

Application of the Problem-Based Learning Model with a Teaching at the Right Level (TaRL) Approach to Enhance Student Mathematics Achievement

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ABSTRACT

This research aims to describe the increase in student learning achievement in mathematics learning through a problem based learning model with a teaching at the right level (TaRL) approach. This research is classroom action research with two cycles and was conducted at SMKN 2 Madiun. The research subjects were class XI DKV 2 students. Data was collected and analyzed using qualitative and quantitative data analysis techniques. The results of this research show that through the application of the problem based learning model with the teaching at the right level (TaRL) approach can improve the quality of mathematics learning. The level of success in mathematics learning achievement from the initial cycle was 29,41%, in cycle I was 52,94% and increased in cycle II by 82,35%. Based on these results, it can be concluded that the problem based learning model with a teaching at the right level approach can improve the mathematics learning achievement of class XI DKV 2 SMKN 2 Madiun students.

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1. INTRODUCTION

Education is one of the main pillars in the progress of a country. Education plays a very important role in life to improve the quality of human resources to be able to face life in the future, become skilled and innovative in utilizing all existing potentials, and be able to face the progress or developments that are happening today, especially in the field of science and technology (IPTEK). This is in line with the opinion Liza et al. (2023) which states that education is one of the efforts to increase the potential of human resources (HR) in students. The potential and human resources of students can be grown by providing learning activity facilities that are in accordance with their characteristics and learning needs and providing support and motivation to increase the enthusiasm for learning so that they are able to obtain maximum achievements. In addition, education is a conscious effort that is carried out in a structured manner to create a supportive learning atmosphere, where students can develop their potential effectively (Sebayang and Rajagukguk, 2019). Education has the main purpose as a means to

develop potential and increase human intelligence to be better prepared to face the challenges of life in the future. In a country, education is considered a very important thing and needs to be considered and improved. The educational process is closely related to teaching and learning activities, both inside and outside the classroom. Currently, the education system in Indonesia has implemented an independent curriculum in response to the fierce competition for human resources in the 21st century.

The independent curriculum is the latest curriculum designed by the government to meet the learning needs of students. According to Rahayu et al. (2022) Explained that the Independent Curriculum is defined as a learning design that makes it easy for students to learn comfortably, fun, and without pressure in developing their natural talents. The independent curriculum is the foundation for developing students' potential by giving teachers the freedom to develop learning tools that can be adjusted to the needs and characteristics of students. This is in line with the opinion Novelita (2022) which states that the independent curriculum aims to provide flexibility or freedom to students to improve their understanding of certain materials from various aspects, so that they do not only depend on the direction of the teacher. As a professional teacher, it is important to have skills in developing students' potential and providing meaningful learning experiences and understanding. This is an important component in the education system, especially in the independent curriculum, where teachers are required to create flexible learning so that students can apply the theories they have learned to solve problems in real life.

This is in line with the problem-based learning model or *Problem Based Learning* (PBL), which is one of the many learning models that connect the learning process with real-life problems. *Problem Based Learning* is a learning approach in which students are actively involved in solving concrete and relevant problems in the context of learning. The *Problem Based Learning* learning model focuses on the role and activities of students in finding solutions and solving problems in daily life (Meilasari et al., 2020). Through *Problem Based Learning*, students not only deepen their understanding of the subject matter, but also develop critical thinking, collaborative, and problem-solving skills that are indispensable to deal with problems that occur in the surrounding environment. Arends stated that in the *Problem Based Learning* learning model, there are several syntax that must be implemented, including orienting students to problems, organizing students to learn, guiding individual and group investigations, developing and presenting the results of work, and analyzing and evaluating the problem-solving process (Daeli, 2023).

The application of *Problem Based Learning* (PBL) in the learning process has been proven to have a positive impact in improving students' understanding of certain subject matter, as supported by a number of studies conducted. Based on research conducted by Rahmat (2018) stated that the application of the *Problem Based Learning* model can improve students' learning achievement. This is strengthened by the results of research conducted by Widayanti (2020) which states that the *Problem Based Learning* learning model can improve mathematics learning achievement and student activities. Meanwhile, Fakhriyah (2014) explained that the basis of *Problem Based Learning* (PBL) is a collaborative learning process, where students are expected to be able to build their own knowledge through the process of interacting with their peers through discussion groups. In the application of the *Problem Based Learning* (PBL) model, students are encouraged to become active and independent learners, exploring various sources of information to solve the given problems.

