

# Application of Problem-Based Learning Models to Improve Ability to Understand Geometry Materials in SD Muhammadiyah 11 Surabaya

Irma Dwi Rahmawati<sup>1\*</sup>, Kunti Dian Ayu Afiani<sup>2</sup>, Meirza Nanda Faradita<sup>3</sup>

<sup>1\*,2,3</sup> Universitas Muhammadiyah Surabaya, East java, Indonesia

[irma.dwi.rahmawati-2021@fkip.um-surabaya.ac.id](mailto:irma.dwi.rahmawati-2021@fkip.um-surabaya.ac.id), [kuntidianayu@fkip.um-surabaya.ac.id](mailto:kuntidianayu@fkip.um-surabaya.ac.id), [meirzananda@fkip.um-surabaya.ac.id](mailto:meirzananda@fkip.um-surabaya.ac.id)

DOI: <https://doi.org/10.21107/Widyagogik/v10i2.18571>

Received December 16, 2022; December 29, 2022; Accepted January 09, 2023

## Abstract

One of the successes of student learning is influenced by the quality or ability of the teacher in managing the learning process. This study aims to (1) describe the application of the problem based learning model to improve student learning outcomes in geometry material (2) to determine the increase in student learning outcomes using the problem based learning model. This research is a class action research (CAR). The research subjects were 3rd grade students of Adh Dhuha SD Muhammadiyah 11 Surabaya. The results of this study are (1). The research was conducted in two cycles, where each cycle had four stages, namely planning, implementing, observing and reflecting. (2). The increase in learning outcomes starting from the pre-cycle was 68.62, cycle 1 was 83.1, cycle 2 was 94.14 and the percentage of classical completeness in the pre-cycle was 65.51%, cycle 1 was 79.31% then experienced an increase of 13, 79% cycle 2 to 93.10% included in the good category. The development of student learning outcomes in affective and cognitive aspects has also increased. The affective aspect of students increased by 11.37% from cycle I of 68.97% to 80.34% in cycle II. While the psychomotor aspects of students experienced an increase of 18.11%, namely from cycle I of 72.84% to 90.95% in cycle II. Student learning outcomes in all aspects have achieved success. From the research results obtained, it was concluded that the problem based learning model could improve the learning outcomes of 3rd graders of Adh Dhuha SD Muhammadiyah 11 Surabaya. This research can be used by elementary school teachers as a reference to improve grade 3 student learning outcomes in geometry material.

**Keywords** – Geometry; Learning Outcomes; Classroom Action Research; Problem Based Learning.



© 2023 by the authors. Submitted for possible open access publication under the terms and conditions of the Creative Commons Attribution ShareAlike (CC BY SA) license (<https://creativecommons.org/licenses/by-sa/4.0/>).

## **1. Introduction**

Elementary school education has a bridge that connects material with students which is called a teaching program. The teachers then translated the teaching methods and strategies in class including mathematics lessons. As a science that is closely related to technology, mastering mathematics is one of the steps in realizing quality Indonesian human resources. According to (Sleman, 2022) based on Permendiknas No 22 of 2006 one of the goals of mathematics in basic education is for students to have the ability to understand mathematical concepts, explain the interrelationships between concepts and apply concepts or algorithms, in a flexible, accurate, efficient, and precise way of solving problem. According to (Setianingsih et al., 2021) that learning is a process that involves interactions between various components, including the teacher, content or learning materials, and students.

According to (Afiani & Putra, 2017) Providing innovative and student-centered learning is the obligation of the teacher, so that the teacher is only a facilitator in learning. Therefore, one of the successes of student learning is influenced by the quality or ability of the teacher in managing the learning process. The real solution in order to increase the achievement of mathematics lessons actually comes from learning in the classroom, and in this case the teacher has a very important role, namely as a learning media to help students to easily understand the lessons being taught, if seen the teacher should be able to be creative in giving lessons (Afiani & Faradita, 2021)

Based on observations made at the end of November 2022 on the results of the Middle Semester Assessment (PTS) I at SD Muhammadiyah 11 Surabaya grade 3, it shows that the learning outcomes in the cognitive aspects of the Mathematics subject matter are unsatisfactory or do not meet the minimum standard of completeness set. The average value of class 3 Adh Dhuha (which will be used as research subjects) is 68.62 with 65.51% of students achieving or exceeding the set KKM which is 78. While 34.48% still have not reached the KKM.

