



Effectiveness of Using the Independent Curriculum Based Problem Based Learning Model in Learning Trigonometry Material in Class X State High School 8 Manado

Andra Christine Tombokan

Department of Mathematics, FMIPAK, Universitas Negeri Manado, Indonesia

James U. L. Mangobi

Department of Mathematics, FMIPAK, Universitas Negeri Manado, Indonesia

Jorry Ferry Monoarfa

Department of Mathematics, FMIPAK, Universitas Negeri Manado, Indonesia

Korespondensi penulis: andratombokan@gmail.com

Abstract. *The objective of this study is to assess the efficacy of employing the Problem-Based Learning approach in the acquisition of Trigonometry concepts. This study examines four metrics of learning efficacy: student learning outcomes, student engagement during the learning process, student feedback on learning, and the teacher's aptitude in facilitating learning. This research falls under the category of quantitative descriptive research. The research was conducted at SMA Negeri 8 Manado during the odd semester of the 2023/2024 academic year. The study included a sample of 38 students from class X-I. The employed data collection approaches include testing, observation, and administering questionnaires. The study determined that the utilization of the Problem-Based Learning (PBL) approach in teaching Trigonometry content yielded positive results. This is exemplified by the attainment of the four metrics that measure the efficacy of utilizing the learning model: (1) Student learning results in the subject matter are classified as thoroughly comprehensive. (2) Student activities during the learning process are classified as satisfactory. (3) Students exhibit a favorable attitude towards the learning process. (4) The teacher's aptitude for overseeing the learning process is exceptional.*

Keywords: *Model, Problem-Based Learning, Independent Curriculum, Trigonometry*

Abstrak. Tujuan dari penelitian ini adalah untuk menilai keefektifan penggunaan pendekatan Pembelajaran Berbasis Masalah dalam perolehan konsep Trigonometri. Penelitian ini mengkaji empat metrik kemandirian pembelajaran: hasil belajar siswa, keterlibatan siswa selama proses pembelajaran, umpan balik siswa terhadap pembelajaran, dan kemampuan guru dalam memfasilitasi pembelajaran. Penelitian ini termasuk dalam kategori penelitian deskriptif kuantitatif. Penelitian ini dilakukan di SMA Negeri 8 Manado pada semester ganjil tahun ajaran 2023/2024. Penelitian ini melibatkan sampel sebanyak 38 siswa kelas X-I. Pendekatan pengumpulan data yang digunakan meliputi tes, observasi, dan pemberian angket. Hasil penelitian menunjukkan bahwa pemanfaatan pendekatan Pembelajaran Berbasis Masalah (PBL) dalam pengajaran materi Trigonometri membuahkan hasil yang positif. Hal ini dicontohkan dengan tercapainya empat metrik yang mengukur efektivitas pemanfaatan model pembelajaran: (1) Hasil belajar siswa pada materi pelajaran tergolong tuntas komprehensif. (2) Aktivitas siswa selama proses pembelajaran tergolong memuaskan. (3) Siswa menunjukkan sikap positif terhadap proses pembelajaran. (4) Kecakapan guru dalam mengawasi proses pembelajaran sangat luar biasa.

Kata Kunci : Model, Problem Based Learning, Kurikulum Merdeka, Trigonometri

INTRODUCTION

Curriculum changes are the government's efforts to improve the quality of education by Republic of Indonesia Law No. 20 of 2003 concerning the National Education System. This is the legal and philosophical basis for the independent learning curriculum, allowing students and teachers to study, innovate and learn independently. The Ministry of Education adapts to changing times to produce a golden generation with quality education through the independent learning program.

In 2020, the Minister of Education and Culture of the Republic of Indonesia, Nadiem Anwar Makarim (Suryani et al., 2023), stated that Merdeka Belajar revitalizes the education system by building key competencies to make learning a pleasant experience. In pedagogy, independent learning encourages a world of competency and values-based education, curriculum and assessment, and an individual needs-based and student-centred approach. In the curriculum, Merdeka Belajar forms a competency-based curriculum focusing on soft skills and character development. At the same time, Merdeka Belajar presents formative assessments based on portfolios in the assessment system category. Curriculum is related to education, which is essential for the nation's progress. Education influences students to enable students to bring about change, and students can function optimally in society.

Mathematics is a popular subject in education but is feared by students because of its difficulty level. According to Glenn and Robert (Rahman & Saputra, 2022), mathematics is the science of logic regarding shape, arrangement, quantity, and concepts related to one another in large numbers divided into three fields, namely algebra, analysis and geometry. Furthermore, Ruseffendi (Ngoe et al., 2023) states that mathematics is the science of order, the science of organized structures starting from undefined elements to defined elements to axioms or postulates and finally to postulates. Mathematics can influence learning outcomes and teach students to think systematically, scientifically and creatively and achieve achievements according to school regulations.