However, in its application, the *Problem Based Learning* (PBL) model is often faced with challenges in the form of gaps in understanding and involvement between students. Not all students have the same ability to understand the subject matter and solve the problems given. Students with low abilities are often left behind and less involved in the learning process. This gap can hinder the effectiveness of the *Problem Based Learning* (PBL) model in improving student learning achievement. Therefore, an approach that can adjust to the level of ability of each student is needed to ensure that all students are

involved in learning. Based on this explanation, the *Problem Based Learning* (PBL) learning model is in line with the *Teaching at the Right Level* (TaRL) approach which provides differentiation in the learning process based on the level of cognitive ability of each student. Basically, students have different backgrounds and mathematical abilities, which come from various factors such as previous education, family support and learning experience. This difference leads to variations in the speed and effectiveness of learners in solving problems. Therefore, it is important for teachers to recognize and adapt teaching methods to meet the needs of each student, provide additional support for those who need it, and challenge more advanced students to develop further (Siahaan et al., 2023).

The *Teaching at the Right Level* (TaRL) approach was first developed by Pratham, an educational organization in India. This *Teaching at the Right Level* (TaRL) approach is not based on class level but on the ability of its students, and aims to provide an improvement in students' abilities and knowledge in literacy and numeracy (Fitriani, 2022). The *Teaching at the Right Level* (TaRL) approach focuses on an initial assessment of students' basic abilities, then groups students based on their ability level. In applying this approach, teachers need to conduct diagnostic assessments before starting the learning process. This assessment aims to find out the characteristics, needs, and potentials of students so that teachers have initial capital about the ability of students to design an effective learning process (Ningrum et al., 2023). So far, teachers generally group students heterogeneously. However, research shows that this method is less effective because the problems given are often only solved by high-ability students, while students with medium or low abilities tend to just watch without actively participating. By using the *Teaching at the Right Level* (TaRL) approach, students can be grouped according to their abilities. Students with high abilities can discuss independently, students with medium abilities can discuss with the help of teachers, while students with low abilities will receive special guidance from teachers. Each group receives instruction tailored to their ability level, so that each learner can learn according to his or her ability level and gradually achieve the expected results. Teachers must be able to understand various learning models and apply them according to the needs of students. Through, the application of TaRL with problem-based learning can make learning more effective, especially in mathematics lessons.

Mathematics is one of the important and mandatory sciences to be studied in the world of education. Mathematics is a compulsory subject given at every level of education, whether elementary, junior high, high school, and even college. The material discussed in mathematics is related to problem solving. Mathematics is not only about learning formulas and concepts, but also about applying that knowledge to solve various problems in daily life, science, and other fields. Despite this, math is still seen as a difficult subject and is often disliked by students. This happens because of the lack of students' ability to learn mathematics. This negative interpretation causes mathematics to be considered very difficult to learn, so it can result in students' learning achievement that is still low. The low learning achievement can also be influenced by the application of learning methods that have not accommodated all differences in students' abilities. Based on the results of the preliminary study from the data on the assignment scores of class XI DKV 2 students at SMKN 2 Madiun, data was obtained that most of the students had not received complete grades or were still below the KKM. This is strengthened by the results of interviews conducted with PPL teachers, stating that learning achievement for mathematics subjects in grade XI DKV 2 is still low, as shown by the daily test scores and the results of the end-of-semester assessment. Teachers realize that the learning methods used are still conventional, so learning is still focused on the teacher.

Based on the above problems, the researcher conducted a study entitled "*Application of Problem Based Learning Model with a Teaching at the Right Level (TaRL) Approach to Improve Mathematics Learning Achievement of Class XI DKV 2 Students at SMKN 2 Madiun*". This research is needed to find out how the learning achievement carried out by students after carrying out learning using the *Problem*

Based Learning learning model with the Teaching at the Right Level (TaRL) approach. This research is expected to contribute to the development of more innovative and effective learning methods, as well as provide guidance for teachers in overcoming challenges in the learning process.