---

The low results are due to the fact that mathematics learning has been conveyed to students in an informative manner, meaning that students only get information from the teacher so that the degree of attachment can also be said to be low. So the role of the teacher in teaching mathematics is very important, the teacher must be able to teach meaningful learning, because this will affect the context of meaning that students get

The results of interviews conducted with class 3 teachers at SD Muhammadiyah 11 Surabaya that (1) geometry material is difficult for students to understand because it has many formulas, (2) students whose understanding is still concrete operational need to be given additional complex geometry material in which there are many symbols and formal operations , this is what makes it difficult for students to understand geometry material. So in this article the researcher will analyze students' learning difficulties in geometry material, especially on the circumference and area of flat shapes at SD Muhammadiyah 11 Surabaya, this research is expected to be used as material for developing geometric problems, and used to make lesson plans by teachers, because lesson plans should be made based on students' learning difficulties, so in this case the teacher needs to understand learning difficulties and students' thinking patterns related to geometric material, especially on the circumference and area of flat shapes, so that lesson plans are made in accordance with the real conditions experienced by students.

Geometry is a branch of mathematics and is one of the subject matter in mathematics in elementary schools. Geometry is closely related to the formation of abstract concepts. This learning cannot only be done by transferring knowledge or lectures, but must be done by forming concepts through a series of activities carried out directly by students (Nurhasanah et al., 2017) . In studying geometry, students need a mature concept so that students are able to apply geometrical skills such as visualizing, recognizing various shapes and spaces, describing images, sketching shapes, labeling certain points, and the ability to recognize differences and similarities between geometric shapes (Muhassanah et al., 2014).

In understanding the relationships between geometric shapes, students have been taught how to find the perimeter and area of flat shapes in grade 3, this learning is continuous from starting to identify the properties of polygons, then finding the perimeter and area of several plane shapes (square, rectangle, triangles, parallelograms, trapezoids, rhombuses and kites), after students have studied plane shapes, they will get geometry lessons back in grade 4, specifically the material for geometric shapes, so that in this case the material for the perimeter and area of flat shapes is a prerequisite in learning building material in class 3.

Several things need to be considered when choosing a learning model, namely learning objectives, material characteristics, and student characteristics. One of the learning models that can be used to improve problem-solving abilities and independent learning is the PBL model. This is because the PBL model is a learning model, in which students work on authentic problems with the intention of compiling their own knowledge, developing inquiry and higher-order thinking skills, developing independence and self-confidence (Reski et al., 2019). Based on the opinions of these experts, it can be concluded that Problem Based Learning (PBL) is constructed on a collaborative and integrative basis in a small group (Ahdhianto et al., 2021). An instructor or a facilitator accompanies the small groups. Problem simulation is used to activate students' curiosity before starting to study a subject. PBL prepares students to think critically and analytically, and to be able to obtain and use learning resources appropriately. So it can be assumed that with PBL students are stimulated to study problems based on the knowledge and experience they already have (prior knowledge) so that from this prior knowledge new knowledge and experience will be formed. Problem Learning Approach Based Learning is able to encourage students to develop skills, encourage students to think critically and students directly involved in every process learning to find an answer (Dewi & Wardani, 2018). Project Based Learning Model (Project Based Learning) is a learning model that uses problems as the first step in gathering and integrating new knowledge based on experience in real

---

activities (Rahmi et al., 2022). PBL is a learning process in which the problem is the main guide towards the learning. Thus, existing problems are used as a means for students to learn something that can support their knowledge.

