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Improving The Performance Skills of Class XI Students at SMAS Tasik Raja Labuhan Batu Selatan in Matricks by Using Model Problem Based Learning

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ABSTRACT

Student performance skills show the success of a learning process. To obtain improved performance skills, appropriate action is needed to overcome problems that cause low learning outcomes. This research aims to improve students' performance skills in matrix material using the Problem Based Learning model in class XI of SMAS Tasik Raja Labuhanbatu Selatan. This research is Classroom Action Research following the Kemmis & McTaggart cycle, each cycle consisting of four stages, namely plan, action, observation and reflection which are analyzed quantitatively. The subjects of this research were 30 class XI students at SMAS Tasik Raja Labuhanbatu Selatan. The results of this research are an increase in students' performance skills as shown by the average value of student learning outcomes in cycle I is 68.20 with classical completeness of 46.66% and the average value of student learning outcomes in cycle II is 86 .60 with a classical completion percentage of 90%.

Keywords : Performance Skills, Problem Based Learning

Introduction

Mathematics is a core subject taught at every level of education. Mathematics underlies technological development and has an important role in the development of science and various scientific disciplines. Mathematics also has an important role in advancing the thinking power of every human being in the process of personal development. This is because studying mathematics requires the ability to analyze and solve problems so that indirectly an individual hones his thinking skills when studying mathematics. This is also what causes many students to find mathematics lessons difficult. This assumption by students causes their lack of interest in participating in mathematics learning which has an impact on low learning outcomes (Nabillah & Abadi, 2020). This is also due to their lack of knowledge regarding the application of mathematics in everyday life. In fact, students' interest in learning plays an important role so that they have a high passion and willingness to learn so that learning is carried out not by force but by their own will (Islamiah, 2019). Thus, teachers must provide students with an understanding of the application and benefits of the mathematics subject matter studied in everyday life . One mathematical material that is rarely studied using real contexts is matrices. Based on the analysis of the results of the assessment carried out on class One of the reasons is that the problem provided in learning only trains students' abilities in carrying out ordinary calculations without knowing the benefits in everyday life. In fact, according to Siregar, Suwanto, & Siagian (2021) every problem given should have a close connection with students' lives so that they are interested in solving it based on their needs and curiosity, not just because of value demands. Apart from that, Hermanto & Susilawati (2023) explained Educators must make students the center of learning and play an active role

in learning so that students understand concepts and don't just memorize formulas and procedures. To overcome these problems, teachers must be wise in determining learning models that are able to bring real problems into mathematics learning. The closer the context of the problem used, the better students will understand the lesson being taught. One learning model that has the characteristic of bringing real world problems to learning is Problem-Based Learning (PBL). In accordance with the opinion of Burhana, et al. (2021) which states that the problem of low motivation and learning outcomes, as well as students' critical thinking skills, is very likely to be overcome through the application of the Problem-Based Learning model. Previously, Masduriah (2020) had conducted research regarding the effect of using the problem-based learning (PBL) model on students' high-level thinking skills, the results showed that there was a positive influence of using the PBL model on students' high-level thinking skills, but there were limitations to this research. namely, students pay less attention to learning because they feel unfamiliar with HOTS-based questions.

Therefore, the problems that researchers use in this research use contexts that are close to students' daily lives. This aims to ensure that students can understand problems well and can reflect on their experiences to this problem. Problem-Based Learning is a learning model that begins with the introduction of contextual problems and problems are solved in groups. The aim of this learning model is to help students develop thinking and problem solving skills (Saputra, 2021). According to Siagian, Saragih, & Sinaga (2019) the application of the Problem-Based Learning model can improve students' mathematical problem solving abilities and metacognitive abilities. The Problem-Based Learning model has the characteristics of student-centered learning, designed based on real problems that encourage students to build rich knowledge of contextual mathematical concepts through a series of constructive questions (Malmia, et al., 2019). In addition, PBL does not only focus on problem solving but can develop other skills, for example communication skills because of the opportunity to practice good language communication through discussion and presentation activities (Larsson, 2001; Azman & Shin,2012; Ali, 2019). Tan (2003) also suggested that problem scenarios in PBL act as a stimulus to scaffold and expand the realistic context that students may face in the future. Through the application of the Problem-Based Learning model, it is hoped that it can improve the learning outcomes of students in class XI SMAS Tasik Raja Labusel on matrix material. The problem formulation in this research is "can applying the Problem-Based Learning model improve student learning outcomes on matrix material at SMAS Tasik Raja Labusel?". This research aims to improve the learning outcomes of students in class XI SMAS Tasik Raja Labusel on matrix material through the application of the Problem-Based Learning model.

