

Improving Grade V Students' Mathematics Learning Outcomes on FPB Topics Through Problem-Based Learning

Siti Aisyah Apriliani^{1*}, Sri Muryaningsih²

¹²Universitas Muhammadiyah Purwokerto

*aisyahapril877@gmail.com

ARTICLE INFO

Article history

Received April 23, 2026

Revised May 27, 2023

Accepted June 22, 2026

Keywords:

Problem Based Learning; learning outcomes; math; Biggest Federal Factor; elementary school

ABSTRACT

The low mathematics learning outcomes in the Biggest Common Factor (FPB) material in grade V of SD Negeri 3 Larangan is due to learning that is still teacher-centered so that students are less active in understanding concepts and solving problems. This research aims to improve student learning outcomes in the cognitive, affective, and psychomotor domains through the application of the Problem Based Learning (PBL) model. The method used is the Kemmis and McTaggart model Class Action Research (PTK) which is carried out in two cycles. The research subjects amounted to 23 students in grade V of SD Negeri 3 Larangan. Data collection techniques are carried out through tests, observations, interviews, and documentation, while data analysis uses quantitative and qualitative approaches. The results of the study show that the application of the PBL model is able to improve student learning outcomes. Cognitive learning completeness increased from 30.43% in the pre-cycle to 63% in the first cycle and 78% in the second cycle. In addition, the affective and psychomotor aspects of students have also improved which is shown through increased discipline, cooperation, responsibility, confidence, and students' skills in solving and presenting problem-solving results. Thus, the Problem Based Learning model is effectively used to improve mathematics learning outcomes in FPB materials in elementary schools.

1. INTRODUCTION

Education is essentially a systematic process to form the ability of human beings to think and act consciously (Suryani, 2023). According to Ki Hajar Dewantara in (Majelis Luhur Persatuan Taman Siswa Yogyakarta, 2004), education is an effort to guide all the natural forces of children so that they as human beings and members of society can achieve the highest safety and happiness. National education according to Law Number 20 of 2003 aims to improve the ability of students to become human beings who have faith, have noble morals, are intelligent, imaginative, independent, democratic and have a sense of responsibility. At the elementary education level, schools have a fundamental role in laying the intellectual, emotional, and social foundations of students (Sinulingga et al., 2025). Through proper learning, children are not only required to master knowledge, but also build positive attitudes and skills that can be used in real life (Noviani et al., 2025). Starting from the elementary school education level, mathematics is a basic subject that must be understood (Savriliana et al., 2020). Through mathematics, students are expected to improve their ability to think logically, be able to analyze, be structured, and critical. (Trisanti et al., 2025). In accordance with the theory developed by Susanto (2016), the existence of mathematics, especially in elementary school, aims to improve the ability to understand concepts, apply reasoning, solve problems and convey ideas appropriately. Therefore, mathematics skills from elementary school are an important foundation for intellectual growth at the next level of education (Saputra, 2024). From this idea, mathematics has a huge influence on education. However, in reality, students' mathematical skills, especially in Indonesia, are in a low position on a national and international scale (Prastyo, 2020). This is shown in the PISA (Programme for International Student Assessment) in 2022, Indonesia obtained an

average score of 366 with a ranking of 64th out of 81 participating countries. The average score obtained is still far below the average score of the OECD (Organisation for Economic Co-operation and Development), which is 500 (OECD, 2023). Not only that, at the time of the TIMSS (Trends in International Mathematics and Science Study) in 2015, Indonesia got a score of 397 and was ranked 44th out of 49 countries that joined (TIMSS & PIRLS International Study Center, 2015). After analysis, the cause was a decrease in the subject of mathematical ability. The percentage of students who reach the basic competency level is only 18.35% and is at 50% below the OECD country average. This score is the lowest of the three PISA assessment subjects, namely reading, mathematics, and science.