One of the materials in the class X high school mathematics subject is Trigonometry. In learning trigonometry, a meaningful learning process must be created in which the teacher is the source of knowledge, students are the centre of learning, and learning activities are supportive. Susanto (Wiratama, 2020) believes teacher-centred learning causes low activity and impacts student learning outcomes.

Based on the results of initial observations carried out through interviews with mathematics teachers and observations of student activities in class, This can be seen from the results of the written test where only 30% of students achieved the Learning Goal Achievement Criteria (KKTP). The remaining 70% of students must undergo remedial training to achieve the KKTP—the low results of student mathematics learning in this Trigonometry material.

As for observations made on class activities, Sometimes students look for excuses to get permission to leave class while learning occurs. Some students need to be more active in participating in the learning process in class. Student behaviour like this causes most students to not master and understand the concepts and stages in solving mathematics-related problems, especially Trigonometry material, properly and correctly. As a result, student learning outcomes in Trigonometry material are low.

If such conditions are addressed, it will help student learning outcomes in mathematics, especially in trigonometry material. Therefore, the teacher's role in managing the class is vital. The solution so that students are fully involved in the learning process is that teachers must be creative in order to be able to create a learning atmosphere that arouses students' enthusiasm for learning so that students will be active themselves in the classroom during the learning process.

Based on findings from interviews and observations, effective learning is needed. Teachers must choose innovative and appropriate learning models to create meaningful, practical learning and to make students more active in the classroom. One of the learning models in question is the Problem-Based Learning (PBL) model. According to Tan (Baroh, 2020), Problem-Based Learning is considered an innovation in learning methods. This approach fully optimises students' thinking abilities through systematic collaboration in groups or teams. This allows students to continuously empower, hone, test and develop their thinking abilities. According to Moffit (Nurwahyuni, 2016), the problem-based learning method is an approach where students use real-world problems as a context framework to develop critical thinking abilities and problem-solving skills. The main goal is for students to gain essential knowledge and concepts from the subject matter.

Implementing this PBL model is hoped to direct student activity and obtain student learning outcomes that are by school regulations so that mathematics learning about trigonometry material can run effectively. Thus, it is necessary to test the effectiveness of implementing the Independent Curriculum-based PBL model in learning Trigonometry material in class X SMA Negeri 8 Manado.

METHOD

This type of research is pre-experimental research involving only one class, the experimental class. The research design that will be used in this research is the one-group, one-group, posttest-only design. This research design compared the academic level before gaining work experience with the level after carrying out work experience.

This research will be carried out at SMA Negeri 8 Manado, Kairagi Dua Village, Mapanget District, Manado City, in the odd semester of the 2023/2024 academic year. The subjects of this research are students in class X of SMA Negeri 8 Manado, which consists of 10 classes, and only one class will be taken randomly, which will be the experimental class.

The variables that will be investigated in this research are the effectiveness of implementing the PBL model in learning trigonometry material in class.

There are four main instruments in this research, namely (1) a Learning Outcomes Test, (2) an Observation Sheet on Student Activities in the Learning Process, (3) a Questionnaire on Student Responses in Learning, and (4) an Observation Sheet on Teachers' Ability to Manage Learning. The data collection techniques used include tests, observations, and questionnaires. Meanwhile, data analysis techniques use analysis of learning results tests, analysis of student observations, analysis of student responses, and analysis of teacher ability observations.

RESULT AND DISCUSSION

A. Description of Research Data

The data in this research were obtained from class X-I at SMA Negeri 8 Manado in the 2023/2024 academic year. Teaching is carried out by applying the Problem-Based Learning (PBL) model involving 38 students. The data collected relates to learning outcomes and observation results in mathematics subjects, especially trigonometry material.

The data taken comes from an instrument sheet which includes four indicators of learning effectiveness, namely: 1) Test sheet on student mathematics learning outcomes; 2) a Student activity observation sheet during mathematics learning activities; 3) a Questionnaire sheet for student responses to mathematics learning; and 4) Observation sheet regarding the teacher's ability to manage to learn using the Problem-Based Learning model. Data from these four indicators will be used as a benchmark to determine the effectiveness of using the Problem-Based Learning model in trigonometry material.

B. Discussion

1. Description of Student Trigonometry Learning Results Test

In this section, the results of students' mathematics learning tests on trigonometry material will be presented to obtain student learning outcomes after participating in learning using the PBL model.

The learning outcomes test consists of 2 objective numbers and 8 description numbers, which 38 students answered. The following table presents a description of student learning outcomes tests.

Table 1. Description of Student Learning Results Tests

Value	Frequensi	Criteria
$70 \leq x \leq 100$	33	Complete
$0 \leq x \leq 70$	5	Uncomplete
Total	38	

Based on table 1 and data on student learning outcomes, the results of student learning tests obtained data:

$$\text{Student Average Score: } \frac{2971}{38} = 78,18$$

$$\text{Classical completion percentage: } \frac{33}{38} \times 100\% = 86,84\%$$

Student learning outcomes are categorized as classically complete, with a completion percentage of 86.84% and an average score of 78.18. Therefore, student learning outcomes can be categorized as classically complete because using the PBL model is suitable for learning trigonometry material, emphasizing problem-solving skills. By implementing the PBL model, students are actively involved in learning and pay close attention to the teacher's explanations during the learning process. This results in students having a good understanding of the material so that they can understand and answer well when taking the test.