The advantages of the PBL Model According to (Anjelina Putri et al., 2018) include 1) students are encouraged to have the ability to solve problems in real situations, 2) students have the ability to build their own knowledge through learning activities, 3) learning focuses on problems is so that material that is not nothing to do with it does not need to be learned by students. This reduces the burden on students to memorize or store information, 4) scientific activities occur in students through group work, 5) students are used to using knowledge sources both in the library, the internet, interviews, and observations, 6) students have the ability to assess their own learning abilities, 7) students have the ability to carry out scientific communication in discussion activities or presentation of the results of their work, 8) individual student learning difficulties can be overcome through group work in the form of peer teaching.

When implementing using Problem Based Learning, the teacher must follow the phases. The five phases that have been passed are: First, proposing a problem. The questions posed as previously stated must not be well structured, in the sense that further information or data is required for their completion, allowing for many ways or answers, and the material content is quite broad. Second, What is known from the problem? In this phase each member will see the problem in terms of the knowledge they have before. The group will discuss and agree on the boundaries of the problem, as well as sort out the issues and aspects that are reasonable for further investigation. This initial analysis should provide a starting point for investigation and can be revised as assumptions are questioned or new information surfaces. Third, what is not known from the problem? In this phase, group members will break down the problem into components, discuss implications, propose various explanations or solutions, and develop working hypotheses. Fourth, Alternative Solutions. In this phase group members will discuss, evaluate, and organize hypotheses and modify hypotheses.

The group will make a "What to do?" list. In this phase group members will determine and allocate tasks, develop plans to obtain the required information. Fifth, Report and Presentation of Results. In this phase, each group will write a report on the work of the group. In this report phase there is material development, namely the teacher will develop material that will be studied further and in depth and facilitate learning based on the concepts proposed by each group in their report (Handayani, 2017)

The application of the Problem Based Learning learning model is an instructional method that challenges students to "learn and to learn", working with groups to find solutions to real problems. This problem is used to relate students' curiosity and analytical skills and initiatives on learning materials. PBL prepares students to think critically and analytically, and to find and use appropriate learning resources (Yulianti & Gunawan, 2019)

According to (Anita Chaudhari, Brinzel Rodrigues, 2016) suggests that the steps of PBL are as follows a) Orientation of students to problems. The teacher explains the learning objectives, explains the logistics needed, and motivates students to be involved in problem solving activities. b) Organizing students to study. The teacher helps students define and organize learning tasks related to these problems. c) Guiding individual/group experience. The teacher encourages students to collect appropriate information, carry out experiments to get explanations and solve problems. d) Develop and present the work. The teacher assists students in planning and preparing appropriate works such as reports, and helps them to share assignments with their friends. e) Analyze and evaluate the problem solving process. Teachers help students to reflect or evaluate their investigations and the processes they carry out

A study on efforts to improve Mathematics learning outcomes for grade 5 students at SD Negeri Sidorejo Lor 01 Salatiga by (Ayudya & Rahayu, 2020), concluded that using the PBL (Problem Based Learning) learning model has a higher level of effectiveness when compared to the TPS learning model ( Think Pair Share) on the critical thinking skills of fifth grade students in mathematics.

---

Similar research was conducted by (Handayani, 2017) on grade 2 students at SDN Kepanjen kidul 2 Kota Blitar in the 2015/2016 academic year, which concluded that the PBL learning model in learning mathematics can improve students' ability to apply concepts.

The purpose of this study was conducted to (1) describe the application of the problem based learning model in improving the learning outcomes of 3rd grade students at SD Muhammadiyah 11 Surabaya in geometry material (2) to determine the increase in the learning outcomes of 3rd grade students at SD Muhammadiyah 11 Surabaya using the problem based learning model.

## **2. Method**

The approach used in this study is a qualitative approach. While the type of research used in this research is class action research (Classroom Action Research), which is a research activity conducted in class. This research was conducted to solve problems that arise during learning takes place. In addition, it also describes how a learning technique is applied, and how the desired results can be achieved (Asrori, 2011).