PISA and TIMSS themselves measure students at a higher level. However, the low foundation of mathematics that has not been understood since elementary school is one of the causes of this low achievement (Destari et al., 2026). The urgency of this, the quality of learning in Mathematics must be handled immediately from the beginning of elementary school (Herman, 2012). There are many factors that may affect the low learning outcomes of mathematics. Apart from the student factor itself, there are also many factors from teachers, learning approaches, learning methods, and even a less supportive learning environment, which will all be optimal if education policies in Indonesia can be implemented properly (Abdillah & Syifa, 2025). According to Romiszowski (2016), Learning outcomes include three domains, namely the cognitive domain, the affective domain, and the psychomotor domain. The cognitive realm reflects the ability to understand concepts and solve problems; the affective domain is related to attitudes such as curiosity, discipline, and willingness to learn; Meanwhile, the psychomotor realm emphasizes skills in applying knowledge practically. According to Bloom in Sudjana (2006), these three domains are a unit that cannot be separated in a meaningful learning process. Ideally, the learning process is able to foster these three aspects in a balanced manner so that students are not only able to answer questions, but also have a high interest in learning and skills in applying knowledge to solve daily problems. However, in reality, the implementation of mathematics learning in elementary schools has not fully encouraged the optimal development of these three domains. Especially in the material of the Greatest Common Factor (FPB), this material is often considered difficult and scary by students. Mathematics learning in elementary school does play an important role in building logical thinking and problem-solving skills. However, many students still have difficulty understanding the concept of FPB in depth and tend to only memorize the calculation procedure (Nurmajumitasari, 2023). This is not only due to the complexity of the material, but also due to the lack of an active learning approach.

FPB and KPK materials are one of the materials that require reasoning and logical skills of students. Many students tend to give up easily before learning math because they think that math is a difficult subject. Furthermore, mistakes that often occur to students in studying FPB include: not understanding the initial concept in finding multiples of numbers, mistakes in doing multiplication, the concept of factors interpreted as multiples, and lack of thoroughness in understanding the problem. Conceptual errors like these suggest that a learning approach that simply transfers formulas without building a complete understanding will not be effective in the long run. From a developmental thinking perspective, the topic of Greatest Common Factors (FPB) requires students to understand several abstract mathematical concepts at once, such as factors, prime factorization, division, and relationships between numbers. According to Piaget (1970), children around the age of 10–11 years are usually at the concrete operational stage, which is the stage where they can only reason logically if they are helped by real objects, everyday situations, or meaningful experiences. Therefore, many students find it difficult if FPB is only taught through procedural steps and symbolic calculations without real examples. Therefore, learning approaches that start with real problems and encourage active exploration, such as Problem-Based Learning (PBL), are considered more

appropriate to help students move from concrete experiences to abstract mathematical understandings. This problem is further aggravated because learning is still dominated by lecture methods and one-way practice questions so that students are only passive listeners with no space to discuss or explore concepts independently. The teacher-centered learning model makes students tend to feel bored and the situation in the classroom becomes monotonous. Another disadvantage of conventional learning is that it tends to emphasize more on results than processes, so students become passive and less active in learning, which ultimately results in non-optimal learning outcomes. The negative impact of monotonous methods is evident in the low level of student participation during the learning process. When teachers only talk and students only listen, there is an imbalance in two-way communication. Students who do not understand the material often choose to remain silent for fear of being blamed, while students who understand the material feel bored because there is no challenge. This pattern creates a passive classroom, where learning becomes a mere obligation, not a fun process (Wedi, 2017). Such conditions are very contrary to the goal of mathematics education which is supposed to develop critical thinking and problem-solving skills actively. Similar conditions were found in grade V students at SD 03 Larangan. Based on the results of initial observations, it shows that most students have difficulty understanding the basic concept of FPB so they often make mistakes in solving simple problems. Student learning outcomes in the cognitive realm are still low, as evidenced by the results of the FPB material pre-test in class V, out of 23 students, only 7 students completed above the Minimum Completeness Criteria (KKM) that have been determined by the school, which is 60. The average class score obtained during the pre-test was 55.