2. METHODS

This research is a classroom action research that will be carried out in June 2024. This research was carried out at SMKN 2 Madiun, in class XI DKV 2 in the even semester of the 2023/2024 school year. At SMKN 2 Madiun, two curricula are still used, namely for classes X and XI using the independent curriculum and for class XII using the 2013 curriculum. The subjects of this study are students of class XI DKV 2 SMKN 2 Madiun which totals 34 students. The material in this study is Function Composition and Inverse Function. The independent variables in this study are the problem-based learning model with the TaRL approach and the bound variable in this study is mathematics learning achievement. The research design used is Kemmis dan McTaggart (in the Arikunto, 2010), which consists of 4 stages of activities, including: planning, implementation of actions, observation, and reflection. The research action was carried out using the steps of the Problem Based Learning (PBL) learning model by homogeneously grouping students according to the Teaching at the Right Level (TaRL) approach. The research procedure is presented in the following figure.

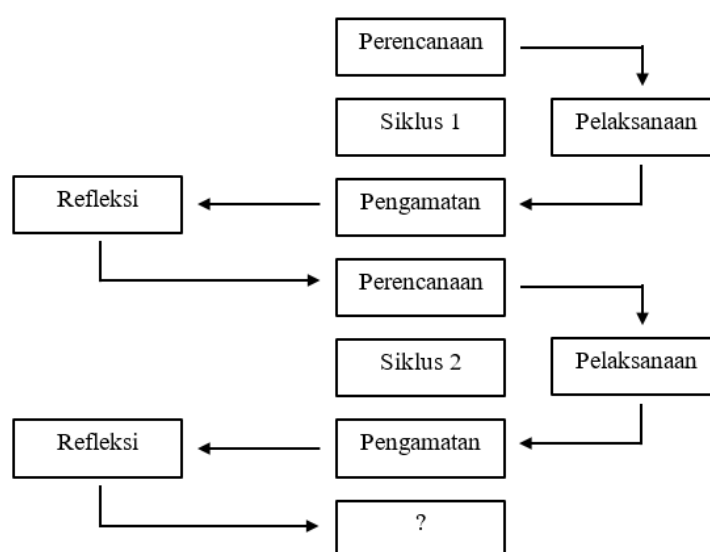


Figure 1. Research Procedure

This research is said to be complete or successful if the average score of students who reach KKM 70 in the evaluation question is 80%. If the score of students who reach KKM 70 has not reached 80%, then this research is said to be incomplete or unsuccessful. The data collection technique in the study uses observation methods and measurement of test scores. The data analysis used in this study is quantitative and qualitative data analysis. For quantitative data analysis includes.

First, measuring the final individual score of the posttest question is by formula.

$$\text{Value} = \text{Total Answer} \times 10$$

Second, to measure the percentage of completeness of students' learning achievement using the formula:

$$\text{Mastery Percentage} = \frac{\text{Number of students who have completed learning}}{\text{Total number of students}} \times 100$$

3. FINDINGS AND DISCUSSION

The results and discussion of the Class Action Research (PTK) that has been carried out come from the results of the research that has been carried out and then reflected after the cycle is implemented. Based on research that has been carried out at SMKN 2 Madiun, the implementation of the cycle has gone well in every stage. This research was carried out in two learning cycles, where before implementation, preliminary value data was taken. From the results of the cycle carried out, it can be seen that there has been an increase in learning achievement obtained by students. As for the explanation, it is presented as follows.

Precycle

Pre-cycle activities are carried out before the cycle in the research is carried out. This is necessary to find out how students understand the material they have learned, so that they can be followed up so that they can be improved in the future. The following are the results of the pre-cycle scores obtained by students with KKM 70 can be seen in the table below.

Table 1. Percentage of Pre-Cycle Learning Achievement

Description	Number of Student	Percentage
Completed	10	29,41%
Incomplete	24	70,59%

Based on table 1, data was obtained that only 10 out of 34 students in class XI DKV 2 or with a percentage of 29.41%. Meanwhile, 24 students or with a percentage of 70.59% have not reached the predetermined KKM. In addition, in learning activities, teachers only use the lecture method in delivering material so that students feel bored. This results in students not paying attention to the teacher's explanations so that students' learning achievement becomes low. Therefore, teachers need to make an innovation in learning to improve student learning achievement, namely through the application of *the Problem Based Learning* (PBL) learning model with *the Teaching at the Right Level* (TaRL) approach. Where in its implementation, before applying the *Problem Based Learning* (PBL) teaching model with the *Teaching at the Right Level* (TaRL) approach, teachers first conduct a diagnostic assessment to determine the initial cognitive abilities of students which will later be used in the grouping of students consisting of low groups, medium groups, and high groups.

