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# Efforts to improve mathematics learning outcomes through the project based learning model for class x students of Hilimegai 1 State Vocational High School

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**ABSTRACT**

The aim of this research is to improve student learning outcomes in the cognitive and psychomotor domains through the application of the Project Based Learning learning model. The type of research is classroom action research (PTK). The PTK model used is the C. Kemmis & Mc Taggart spiral model which is implemented in 2 cycles. Data collection techniques are test techniques and non-test techniques. The research instrument uses test items and observation sheets. The data analysis technique used is descriptive comparative. Based on the research results, it shows that the cognitive domain mathematics learning outcomes based on the percentage of pre-cycle, cycle I and cycle II learning completion are 20.8%; 54.2%; 91.8%. Meanwhile, the results of mathematics learning in the psychomotor domain based on the percentage of learning completion in pre-cycle, cycle I and cycle II were 41.6%; 70.8%; 95.8%. Thus, the application of the Project Based Learning model can improve student learning outcomes in the cognitive and psychomotor domains of Class X students at Hilimegai 1 State Vocational High School.



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## 1. INTRODUCTION

Mathematics is one of the fields of study taught at school(Even, 2011). Both elementary schools, junior high schools, general high schools and even tertiary institutions(Kariya, 2011). Mathematics is also one of the basic sciences in schools which has several important roles in mastering science and technology which is developing in the era of globalization(Weber, 2015). Mathematics also needs to be used optimally as a forum for developing intelligence, understanding, skills, abilities and forming good character in students in everyday life(Lestari et al., 2021). Mathematics learning places great emphasis on understanding concepts. Mathematics learning is an activity that involves someone in an effort to acquire knowledge, skills and positive values by utilizing various sources for learning(English & Halford, 2012). Good and meaningful mathematics learning for students depends on how the teacher teaches(Hiebert & Grouws, 2007).

For some students, Mathematics is not an enjoyable lesson(Nardi & Steward, 2003). Researchers who are also Mathematics teachers, indeed found similar conditions, where students were not enthusiastic about learning Mathematics, mathematics was scary, and students did not like mathematics. So their level of understanding is not optimal, which results in learning outcomes that

are also not optimal(Hussey & Smith, 2003). So far, researchers have not used innovative teaching methods, have not tried creative ways that can liven up the class and make students active in participating in the learning process, so researchers want to try new ways of delivering Mathematics material.

Researchers try to apply active learning methods that involve students directly in teaching and learning activities so that they are encouraged to move and think in enthusiastic classroom conditions(Bonwell & Eison, 1991). An active learning process is student-centered learning(Armbruster et al., 2009). Learning using the Project Based Learning model is a learning model that involves students actively in the learning process(Mihardi et al., 2013). The aim of using the Project Based Learning model is to teach students to be able to work collaboratively in solving problems and producing a project in the learning process(Putri et al., 2017). In this learning process, the teacher only functions as a facilitator, because lecture-based learning (teacher centered) is believed to have less of a meaningful impact on students(Mascolo, 2009). The results of Polio's research in Silberman (2012:24) state that in learning that uses a lecture style, students pay less attention for 40% of the entire learning time(Dean & Hubbell, 2012). Therefore, teachers must make various efforts so that the learning process runs well(Berliner, 2001).

Based on data on mathematics Mid-Semester Test (UTS) scores, it shows that the mathematics learning results of class X students at Hilimegai 1 State Vocational High School are still below the specified KKM. The average UTS mathematics score is 58.72 while the specified KKM is 70(Gandhi et al., 2012). Of the 24 students, only 5 students got a score above the KKM(Rukun et al., 2019). Meanwhile, 19 students got scores below the specified KKM(Fakhroni & Puotier, 2023). The percentage of students who got a score above 70 was 20.83%, while the percentage of students who got a score below 70 was 79.16%(Amalia et al., 2023). Based on the percentages that have been described, it shows that there are more students who did not complete than students who completed(Shapiro et al., 2014). Some of the problems experienced during the learning process are that the teacher has implemented several models and methods to support the learning process, but the implementation is less varied and still conventional so that the teacher has not been able to improve the quality of the learning process in the classroom. Mathematics learning will be more interesting if teachers are able to use innovative learning models.

According to Thomas et al, Project Based Learning is a learning model that provides teachers with the opportunity to manage learning in the classroom by involving project work(Sumarni, 2015). Cord also explained that Project Based Learning is an innovative learning model that focuses on contextual learning through complex activities(Krauss & Boss, 2013). Project-based work contains complex tasks based on questions and problems that are very challenging and require students to design, solve problems, make decisions, carry out investigative activities, and provide opportunities for students to work independently. Clegg in Wena (2011:144) also explains that through project work, students' creativity and motivation will increase(Pramudita et al., 2022).

## 2. RESEARCH METHOD

This research was carried out at Hilimegai 1 State Vocational High School in class X semester 1 of the 2023/2024 academic year. The research subjects were 24 class X students, consisting of 15 male students and 9 female students. This type of research is classroom action research (PTK). According to Kemmis & Taggart (1981: 7-8) states that the PTK procedure consists of three stages, namely planning, action and observation and reflection. This research is research conducted by teachers on their students and assisted by one observer. This research was conducted in two cycles, where each cycle contained two meetings.

The data collection technique in this research uses a test technique by providing questions related to statistics and non-tests in the form of an observation sheet in the form of a rubric for assessing students' skills in determining the characteristics of the exposure. Test techniques are used to obtain cognitive learning outcomes, while non-test techniques, observation sheets in the form of learning rubrics, are used to obtain learning outcomes in the psychomotor domain.