Table 1. FPB Pre Test Score

Quantity Students	Average Value	Value Highest	Value Lowest	KKM	Conclusion on KKM
23	55	100	20	60	7

The results of interviews with teachers in grade V of SD 3 Larangan obtained data that when the teacher explained the material, only a few students participated or asked questions. Most choose to be silent, wait for instructions, and take notes without really understanding. This indicates a low level of cognitive and affective involvement of students during the learning process. In addition, psychomotor skills in applying the concept of FPB to real situations, such as dividing objects fairly or determining repetition patterns, are still very limited. If this condition is left unchecked, then Mathematics learning will only become a meaningless routine that forms the logical thinking character of students. To overcome these problems, a learning model that is able to activate students intellectually, emotionally, and practically is needed. Problem Based Learning (PBL) is one of the models that places real problems as the starting point for learning. Through this approach, students not only listen to the teacher's explanations, but are involved in the process of finding and solving problems independently or in groups. Thus, the learning process becomes more meaningful because students are encouraged to think critically, collaborate, and communicate their understanding. The selection of this PBL learning model was also inspired by previous research. In accordance with the results of research conducted by Nurmin Muliati et al. (2024) which shows that the use of the PBL model has a positive impact on improving student learning outcomes. Not only that, based on the results of research conducted by Shishigu Argaw et al. (2016) which shows that the Problem Based Learning (PBL) model is a more effective method of teaching physics than conventional teaching methods. This is also proven by research conducted by Rasyida Nafisa Alfi Ni'mah and Sri Muryaningsih (2024) which shows that the application of the Problem Based Learning model is effective in improving student learning outcomes in the cognitive, affective and psychomotor domains.

Based on the description above, the application of the Problem Based Learning Model to the Biggest Common Factor (FPB) material in grade V of SD 03 Larangan is expected to improve student learning outcomes as a whole. Through problem-based learning situations, students will be trained to understand concepts more deeply, show a positive attitude towards Mathematics, and be able to apply knowledge in a real-life context. For this reason, a study focused on the implementation of PBL is needed to measure the extent to which this model can be a solution to the low learning outcomes in FPB materials. Based on the literature review in the last decade that the researcher has explained above, it has been widely researched as an effective approach in improving mathematics learning outcomes and problem-solving skills of elementary school students with the result that the application of PBL is able to improve student learning outcomes in cognitive, affective, and psychomotor aspects. However, most previous research has focused on improving learning outcomes in general or on specific mathematics materials without specifically examining the application of PBL to the Greatest Common Factor (FPB) material in elementary schools. In addition, previous research generally focused more on cognitive aspects, while integrated evaluation of the three domains of learning outcomes according to Bloom's Taxonomy (cognitive, affective, and psychomotor) is still relatively limited. Therefore, this study has an urgency to fill the gap through a study of the implementation of PBL in FPB materials in grade V of SD 03 Larangan. Based on these conditions, the gap analysis of this study lies in the focus of a study that integrates the measurement of cognitive, affective, and psychomotor learning outcomes simultaneously in FPB learning using the PBL model in elementary school students. The novelty of this research is not only in the object of FPB material that is still rarely studied specifically, but also in efforts to comprehensively evaluate the effectiveness of PBL on all areas of student learning outcomes. The problems of this research include: (1) how the application of PBL can improve students' cognitive learning outcomes in FPB materials; (2) how PBL affects the affective aspects of students during learning; and (3) how the application of PBL can develop students' psychomotor abilities in solving FPB problems. To answer these problems, the research uses a classroom action approach through the application of PBL steps which include problem orientation, student organization, investigation, presentation of results, and evaluation. This study aims to improve overall student learning outcomes in the cognitive, affective, and psychomotor realms through the application of the Problem Based Learning model to the Biggest Common Factor (FPB) material in grade V SD 03 Larangan.

2. METHODS

This research method uses Classroom Action Research (PTK) which aims to improve the quality of the learning process and outcomes through actions carried out reflectively. PTK is understood as research that helps teachers solve learning problems directly while improving their professionalism (Hopkins, 2014). In line with that, Kemmis et al. (2013) explained that PTK is a reflective investigation process carried out by education practitioners to improve the quality of learning practices and their institutional environment. This study applies the PTK model from Kemmis and McTaggart which consists of four stages, namely planning, action, observation, and reflection. The research was carried out in grade V of SD Negeri 3 Larangan, Brebes Regency, in the second semester of the 2025/2026 school year with 23 subjects consisting of 11 males and 12 females. The implementation of the research is designed in two cycles, each of which includes the stages of planning, implementation of actions, observation, and reflection. The action applied was in the form of using the Problem Based Learning (PBL) model on the Biggest Common Factor (FPB) material. At the implementation stage, learning is carried out through problem orientation, student organization in groups, group investigations, presentation of results, and learning evaluation. Data collection was carried out through test and non-test techniques. The test technique is in the form of