Research Methodology

This research is Classroom Action Research (PTK), with cyclical stages. Every the cycle follows the Kemmis, McTaggart, & Nixon (2014) cycle which consists of four stages, namely planning, implementing, observing, and reflecting. This research was carried out at SMAS Tasik Raja located at Jl. PT Tasik Raja Emplasm, Torgamba District, South Labuhan Batu, North Sumatra. The subjects of this research were 30 class XI students at SMAS Tasik Raja. The data in this research was collected through observation to see students' activities during learning and written tests to determine students' learning outcomes on matrix material through problem-based learning. The data that has been collected is then analyzed using a quantitative approach by calculating class averages and classical learning mastery assessments. The indicator of success in this assessment is an increase in student learning outcomes. This research is said to be successful if the learning outcomes of students in class XI SMAS Tasik Raja Labusel meet ≥ 70 and classical completeness is 85%.

Results and Discussion

Problem-Based Learning Model

Problem-Based Learning (PBL) is a learning model that uses contextual problems to be solved using PBL syntax. The PBL syntax is: (1) orientation towards problems, (2) organizing students, (3) guiding individual and group investigations, (4) developing and presenting work results, and (5) analyzing and evaluating the problem solving process. Arni & Sari (2022) stated that the learning process using the PBL model can increase activity and creative thinking in students because they are more interested in solving problems that are close to everyday life, students also feel happy because they do not have to solve problems themselves but through Group discussions and presentation activities of group work can help students grow their self-confidence. The characteristics of the Problem-Based Learning model according to Tan (2000) include learning starting with real world problems that appear unstructured, problems requiring several perspectives and challenging knowledge, prioritizing independence where students have the responsibility to obtain information and knowledge, utilize various sources, learning is collaborative, communicative, and cooperative, the development of inquiry and problem solving skills is as important as the acquisition of content knowledge to solve problems, learning closure includes synthesis and integration of learning, and learning activities also end with an evaluation and review of student experiences and the learning process. Apart from that, (Esema, Susari, & Kurniawan, 2012) stated that with PBL students are expected to

be able to think critically and apply the knowledge they gain through solving the problems given. Through the implementation of PBL for students have the opportunity to gain meaningful knowledge and learning through their active role in the learning process.

Learning Outcomes

Learning outcomes are important in education. Learning outcomes indicate the quality of learning carried out. According to Darmadi (2017) learning outcomes are students' learning achievements which are characterized by the formation and changes in behavior in the learning process. Information on learning outcomes can show the extent to which the material is understood by students and used as reflection so that it can motivate teachers and students to make improvements in the learning process (Rasyid & Mansur, 2019). Thus, learning outcomes are information about students' learning achievements which are used to motivate teachers and students to make improvements in the learning process. This research was carried out in a cycle consisting of four stages, namely planning (plan), action (act), observation (observe), and reflection (reflect).

Cycle I

In the initial stage of cycle I, researchers prepared teaching modules along with teaching materials, Student Worksheets (LKPD), PowerPoint media and assessment sheets for each meeting. Next, in the second stage, the researcher carried out learning on the determinant subtopic in the matrix at the first meeting and the inverse matrix subtopic at the second meeting. Learning is carried out in accordance with the teaching module that has been prepared previously with learning steps including 3 stages, namely (1) preliminary activities, (2) core activities containing PBL syntax, and (3) closing. At the first meeting in cycle I, the researcher started the learning with preliminary activities, which began with saying hello, praying, checking attendance, apperception, conveying learning objectives, and motivation. Next, in the core activities, researchers carried out the PBL stages, namely (1) orienting students to the problem by presenting the problem context via PowerPoint and inviting students to understand the problem; (2) organizing students to learn, namely by placing students in groups that have been previously divided and the results of the group divisions are displayed via PowerPoint; (3) guiding individual and group investigations, at this stage the researcher monitors the activities of students in groups and guides students and groups who experience difficulties, during the discussion process the researcher finds students who are not actively involved in discussion activities; (4) develop and present work results, at this stage students present solutions to problems on the LKPD and present the results in front; (5) analyzing and evaluating the problem solving process, at this stage students provide responses to the work of the presenting group and/or questions to the presenting group. After students make presentations, researchers provide reinforcement to students regarding the material studied and facilitate students to ask questions. After the reinforcement process, researchers gave formative tests to students. In the closing activity, students and the teacher draw conclusions from the learning. Next, students reflect via Google Form. Then the educator provides information related to the material that will be studied next, namely multiplication operations on matrices. The learning activity ended with a joint prayer and greetings.