Cycle 1

In the planning stage of the first cycle, teachers create teaching modules with the *Problem Based Learning* (PBL) learning model, create teaching materials, create learning media in the form of power points, and prepare 3 types of LKPD consisting of low LKPD, medium LKPD, and high LKPD. Each LKPD presents a problem that must be solved by students by providing a different level of *hint* (assistance). Then at the stage of implementing the first cycle, teachers carry out the learning process in accordance with the teaching modules that have been designed. The learning stages are in accordance with the planning in the teaching module which consists of three steps, namely a) Initial activities; b) Core activities that contain learning stages using *the Problem Based Learning* (PBL) learning model with

homogeneous grouping of students in accordance with the *Teaching at the Right Level* (TaRL) approach; c) Closing activities.

Based on the results of the data on the implementation of the first cycle that has been implemented, the following data on student learning achievement was obtained.

Table 2. Percentage of Learning Achievement Cycle I

Description	Number of Student	Percentage
Completed	18	52,94%
Incomplete	16	47,06%

Based on table 2, data was obtained that the number of students who completed the program increased. There were 18 students who completed with a percentage of 52.94% and 16 students who did not complete with a percentage of 47.06%. The percentage of students' learning achievement has shown an increase, but has not reached the success indicators of the research that have been determined.

Cycle 2

In the planning stage of cycle II, teachers create teaching modules with *the Problem Based Learning* (PBL) learning model, create teaching materials, create learning media in the form of power points, and prepare 3 types of LKPD consisting of low LKPD, medium LKPD, and high LKPD. Each LKPD presents a problem that must be solved by students by providing a different level of *hint* (assistance). Then at the stage of implementing cycle II, teachers carry out the learning process in accordance with the teaching modules that have been designed. The learning stages are in accordance with the planning in the teaching module which consists of three steps, namely a) Initial activities; b) Core activities that contain learning stages using *the Problem Based Learning* (PBL) learning model with homogeneous grouping of students in accordance with the *Teaching at the Right Level* (TaRL) approach; c) Closing activities.

Based on the results of the data on the implementation of the second cycle that has been implemented, the following data on student learning achievement was obtained.

Table 3. Percentage of Learning Achievement Cycle II

Description	Number of Student	Percentage
Completed	28	82,35%
Incomplete	6	17,65%

At the reflection stage of cycle II, based on students' learning achievements and observations on the learning process, there was an increase in student learning achievement in cycle I and cycle II. The students who completed were 28 students with a percentage of 82.35% and the students who did not complete were 6 students with a percentage of 17.83%. The data shows that the percentage of students who have completed has reached the target of research success indicators.

Based on the research activities on "The Application of the *Problem Based Learning* Model with the *Teaching at the Right Level* (TaRL) Approach to Improve the Mathematics Learning Achievement of Class XI DKV 2 Students at SMKN 2 Madiun" which has been carried out including pre-cycle activities, cycle I, and cycle II, it can be seen that the learning achievement of students has increased. The learning achievement increased after teachers used the *Problem Based Learning* with the *Teaching at the Right Level* (TaRL) Approach to explain the learning material in grade XI DKV 2 SMK Negeri 2 Madiun. The improvement of students' mathematics learning achievement from the prestralus, cycle I, and cycle II activities can be seen in the following diagram.