description questions to measure students' cognitive learning outcomes, while the non-test technique includes observation, semi-structured interviews, and documentation. The research instruments consist of test questions, observation sheets of teacher and student activities, interview guidelines, and supporting documents such as lesson plans, LKPD, grade archives, and documentation of learning activities. The data obtained were analyzed using quantitative and qualitative approaches, including the analysis of teacher activities, the completeness of cognitive learning outcomes, and the assessment of the affective and psychomotor domains based on the criteria that have been set.

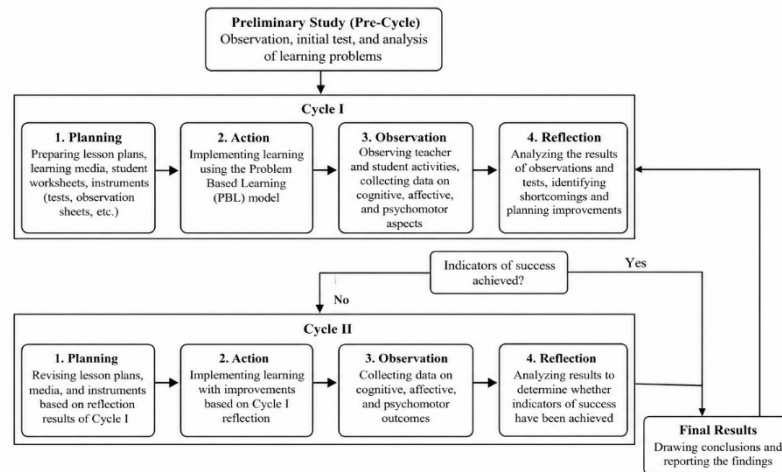


Figure 1. Methods

3. RESULTS AND DISCUSSION

Classroom Action Research (PTK), carried out in grade V of SD Negeri 03 Prohibition on Mathematics subjects, especially on the material of the Largest Common Factor (FPB). This research was carried out for 2 cycles consisting of 2 meetings each cycle with a total of 23 students consisting of 11 male students and 12 female students. The time used in a single meeting is 2 x 35 minutes. Before conducting the research, initial observations were carried out to find out the initial conditions in the school. The results of the initial observations, cycle I and cycle II are described as follows: Initial Observations: Initial observation was carried out before the Class Action Research (PTK), by giving FPB questions to all grade V students. In the process of this research, the researcher discussed with grade V teachers who teach mathematics subjects about the learning process that is usually carried out in grade V of SD Negeri 03 Larangan. Through observation at this pre-cycle stage, it is known that some students have difficulty understanding the concept of FPB so they often make mistakes in solving FPB questions. This is strengthened by the results of student scores on the pretest questions given by the teacher. Out of a total of 23 students, there are 16 students who have not reached the Minimum Completeness Criteria (KKM) score that has been set, which is 60. Below is a table of student learning outcomes in the pre-cycle stage in the FPB material mathematics lesson.

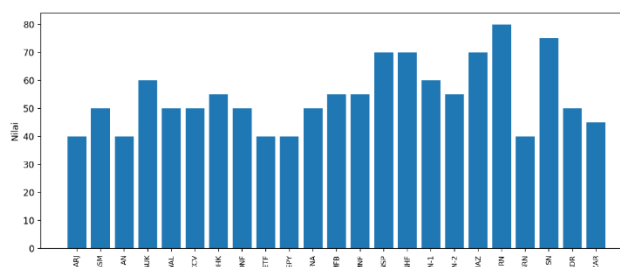


Figure 2. Minimu Completeness Criteria

From the graphic above, it can be seen that in the results of the student learning test at the preliminary stage, the percentage in the complete category was 30.43%, while the percentage of students who did not complete was 69.57%. The average score for this pre-cycle stage is reflected in the results that reached 54.2 and have not reached the KKM value that has been set, which is 60, so that improvements or actions are needed for the next cycle.