At the second meeting, the researcher carried out learning according to the learning steps in the teaching module that had been prepared, starting with preliminary activities which began with saying hello, praying, checking attendance, apperception, conveying learning objectives, and motivation. Next, in the core activities, researchers carried out the PBL stages, namely (1) orienting students to the problem by presenting the problem context via PowerPoint and inviting students to understand the problem; (2) organizing students to learn, namely by placing students in groups that have been previously divided and the results of the group divisions are displayed via PowerPoint; (3) guiding individual and group investigations, at this stage the researcher monitors the activities of students in groups and guides students and groups who experience difficulties, during the discussion process the researcher finds students who are not actively involved in discussion activities; (4) develop and present work results, at this stage students present solutions to problems on the LKPD and present the results in front; (5) analyzing and evaluating the problem solving process, at this stage students provide responses to the results of the presenting group's work or questions to the presenting group. After students make presentations, researchers provide reinforcement to students regarding the material studied and facilitate students to ask questions. After the reinforcement process, researchers gave formative tests to students. In the closing activity, students and the teacher draw conclusions from the learning. Next, students reflect via Google Form. Then the educator provides information related to the material that will be studied next, namely matrix determinants. The learning activity ended with a joint prayer and greetings

The results of observations in cycle I are: (1) the researcher has carried out learning in accordance with the learning steps in the teaching module; (2) students do not understand the prerequisite material, namely matrix

similarity; (3) during group discussions there are still students who are not actively involved in group discussion activities; (4) the implementation of learning is carried out in the last lesson period so that students start to feel less conducive when they approach home time; (5) students still lack confidence to make presentations in front of the class. During the implementation of cycle I, the researcher found that students did not understand the prerequisite material, namely the similarity of matrices, so the researcher provided another explanation regarding the prerequisite material that the students did not understand. During group discussions, there were still students who were not involved in discussion activities and tended to separate themselves from their groups. The researcher has asked students to discuss with their groups, but there are still students who are not involved in discussion activities. At the time of the presentation, no group volunteered to present the results of their work. This is because students are still not confident enough to make presentations in front of the class. The evaluation results show that there are still many students who are confused about carrying out multiplication operations on matrices, whether multiplying matrices with scalars or multiplying matrices with matrices. The following is a snippet of students' assessment answers in cycle I.

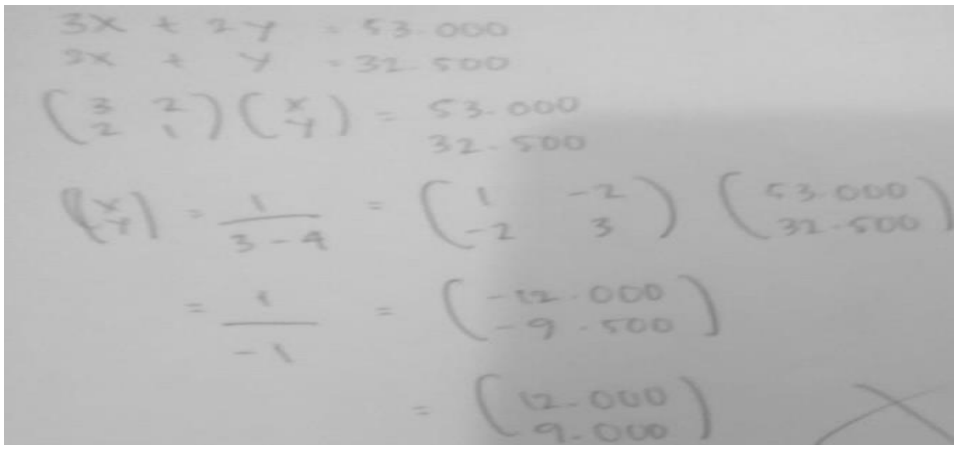

Figure 1. Student Answers to the Subtopic Assessment of Matrix Multiplication Operations