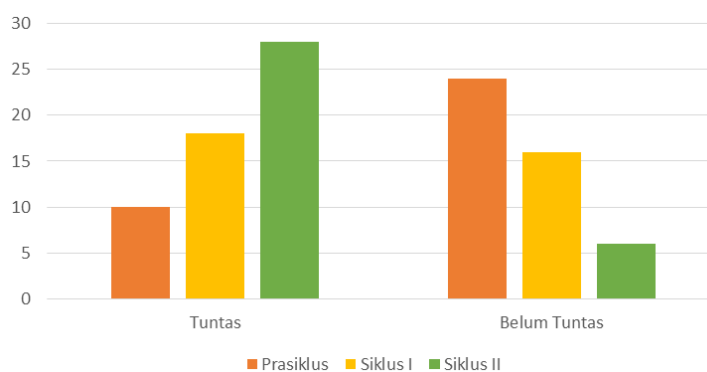


Figure 2 Diagram of Improving Students' Mathematics Learning Achievement

Based on Gambar 2, it is known that from the preliminary activities, cycle I, and cycle II that have been implemented, it is known that the number of completed education students has increased. In the preliminary activity, there were only 10 students who completed and 24 students who did not complete. This happens because teachers have not innovated learning and are still using conventional learning models. Then, in the first cycle, the number of students who completed increased to 18 students who completed and 16 students who did not complete. The increase occurred because teachers have implemented learning innovations by implementing a *problem-based learning* model with a *teaching at the right level* (TaRL) approach. Then in the second cycle, the number of students who completed also increased to 28 students and those who have not completed as many as 6 students. When viewed from the percentage of completeness of mathematics learning achievements obtained, there has also been an increase. This can be proven in the following diagram image.

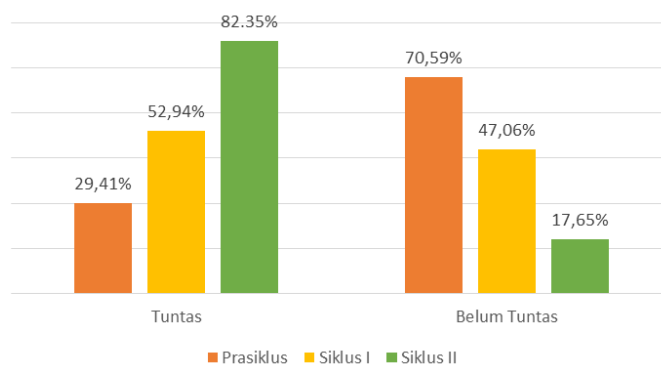


Figure 3 Percentage Chart of Students' Mathematics Learning Achievement

Based on figure 3, it is known that in the preliminary activity, only 10 students out of 34 students in class XI DKV 2 or with a percentage of 29.41%. Meanwhile, as many as 24 students or with a percentage of 70.59% have not been able to achieve the predetermined KKM score. Then in the first

cycle, teachers began to apply the *problem-based learning* model with the *teaching at the right level* (TaRL) approach in classroom learning activities, so that the number of students who completed increased to 18 students with a percentage of 52.94% and 16 students who did not complete with a percentage of 47.06%. Then after reflecting on the second cycle, the number of students who completed it also increased to as many as 24 students out of 34 students with a percentage of 82.35%. Meanwhile, there are 6 students who have not completed with a percentage of 17.65%. The increase in mathematics learning achievement obtained by students can be evidenced by the quality of learning carried out by teachers.

4. CONCLUSION

Based on the results of the research and discussion, it can be concluded that the application of the problem-based learning model with the teaching at the right level (TaRL) approach can improve the mathematics learning achievement of students in grade XI DKV 2 SMK Negeri 2 Madiun. This is evidenced by the increase in the number of students who obtain completeness scores above the KKM score. In the first cycle there was an increase, where students who received a completeness score were 18 students with a percentage of 52.94% (an increase of 23.53% from the pre-program). Meanwhile, in cycle II, there was also an increase, where students who received a completeness score were 28 students with a percentage of 82.35% (an increase of 29.41% from cycle I). The application of the problem-based learning model with the teaching at the right level (TaRL) approach is one of the alternatives for teachers to provide variety in learning activities in the classroom. The problem-based learning model with a detailed teaching at the right level (TaRL) approach can provide flexibility for students to actively participate in learning activities and students can learn according to their ability level through group discussions, problem-solving, and presentations. With a variety of learning using the problem based learning model with the teaching at the right level (TaRL) approach, it can make students feel a more fun and more meaningful learning atmosphere so that it can increase motivation, learning interest, and active participation of students.

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Conflicts of Interest: The authors declare no conflict of interest.

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