The data analysis technique in this research uses comparative descriptive analysis. Comparative descriptive is comparing the research results in the pre-cycle, cycle I and cycle II. The results of this comparison are to determine indicators of success and shortcomings in each cycle. Indicators that have not been achieved are corrected in the next cycle. So that deficiencies that have been corrected, in the next cycle can improve learning outcomes in the cognitive and psychomotor domains. Benchmarks for success in this research can be measured using the following indicators: 1) the percentage of completeness of students' mathematics learning outcomes in the cognitive domain which reaches a KKM of 70, 2) the percentage of completeness of mathematics learning outcomes in the psychomotor domain reaches a KKM of 70.

Student learning completion in the cognitive and psychomotor domains can be calculated using the formula below:

$$P\frac{F}{N}x100\%$$

Information:
P = percentage of learning completeness
F = Number of students who have completed their studies
N = Total number of students

## 3. RESULTS AND DISCUSSIONS

Research using the Project Based Learning approach carried out at Hilimegai 1 State Vocational High School was carried out in two cycles, where each cycle was carried out in two meetings. Based on the research results, it can be seen that the comparison of the learning outcomes of class.

**Table 1. Distribution of Complete Learning Outcomes in Pre-Cycle, Cycle I and Cycle II**

| No | Score | Criteria | PreCycle | | Cycle I | | Cycle II | |
|---|---|---|---|---|---|---|---|---|
| | | | fi | % | fi | % | fi | % |
| 1 | ≥ 80 | Complete | 5 | 20,8 | 13 | 54,2 | 22 | 19,6 |
| 2 | < 80 | Not Completed | 19 | 79,2 | 11 | 45,8 | 2 | 8,4 |
| Amount | | | 24 | 100 | 24 | 100 | 24 | 100 |

Based on Table 1 above, it can be seen that the number of students who completed the pre-cycle was 5 students and the number of students who did not complete was 19 students with classical completion of 20.8%. In the first cycle, it can be seen that the number of students who completed was 13 students, and those who did not complete were 11 students with classical completeness of 54.2%, while in the second cycle the students who completed were 22 students and those who did not complete were 2 students with classical completeness. amounting to 91.6%. The results above show an increase starting from the pre-cycle, increasing in cycle I and increasing in cycle II. Improvement in each cycle is influenced by several factors, namely: 1) in the pre-cycle students do not know the models, methods or approaches to the learning process at all, so the learning process carried out is still conventional. The results of observations on pre-cycle activities show low student activity, this is indicated by the lack of student interest in the mathematics subjects presented so that students tend to be passive in the learning process,

Cycle II is an improvement on the learning process that was carried out in cycle I. In cycle II students have experienced a very significant improvement in the success indicators that have been determined. In the second cycle, students already understand how to learn using the Project Based Learning model. Students who have begun to master learning using this approach are characterized by increased student activity during the learning process. During the learning process, students are able to independently determine what project to create and students are able to organize the project so that their work can be completed. Increased student activity influenced student learning outcomes in the second cycle, where in the second cycle learning outcomes increased from 54.2% to 91.6%. The increase in learning outcomes by 37.4% is not only influenced by students who have begun to be

independent, but also by implementing this approach, it provides students with direct experience in learning, so that students can discover for themselves the learning concepts provided.

The increase in learning outcomes can be seen from the maximum score, minimum score and average score, which are shown in Table 2 below:

**Table 2. Frequency Distribution of Student Learning Outcomes in the Cognitive Domain**

| Criteria | PreCycle | Cycle I | Cycle II |
|---|---|---|---|
| Maximum Value | 85 | 90 | 100 |
| Minimum Value | 25 | 60 | 75 |
| Average | 62,7 | 72,4 | 86,2 |

Based on Table 2 above, there is an increase in learning outcomes. The increase in learning outcomes can be seen from the increase in the maximum score, minimum score and average score from pre-cycle, cycle I and cycle II. In the pre-cycle, the maximum score achieved by students was 85, the minimum score was 25 and the average score was 62.7. In cycle I, the maximum score increased to 93, the minimum score increased to 60 and the average score increased to 72.4. At the end of cycle II the maximum score reached 100, the minimum score reached 75 and the average score reached 86.2.

The Project Based Learning model is a model that produces a project. This model makes students more independent in their learning process. According to Sutirman (2013:43), explains that Project Based Learning is an innovative learning model that focuses on contextual learning through complex activities. Complex activities are based on very challenging questions and problems and require students to design, solve problems, make decisions and provide opportunities for students to work independently. The projects created by students are in the form of presenting data in the form of bar, line and circle diagrams. Students are directed to be able to - create and find their own steps to create the diagram. So in the learning process the teacher is only a facilitator, students are given more freedom to complete their projects. This freedom encourages students to develop the ability to understand knowledge to increase their knowledge and makes students more responsible and play an active role in completing a product, namely making data presentations in the form of bar, line and circle diagrams.

## 4. CONCLUSION

Based on the results of research and discussions that have been carried out regarding improving mathematics learning outcomes through the application of the Project Based Learning model, it can be concluded that the Project Based Learning model used in the learning process can improve student learning outcomes in the cognitive and psychomotor domains as shown by 24 students and has met the indicators established achievements. Based on the research results and conclusions, it is recommended to teachers that the application of the Project Based Learning model can be used as an alternative in solving learning problems for students. The use of Project Based Learning can also be developed in subjects or thematic learning as a reference for further research.

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