2. Description of student activities during the learning process

This Student Activity, Observation Sheet instrument was prepared to collect supporting data in assessing the effectiveness of implementing the PBL model in learning Trigonometry material in class X-I SMAN 8 Manado. This instrument includes 9 indicators of observed student activities. This observation was carried out by the researcher and 3 other people as observers during 2 meetings by monitoring student activities during the lesson. Data collected from this instrument is summarized at the end of each meeting.

The criteria for the success of student activities in this research are said to be effective if at least 75% of students are actively involved in the learning process. This can be seen from the learning process carried out during two meetings where:

- a. The percentage of students who pay attention/listen/respond carefully when the teacher opens learning activities is 93.23%.
- b. The percentage of students who pay attention to the teacher's explanation during learning is 90.46%.
- c. The percentage of students who responded actively to questions from the teacher or asked the teacher about the lesson material was 58.93%.
- d. The percentage of active students in their group is 68.54%.
- e. The percentage of students who responded to the other group's presentation was 45.15%.
- f. The percentage of students who actively work on questions and dare to present them in front of the class is 71.16%.
- g. The percentage of students who are enthusiastic and focused during learning is 84.98%.
- h. The percentage of students who reflected and accepted the evaluation happily was 97.29%.
- i. The percentage of students who follow the learning process from the beginning to the end of class time is 97.29%.

From several activities observed during the two meetings, the average percentage of student activity was 79% of students actively learning mathematics.

3. Description of Student Response Questionnaire to Learning

This section will present the results of the analysis of student questionnaire responses regarding mathematics learning, especially in trigonometry material, using the PBL model. This questionnaire was completed by 38 students from class X-I at SMA Negeri 8 Manado. This questionnaire consists of 13 statements; for each, students can choose the option "agree" or "disagree".

Based on the analysis of student responses, 382 statements received an agreed response, while 112 received a disagree response. Then, the percentage of respondents (students) who agreed or disagreed was calculated. The calculations are as follows:

- a. Percentage of students who answered agree: $\frac{382}{494} \times 100\% = 77,32\%$
- b. Percentage of students who answered disagree: $\frac{112}{494} \times 100\% = 22,67\%$

Thus, the response of students who take part in learning using PBL can be said to be positive. Aspects that are considered positive involve student satisfaction with the way teachers guide and teach using the PBL model, increased student interest in understanding new material, more diverse student learning experiences to enrich knowledge, student excitement when allowed to express opinions, as well as student perceptions regarding the benefits of increasing skills obtained for the future after learning through PBL.

4. Description of the Teacher's Ability to Manage Learning Through the Use of the Problem Based Learning Model

The Teacher Ability Observation Sheet Instrument in Managing Learning was prepared to collect supporting data in assessing the effectiveness of using the PBL model in Mathematics learning in Trigonometry material in class X-I SMA Negeri 8 Manado.

Observations made on the teacher's ability to manage learning were carried out in 2 meetings. The collected data is then summarized in a completed observation sheet. The results of these observations are presented in the following table.

Table 2. Description of observations of teachers' abilities to manage learning.

Observation Aspect	Average Score	Category
Initial activity	3,80	Very good
Core activities	3,67	Very good
End activities	3,83	Very good
Average	3,76	Very good

The overall average value of the indicators on the teacher ability observation sheet is obtained by adding up the average value of each indicator, namely 11.3, then dividing by the number of assessment indicators in each aspect, namely 3 parts. Therefore, the overall average value of the indicators for assessing teachers' abilities in managing learning by applying the PBL model to Trigonometry material is 3.76 (categorized as very good).

The results of observations of the teacher's ability to manage learning through the PBL model were considered good because the mathematics subject teacher evaluated the researcher at the end of each meeting. The teacher provided suggestions and input regarding the researcher's shortcomings when he was a teacher in the learning process and discussed the obstacles the researcher faced during the learning activities. Therefore, every suggestion and input given by the teacher is implemented by researchers to broaden and deepen insight and improve student learning outcomes.

CONCLUSION

The research conducted on class X-I students at SMA Negeri 8 Manado indicated that the utilization of the Problem-Based Learning (PBL) paradigm in teaching Trigonometry content was found to be beneficial. This is evidenced by the achievement of the four indicators of the efficacy of utilizing the learning model, specifically: (1) Student learning outcomes in the subject matter are classified as classically comprehensive, (2) Student reactions to the learning process are deemed positive, (3) Student engagement during the learning process is classified as commendable, (4) The teacher's proficiency in managing learning is classified as highly commendable.

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