In Figure 1 above, it can be seen that students are still mistaken in writing and calculating matrix multiplication with scalars. Students make a mistake in answering question number 1 by adding up each element of the product on the same line. However, when multiplying matrix by matrix in question number 2, students can perform the operation of multiplying two matrices correctly. In question number 3, students were not careful in matrix multiplication so the results were wrong. Students experienced errors in answering question number 1 because they added each element of the matrix product with a scalar in the same row. This is because students are still confused about the difference between multiplying matrices with scalars and multiplying matrices with matrices. The next stage, the researcher reflected on the results of observations and student learning outcomes in cycle I. In cycle I, student learning outcomes had improved but had not yet reached the minimum completeness criteria. The results of cycle I reflection include: (1) the researcher has carried out learning in accordance with the learning steps in the teaching module; (2) strengthening prerequisite material that students do not yet understand in apperception activities has shown good results, namely students can understand the similarity matrix well; (3) during group discussions there are still students who are not actively involved in group discussion activities even though they have been directed to be actively involved in discussion activities, so researchers must have other plans to overcome this; (4) a less conducive learning process which causes students to lack focus in learning activities; (5) students still lack confidence to make presentations in front of the class; and (6) the evaluation results are low. Based on the results of the researcher's reflection on the implementation of the learning, the researcher prepared a follow-up plan, namely: (1) improving the teaching module according to the results of the reflection in cycle I; (2) rearranging PowerPoint and providing more structured reinforcement; (3) strengthen motivation students to be actively involved in the learning process including discussion activities; (4) provide encouragement to students to be confident in making presentations; and (5) conditioning the participants educate students to remain focused on learning even though learning is carried out in the last lesson period; (6) providing reinforcement related to the material studied so that it can help improve student evaluation results.

Cycle II

In the early stages of cycle II, researchers made improvements to the teaching modules along with media, teaching materials and LKPD, and reviewed the assessment sheets in cycle II. Next, in the second stage, the researcher carried out learning on the matrix determinant subtopic at the first meeting and the matrix inverse subtopic at the second meeting. Learning is carried out in accordance with the previously revised teaching module with

learning steps including 3 stages, namely preliminary activities, core activities containing PBL syntax, and closing. At the first meeting in cycle II, the researcher started the learning with preliminary activities, which began with saying hello, praying, checking attendance, apperception, conveying learning objectives, and motivation. Next, in the core activities, the researcher carried out the PBL stages, namely (1) orienting students to the problem by presenting the problem of the context of typical Palembang food, namely pempek, via PowerPoint and inviting students to understand the problem; (2) organizing students to learn, namely by placing students in groups that have been previously divided and the results of the group divisions are displayed via PowerPoint; (3) guiding individual and group investigations, at this stage the researcher monitors the activities of students in groups and guides students and groups who experience difficulties, during the discussion process the researcher still finds students who are not actively involved in discussion activities; (4) develop and present work results, at this stage students present solutions to problems on the LKPD and present the results in front; (5) analyzing and evaluating the problem solving process, at this stage students provide responses to the work of the presenting group and/or questions to the presenting group. After students make presentations, researchers provide reinforcement to students regarding the material studied and facilitate students to ask questions. After the reinforcement process, researchers gave formative tests to students. In the closing activity, students and the teacher draw conclusions from the lesson. Next, students reflect via Google Form. Then the educator provides information related to the material that will be studied next, namely inverse matrices. The learning activity ended with a joint prayer and greetings.

At the second meeting, the researcher carried out learning according to the learning steps in the revised teaching module which started with preliminary activities which began with saying hello, praying, checking attendance, apperception, conveying learning objectives, and motivation. Next, in the core activities, the researcher carried out the PBL stages, namely (1) orienting students to the problem by presenting the problem of the context of a typical Palembang food, namely pempek submarine via PowerPoint and inviting students to understand the problem; (2) organizing students to learn, namely by placing students in groups that have been previously divided and the results of the group divisions are displayed via PowerPoint; (3) guiding individual and group investigations, at this stage the researcher monitors the activities of students in groups and guides students and groups who experience difficulties, during the discussion process the researcher makes arrangements for students who are not involved in discussion activities; (4) develop and present work results, at this stage students present solutions to problems on the LKPD and present the results in front; (5) analyzing and evaluating the problem solving process, at this stage students provide responses to the work of the presenting group and/or questions to the presenting group. After students make presentations, researchers provide reinforcement to students regarding the material studied and facilitate students to ask questions. After the reinforcement process, researchers gave formative tests to students. In the closing activity, students and the teacher draw conclusions from the lesson. Next, students reflect via Google Form. The learning activity ended with a joint prayer and greetings.

