal Pendidikan Sains Dan Komputer*, *2*(02), 420–426. Https://Doi.Org/10.47709/Jpsk.V2i02.1796

Info Artikel : Diterima Juni 2025 | Disetui Juli 2025 | Dipublikasikan Agustus 2025

Rani, R., Manurung, H., & Siregar, T. M. (2023). *Penerapan Model Pembelajaran Pbl Untuk Meningkatkan Kemampuan Pemecahan Masalah Matematika Pada Pokok Bahasa Program Linier*. *2008*.

Salsabila, Y. R., & Muqowim, M. (2024). Korelasi Antara Teori Belajar Konstruktivisme Lev Vygotsky Dengan Model Pembelajaran Problem Based Learning (Pbl). *Learning : Jurnal Inovasi Penelitian Pendidikan Dan Pembelajaran*, *4*(3), 813–827. Https://Doi.Org/10.51878/Learning.V4i3.3185

Silaban, R., Panggabean, F. T. M., Hutapea, F. M., Hutahaean, E., & Alexander, I. J. (2020). Implementasi Problem Based-Learning (Pbl) Dan Pendekatan Ilmiah Menggunakan Media Kartu Untuk Meningkatkan Hasil Belajar Peserta Didik Tentang Mengajar Ikatan Kimia. *Jurnal Ilmu Pendidikan Indonesia*, *8*(2).

Simamora, E. S. (2018). *Perbedaan Hasil Belajar Kimia Siswa Yang Dibelajarkan Dengan Model Pembelajaran Problem Based Learning (Pbl) Dan Kooperatif Tipe Student Team Achievement Divisions (Stad) Menggunakan Lembar Kerja Siswa (Lks) Pada Materi Larutan Penyangga (Buffer)*. Unimed. Http://Digilib.Unimed.Ac.Id/Id/Eprint/34798

Simangunsong, A. D. (2015). *Pengaruh Model Problem Based Learning (Pbl) Berbasis Kolaboratif Dengan Media Exe Learning Terhadap Kreativitas Dan Hasil Belajar Siswa Sma Pada Pokok Bahasan Hidrolisis Garam*. Unimed.

Simangunsong, A. D. (2023). Implementation Of The Problem Based Learning (Pbl) Learning Model To Improve Skills Creative Thinking Of Students On The Material Coligative Properties Of Solutions. *Edunesia: Jurnal Ilmiah Pendidikan*, *4*(2), 483–494. Https://Doi.Org/10.51276/Edu.V4i2.396

Siregar, M. N. N., & Aghni, R. I. (2021). Pengembangan Perangkat Pembelajaran Berbasis Problem Based Learning (Pbl) Untuk Meningkatkan Higher Order Thinking Skill (Hots). *Jurnal Pendidikan Akuntansi (Jpak)*, *9*(2), 292–301. Https://Doi.Org/10.26740/Jpak.V9n2.P292-301

Sismayani, S., Khairil, K., & Kasmirudin, K. (2019). Kemampuan Berpikir Kritis Menggunakanpenerapan Model Problem Based Learning (Pbl) Danstudent Team Achievementdivision (Stad) Pada Pembelajaran Biologi Di Smp Negeri 20 Seluma. *Seminar Nasional Sains & Entrepreneurship*, *1*(1).

Wardani, W. F. (2022). *Penerapan Model Problem Based Learning (Pbl) Untuk Meningkatkan Hasil Belajar Siswa Pada Mata Pelajaran Ips Kelas Iv Mi Islamiyah Sumberrejo Batanghari Tahun Pelajaran 2017/2018*. Skripsi. Iain Metro.

Wondo, M. T. S., & Meke, K. D. P. (2021). Analisis Pengaruh Sikap Percaya Diri Siswa Dalam Pembelajaran Matematika Menggunakan Model Pbl Berbantuan Bahan Manipulatif. *Jupika: Jurnal Pendidikan Matematika*, *4*(1), 11–21. Https://Doi.Org/Https://Doi.Org/10.37478/Jupika.V4i1.894

Yuliana, Y., Kresnadi, H., & Uliyanti, E. (2020). Pengaruh Model Pbl Terhadap Hasil Belajar Ilmu Pengetahuan Alam Siswa Kelas V Sekolah Dasar. *Jurnal Pendidikan Dan Pembelajaran Khatulistiwa*, *8*(6). Https://Doi.Org/Http://Dx.Doi.Org/10.26418/Jppk.V8i6.33439