This classroom action research design uses the cycle model developed by Kemmis and Mc Taggart in 1988 (Asrori, 2011). This PTK model contains four components, namely (1) planning (planning), which is the stage of formulating an action plan by the teacher or researcher to improve and enhance the learning process or student achievement, (2) action (action), which is the implementation of actions based on plans that have been made as an effort to improve the learning process and desired student learning outcomes, (3) observation, namely the stage of observing the impact or results of the actions taken, whether they affect the improvement or improvement of the learning process and student learning outcomes or not, and (4) reflection, namely the stage where the teacher or researcher examines the results or impacts of the actions taken based on various criteria that have been made. If there is still a shortage of teachers, they can make improvements to the initial plans that have been made.

This research took place at SD Muhammadiyah 11 Surabaya which is located at Jalan Dupak Bangunsari I No. 35-40 Kota Surabaya. The research was carried out in the even semester of the 2022-2023 school year. The research subjects in this study were 3rd grade students of SD Muhammadiyah 11 Surabaya Adh Dhuha in the academic year 2022/2023 with a total of 29 students with 16 male students and 13 female students.

Several data collection techniques used in this study were (1) tests, namely instruments used to measure students' abilities in the cognitive aspect and given at the end of each cycle, (2) observation, namely techniques carried out by observing each event and recording it according to the observation sheets that have been prepared and the results are used as material in the reflection stage, (3) documentation, namely various data used as supporting information, including student daily test results, semester final exam results, pre-cycle and end-cycle test results, photos and video processes learning, and (4) interviews, which are techniques used to obtain information from class teachers using a list of questions that have been prepared, and the data obtained is used to support the results of observations.

Data analysis techniques used are quantitative and qualitative. To determine the learning completeness of all students who were sampled in this study (Kb)

$$\text{Mastery of Classical Learning} = \frac{\text{Number of Students Who Complete Study}}{\text{Many Students Entirely}} \times 100\%$$

Data on student activity observations were obtained through observation activities carried out by observers. Observation results were analyzed using the following formula:

$$\text{Value Percentage} = \frac{\text{Total score obtained}}{\text{Maximum total score}} \times 100\%$$

The indicator of success is if the average score of student learning outcomes reaches or exceeds the KKM in mathematics at school, namely 78 and



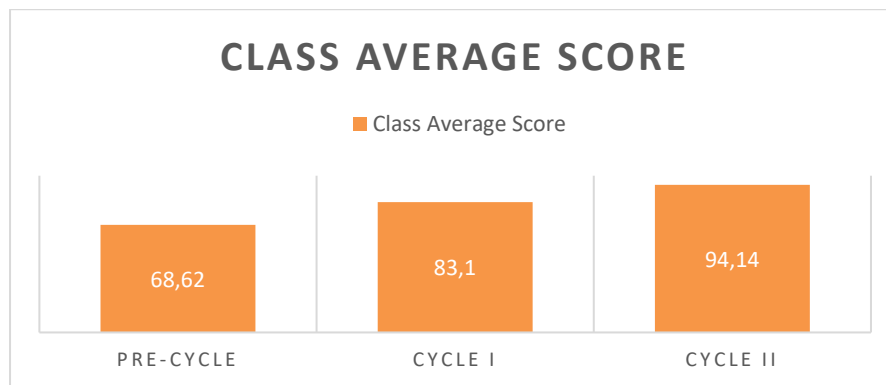
---

the percentage of classical learning completeness is at least 75%. Student positive activity and learning management is said to be good if it reaches a minimum of 75%