The results of observations in cycle II are: (1) the researcher has carried out learning in accordance with the learning steps in the teaching module which have been revised according to previous reflections; (2) there are still students who are confused about changing the form of a system of linear equations to matrix form or vice versa; (3) during group discussions students who are actively involved in group work have increased; (4) learning is carried out in the last lesson period so that there are still students who lose focus when it is time to go home; (5) some students who previously lacked confidence in making presentations in front of the class in cycle II were now confident in presentation activities. In learning in cycle II, the researcher found that some students still had difficulty changing the form of a two-variable linear equation system into a matrix form, so the researcher further strengthened the students' understanding of the previous material, namely the matrix multiplication operation and relating it to a two-variable linear equation system. During the group discussion process, student involvement has increased, but there are still students who are not active in discussion activities. Learning is still carried out in the last lesson period so that there are still students who are not focused but the class is conducive. As a follow-up to the previous lesson, the researcher provided motivation to students regarding the benefits of presentation skills and invited students to practice presentations in class. As a result, students are more active and enthusiastic in presentation activities. The evaluation results in cycle II have improved from the evaluation results in the previous cycle. The evaluation questions contain a context that is close to students' daily lives. The evaluation results in this cycle have improved from the evaluation results in the previous cycle. The following is a snippet of students' assessment answers in cycle II.

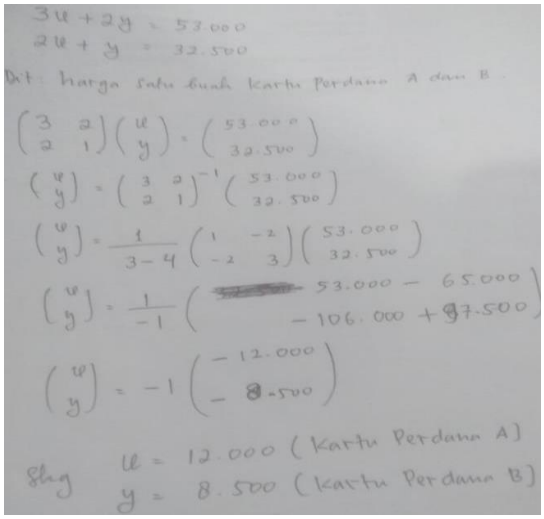

Figure 2. Student Answers to the Inverse Matrix Subtopic Assessment

Figure 2 above shows students' skills in solving problems on the questions given. The questions given contain contextual problems that encourage students to solve problems using the inverse matrix. Based on excerpts from the students' answers, it can be seen that the students have understood the concept of inverse matrices very well and are able to apply it to contextual problems. This shows that the closer the context of the problem raised in the question, the more capable students will be in solving the problem. The next stage, the researcher reflected on the results of observations and student learning outcomes in cycle II. In cycle II, student learning outcomes have increased and have reached the minimum completeness criteria. The results of cycle II reflection include: (1) the researcher has carried out learning in accordance with the learning steps in the teaching module which have been revised based on reflection in cycle I; (2) there are still students who are confused about changing the form of a system of linear equations to matrix form or vice versa so that the teacher explains again about changing the form of a system of linear equations to matrix form and vice versa; (3) during group discussions students who were actively involved in group work had increased but there were still students who were not active in group discussions; (4) learning is still carried out in the last lesson period so that there are still students who lose focus when it is time to go home but class conditions are more conducive than the previous cycle; (5) some students who previously lacked confidence in making presentations in front of the class in cycle II are now confident in presentation activities; and (6) evaluation results have increased. Based on the results of the researcher's reflection on the implementation of the lesson, the researcher prepared a follow-up plan, namely: (1) continuing to make improvements to prepare for the next lesson; (2) provide motivation for students to be actively involved in the learning process and confident to make presentations in front of the class; (3) continue to provide reinforcement for the material studied so that students can understand the lesson concepts well. The following is a table of the results of implementing Classroom Action Research.

Table 1. Results of Implementing Classroom Action Research

		Cycle I			Cycle II	
Completeness	Meeting 1	Meeting 2	End of cycle assessment	Meeting 1	Meeting 2	End of cycle assessment
Complete	9	10	14	23	25	27
Not finished	21	20	16	7	5	3
Classical completeness	30 %	33.33%	46.66 %	76.66%	83.33 %	90 %
Average value	65.63	65.70	68.20	73.13	73.86	86.60

Based on the table above, it can be seen that there was an increase in students' performance skills from cycle I to cycle II. This improvement cannot be separated from the improvement efforts made in cycle II based on the results of reflection in cycle I. This is in line with Aqib & Chotibuddin (2018) that to overcome difficulties or findings in the first cycle, the activities carried out in the second cycle have various additional improvements from actions in the previous cycle. Before implementing the Problem Based Learning model, researchers conducted a diagnostic assessment of students. The assessment results were still low, namely 50.15 with a KKM of 70. In the previous

lesson, the teacher carried out learning using a conventional model, namely the lecture method and practice questions which were given in the form of questions that only used ordinary calculation operations without providing contextual problems related to matrices. In fact, according to Lubis and Azizan (2018), active involvement of students in problem-based learning through activities of constructing real-life material in their learning environment greatly influences students' learning outcomes. In cycle I of this research, the researcher presented contextual problems in a context that was close to the lives around the students. The aim of using this context is so that students can truly understand the problems and benefits of matrices in everyday life. In line with Siregar, Suwanto, & Siagian (2021) who stated that every problem given should be a problem that has a close relationship with students so that students are interested in solving it based on their needs and curiosity, not just because of value demands. Apart from that, according to Reski, Hutapea, & Saragih (2019) in learning mathematics, the learning process should begin with problems related to students' daily lives and then students are guided to explore understanding of the problems given so that they can find mathematical concepts from the problems. the.

In cycle I, student learning outcomes increased. It's just that in cycle I the average score of students still did not reach the KKM, namely 57.25 at the second meeting. Of the 30 students, only 10 people completed it so the percentage of classical completeness was only 33.33% and had not yet achieved the expected classical completeness. Furthermore, in cycle II, there was a significant increase at each meeting. This increase occurred because improvements were made based on the results of reflection in the previous cycle. In the plan stage of cycle II, researchers made improvements to the teaching modules including teaching materials, media, LKPD, and assessment sheets. This improvement is based on findings and reflections on learning in the previous cycle so that the learning process in this cycle can run well. This can seen from classical completion in cycle II of the second meeting, it was 83.33%. Through the application of Problem Based Learning in this research, students have the opportunity to hone their abilities in solving problems and understanding the application of the material studied to the problems given. According to Aufa, Saragih, & Minarni (2016) the problem-based learning model is a learning model that provides authentic and meaningful problems that are close to students' lives, as well as being a basis for students to sit in conducting research, so that students can build their own knowledge, hone inquiry skills, as well as increasing their independence and self-confidence. Apart from that, according to Ali (2019) through Problem-Based Learning students learn to work in groups, become partners in the teaching and learning process where they can learn successfully, and can face new situations and develop lifelong learning abilities. The application of the problem-based learning model can also provide new experiences for students and motivate students to learn and can increase students' activities and learning outcomes (Brathatapa, 2021). Based on the discussion above, it can be seen that the application of the problem-based learning model can improve students' performance skills. This is in line with the research results of Lubis, Irwanto, & Harahap (2019) that problem-based learning is very effective in improving students' learning outcomes and critical thinking skills. Apart from that, research from Susanti, et al (2022) also shows that there is an increase in student learning outcomes in each cycle through the application of the problem-based learning model. Thus, through the application of the problem-based learning model, student learning outcomes in matrix material in class XI at SMAS Tasik Raja Labuhanbatu Selatan have increased.

Conclusion

Based on the results of this research, it can be seen from the increase in the percentage of students' completion in cycle I as much as 46.66% and in cycle II it reached 90% so it can be concluded that the application of the Problem Based Learning model can improve students' performance skills in matrix material in class XI Tasik Raja High School Labuhanbatu Selatan. Applying the Problem Based Learning model to a real context that is closely related to students can help students more easily understand mathematics lesson concepts. By solving real problems using the Problem Based Learning model, it is also hoped that students will be able to prepare them to face realistic problems that they may face in the future.

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