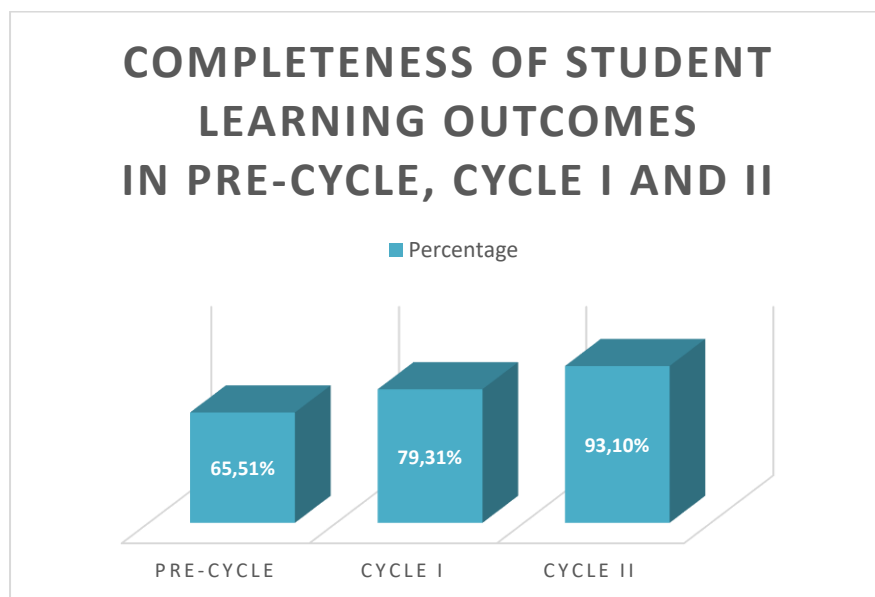
### **3. Result and Discussion**

This study describes the results of observations of student activities and student learning outcomes in the application of problem-based learning models to improve the ability to understand geometry material for grade 3 students at SD Muhammadiyah 11 Surabaya. The application of problem based learning to improve learning outcomes in geometry material for grade 3 students at SD Muhammadiyah 11 Surabaya, includes four stages namely planning, implementation, observation and reflection. The planning stage includes making lesson plans, test questions and research instruments in the form of observation sheets for teacher and student activities. The implementation stage, namely the teacher poses a problem that is stated in an unstructured manner, then the teacher encourages students to gather appropriate information to solve the problem. At the end of learning students are given test questions as a reflection and as a reference for student learning outcomes. The observation stage includes observing student activities carried out by the teacher when the learning takes place and the results of the observations are written in the observation sheet. Evaluation stage, namely after learning is complete, the researcher evaluates the learning process and student learning outcomes. At this stage the researcher determines the actions to be taken in further learning.

In this discussion, the development of the implementation of the implementation of the Problem Based Learning learning model will be explained in learning mathematics material geometry. The success of this research can be explained based on the achievement of each indicator in the research, especially on the completeness aspect of student learning outcomes. The classical mastery of student learning in each cycle can be observed in Diagram 1 and Diagram 2 below.



Picture 1. Diagram of Class Average Score



Picture 2. Diagram of Completeness of Student Learning Outcomes in Pre-Cycle, Cycle I and II

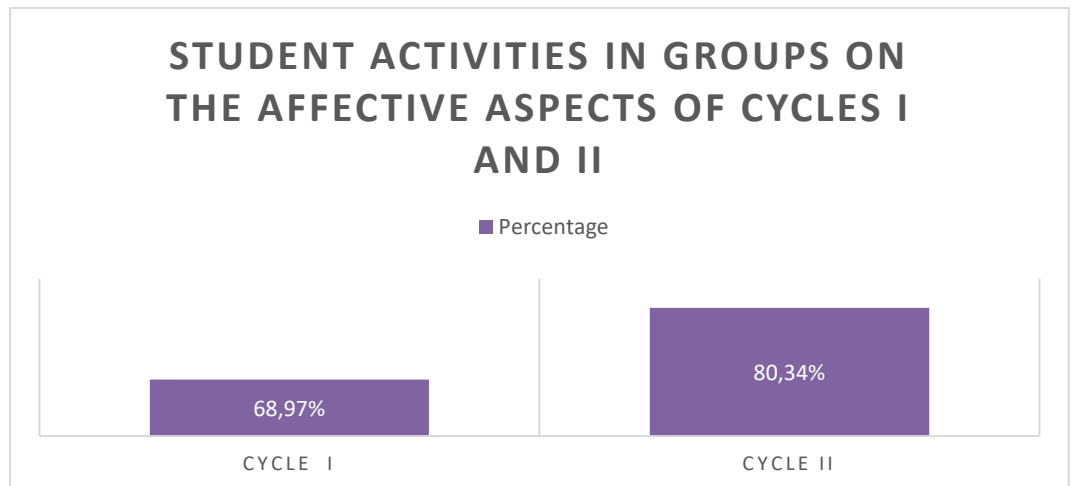
Based on Diagram 2, it can be seen that the classical mastery of student learning outcomes in the pre-cycle is 65.51%. Cycle I obtained a percentage of 79.31% or as many as 23 students who had completed their studies, while 6 students did not complete their studies with a percentage of 20.69%. Completeness of student learning outcomes increased by 13.79% in cycle II to 93.10%. There were 27 students who had completed learning in cycle II, there were 2 students who did not complete their studies. This shows that the classical mastery of student learning outcomes in cycle II has reached the percentage set on the indicator of success. There is an increase in the percentage of

---

completeness of classical learning results indicating that the application of the Problem Based Learning learning model in learning mathematics material geometry can help students to more easily understand and master learning material.

In cycle I, the percentage of students who did not complete their studies was still high. The high percentage of students who do not complete their studies is because students are still not able to master the material being studied. This can be seen when students work on evaluations at the end of learning, some of them cannot focus and there are still students who answer without reading carefully. In cycle II, the quality of learning is improved so that students are able to master the learning material well so that they complete learning. Efforts to improve and improve the quality of learning are carried out primarily to help students who have not finished studying so that they can complete it. Efforts to improve the quality of learning are carried out in several ways, for example the teacher increases the provision of motivation to students through giving awards to students who get the highest scores in the evaluation of learning outcomes and actively participate in learning. Thus students become more active and focus attention when participating in the learning process. In presenting initial information, the teacher optimizes the use of instructional media to clarify learning material. In addition, the teacher also increases the provision of guidance to students who are still unable to be independent in carrying out learning activities. When doing reflection activities at the end of learning, students are given the widest possible opportunity to deepen the material being studied and increase their understanding of the material through question and answer activities. These efforts are able to help students master the material being studied so that their learning experiences are more meaningful and can last longer in students' memories. This is evident from the classical learning mastery achieved in cycle II, namely 93.10% has reached the percentage set on the indicator of success.

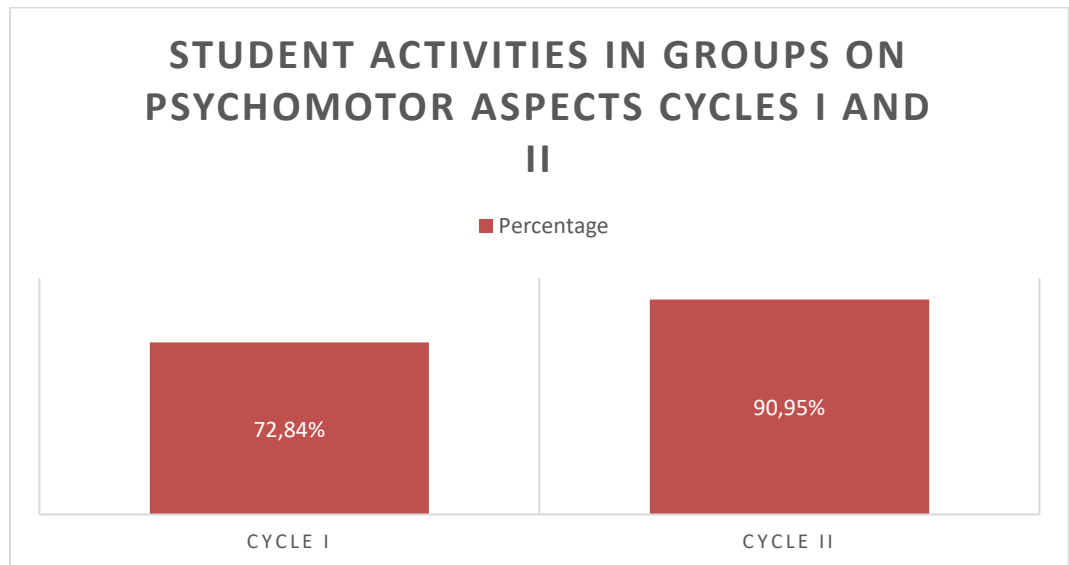
Student activities in groups observed by the teacher include affective and psychomotor aspects. These two aspects are always assessed by the teacher in each cycle using affective and psychomotor assessment sheets. This is done to describe the development of learning outcomes in these two aspects to support the achievement of student learning completeness. The development of student activity on affective aspects in each cycle can be observed in diagram 3.



**Picture 3.** Diagram of Student Activities in Groups on the Affective Aspects of Cycles I and II

Based on Diagram 3, it can be seen that the activity of students in groups on the affective aspect in cycle I obtained a percentage of 68.97%, meaning that it had not reached the percentage set on the success indicator, namely 75%. When studying in groups, students still cannot be orderly. Sometimes they still make noise and don't finish the task right away. Therefore, it is necessary to improve learning in cycle II. The teacher increases supervision and provides guidance to students when studying groups so that students become more disciplined. This is evidenced by an increase in the affective aspects of students by 11.37%, namely from cycle I of 68.97% to 80.34% in cycle II. Thus, student learning outcomes in the affective aspect have achieved success. In learning in each cycle, students carry out simple experiments with study groups. Students' psychomotor skills are developed through this activity. The development of

student activity on psychomotor aspects in each cycle can be observed in Diagram 4 below.



**Picture 4.** Diagram of Student Activities in Groups on Psychomotor Aspects Cycles I and II

Based on Diagram 4, it can be seen that the activity of students in groups on psychomotor aspects in cycle I obtained a percentage of 72.84%, meaning that it had not reached the percentage set on the success indicator, namely 75%. Students' ability to analyze experiments is also lacking. So it is necessary to hold learning improvements in cycle II. Teachers improve supervision and provide guidance to students. Improvement efforts made by the teacher in cycle II can increase the development of student learning outcomes in the psychomotor aspect by 18.11%, namely from cycle I by 72.84% to 90.95% in cycle II. Thus, student learning outcomes in the psychomotor aspect have achieved success.

#### **4. Conclusion**

Based on the observations obtained in cycle 1 and cycle 2, the results of this class action research (PTK) can be concluded as follows: (1) The application of the Problem Based Learning model can improve learning outcomes in geometry material for grade 3 students at SD Muhammadiyah 11 Surabaya, every

The cycle includes planning, namely making lesson plans, test questions and research instruments in the form of student activity observation sheets. Implementation, which includes proposing problems that are stated in an unstructured manner so that it encourages students to collect appropriate information to solve problems. (2) Student learning outcomes have increased as can be seen from the classical completeness which was initially only 65.51%, in cycle 1 it was 79.31% then in cycle II it increased 13.79% to 93.10%. The class average also increased from 68.62 to 83.1 and increased in cycle II to 94.14, this has fulfilled the KKM. The development of student learning outcomes in affective and cognitive aspects has also increased. The affective aspect of students increased by 11.37% from cycle I of 68.97% to 80.34% in cycle II. While the psychomotor aspects of students experienced an increase of 18.11%, namely from cycle I of 72.84% to 90.95% in cycle II. Student learning outcomes in all aspects have achieved success.

---

**References**

- Afiani, K. D. A., & Faradita, M. N. (2021). Analisis Aktivitas Siswa dalam Pembelajaran Daring Menggunakan Ms . Teams pada Masa Pandemi Covid-19. *Jurnal Pemikiran Dan Pengembangan Sekolah Dasar*, 9(1), 16–27.
- Afiani, K. D. A., & Putra, D. . (2017). Peningkatan Kemampuan Berpikir Kreatif Pada Siswa Kelas III SD Melalui Pembelajaran Berbasis Pengajuan Masalah. *ELSE (Elementary School Education Journal)*, 1(1), 38–47.
- Ahdhianto, E., Thohir, M. A., Education, P., & Malang, U. N. (2021). STUDENTS ' PERCEPTION OF PROBLEM-BASED LEARNING IN. *Jurnal Pendidikan Dan Pembelajaran Sekolah Dasar*, 116–134.
- Anita Chaudhari, Brinzel Rodrigues, S. M. (2016). *KETERKAITAN KEMAMPUAN PENALARAN MATEMATIS SISWA DENGAN MODEL PROBLEM BASED LEARNING (PBL)*. 390–392.
- Anjelina Putri, A. A., Swatra, I. W., & Tegeh, I. M. (2018). Pengaruh Model Pembelajaran Pbl Berbantuan Media Gambar Terhadap Hasil Belajar Ipa Siswa Kelas Iii Sd. *Mimbar Ilmu*, 23(1), 21–32. <https://doi.org/10.23887/mi.v23i1.16407>
- Asrori. (2011). *Metode Pembelajaran di Sekolah Dasar*. Wicaksana.
- Ayudya, M. S., & Rahayu, T. S. (2020). Efektivitas Model Problem Based Learning Dan Think Pair Share Ditinjau Dari Kemampuan Berpikir Kritis Siswa Kelas 5 Dalam Pelajaran Matematika Dasar. *Jurnal Pendidikan Tambusai*, 4(1), 272–281. <https://jptam.org/index.php/jptam/article/view/458>
- Dewi, T. A., & Wardani, N. S. (2018). Upaya Peningkatan Keterampilan Pemecahan Masalah Matematika Melalui Pendekatan Problem Based Learning Siswa Kelas Ii Sekolah Dasar. *Jurnal Pendidikan Dan Pembelajaran Sekolah Dasar*, 1–12. <https://journal.trunojoyo.ac.id/widyagogik/article/view/4558>
- Handayani, E. (2017). Penerapan Model Problem Based Learning untuk Meningkatkan Kemampuan Memahami Perkalian Bilangan. *Briliant: Jurnal Riset Dan Konseptual*, 2(3), 319. <https://doi.org/10.28926/briliant.v2i3.75>
- Muhassanah, N., Sujadi, I., & Riyadi. (2014). Analisis Keterampilan Geometri Siswa Dalam Memecahkan Masalah Geometri Berdasarkan Tingkat Berpikir Van Hiele. *Jurnal Pembelajaran Matematika*, 2(1), 54–66. <http://jurnal.fkip.uns.ac.id>

- Nurhasanah, F., Kusumah, Y. S., & Sabandar, J. (2017). Concept of Triangle : Examples of Mathematical. *International Journal on Emerging Mathematics Education*, 1(1), 53–70.
- Rahmi, L., Landong, A., Al-washliyah, U. M. N., & Sumatra, N. (2022). The Influence of Problem-Based Learning Model on Student Learning Outcomes in the Theme of Technology Development Class III SD Negeri 101731 Kp . Lalang. *Jurnal Pendidikan Dan Pembelajaran Sekolah Dasar*, 284–294.
- Reski, R., Hutapea, N., & Saragih, S. (2019). *Peranan Model Problem Based Learning ( PBL ) terhadap Kemampuan Pemecahan Masalah Matematis dan Kemandirian Belajar Siswa*. 2(1), 49–57.
- Setianingsih, D., Afiani, K. D. A., & Mirnawati, L. B. (2021). Penerapan Model Pembelajaran Teams Games Tournament (Tgt) Untuk Meningkatkan Hasil Belajar Materi Perkalian Siswa Kelas Iii Sd Muhammadiyah 8 Surabaya. *Alpen: Jurnal Pendidikan Dasar*, 5(1), 24–37. <https://doi.org/10.24929/alpen.v5i1.75>
- Sleman, D. I. K. (2022). *Siswa Kelas V Sekolah Dasar Negeri*. 4, 1–11.
- Yulianti, E., & Gunawan, I. (2019). Model Pembelajaran Problem Based Learning (PBL): Efeknya Terhadap Pemahaman Konsep dan Berpikir Kritis. *Indonesian Journal of Science and Mathematics Education*, 2(3), 399–408. <https://doi.org/10.24042/ijsme.v2i3.4366>