Cycle I

Cycle I Planning

After identifying the problem, the researcher made a plan for the implementation of the first cycle, which is as follows: Prepare and make a Learning Implementation Plan (RPP) for FPB materials using the PBL learning model. Prepare an observation sheet that will be used by the researcher to observe the learning process. The observation sheet was used in the pre-cycle, cycle I and cycle II. The observation sheet consists of an observation sheet for teacher activities, observation sheets for student activities, and questions to evaluate student learning outcomes. Coordinate with teachers about the learning model to be used, namely the PBL learning model and explain the steps that must be taken by teachers in the learning process. Prepare learning media or devices to be used such as laptops, projectors, or other supporting devices.

Implementation of Cycle I

After making an Action Plan, the researcher conducts research in accordance with the Learning Implementation Plan (RPP). In its implementation, the researcher acted as a teacher and was assisted by three observers, namely Fatikhatul Muflikha, S.Pd. as the teacher in charge of the subject of Mathematics as an observer on the teacher's activity sheet. The next observers were Dita Yunilasari as a colleague as an affective observer of students and Nadiah Syahirah Salma as a student psychomotor observer. In the implementation stage, the researcher divides into several stages of learning activities, namely:

Early Activities, before learning begins, educators first pray with students led by one of the students; educators check the attendance of students; educators explain the objectives during learning activities; educators provide motivation to students; educators explain the learning steps that will be carried out; and educators prepare media, materials, and tools that will be used in learning. Core Activities, In the core activities, the researcher divides learning into several phases, namely: First, Phase 1: Orientation to the problem. In this phase, educators provide problem orientation to students by presenting contextual problems related to daily life, especially for the material of the Greatest Common Factor (FPB). Second, Phase 2: Organizing students to learn. In this phase, educators form small groups of 3-5 students and share teaching materials that have been created by researchers. Third, Phase 3: Assisting the group's investigation. In this phase, educators guide students to carry out learning activities by providing a Student Worksheet (LKPD) that has been prepared. Fourth, Phase 4: Developing and presenting the results In this phase, the educator directs the students to present the results of their work in front of the class and the students do a question and answer activity. Fifth, Phase 5: Analyze and evaluate. In this phase, educators analyze the course of learning and conduct evaluations. Final Activities, In the final activity, the educator discusses and concludes the material that has been studied.

Observation Cycle I

Observation was carried out during the learning process, with the aim of finding out how the quality of learning, student learning outcomes both in terms of cognitive, affective and psychomotor students after implementing learning using a learning model different from the initial condition, namely the Problem Based Learning (PBL) Learning Model. The following are the results of class action research in cycle I: First, the assessment of teacher activities. Observation of teachers' activities is carried out during the implementation of the Action. This observation aims to ensure

that each stage of learning takes place effectively which will later affect the quality of learning implementation. The following is data on observation of teachers' activities using PBL in cycle I at meeting I and meeting II: The results of the observation show that in cycles I and II teachers have carried out all stages of learning using the Problem Based Learning (PBL) model in accordance with the planned syntax. In the introductory activity, the teacher opens the learning with greetings and prayers, checks the attendance and readiness of students, provides motivation through ice breaking activities, explores students' initial knowledge about the concept of FPB and prime numbers, and conveys the goals, steps, and forms of assessment that will be carried out during the learning process. In the core activities, teachers apply the entire PBL syntax, namely providing contextual problems as learning orientations, organizing students into groups, guiding the investigation process through the Student Worksheet (LKPD), facilitating group discussions, directing students to present the results of discussions, providing reinforcement to the results of presentations, facilitating question and answer sessions, and conducting analysis and evaluation with students to learning outcomes. To support student involvement, teachers also utilize learning media in the form of interactive presentations, FPB animation videos, and Wordwall-based quizzes. In the closing activity, the teacher gave a learning evaluation, distributed an attitude assessment questionnaire and reflection sheet, concluded the material with the students, then closed the learning by reading the hamdalah and closing greetings. Overall, the observation results show that all stages of learning using the PBL model have been carried out well in both cycles so that the implementation of actions can be said to be in accordance with the planning that has been prepared. Remarks: Score 4: very complete; Score 3: fairly complete; Score 2: incomplete; Score 1: incomplete. From the table data, it can be seen that the researcher carried out learning steps with the PBL model in complete from the initial activities to the core activities.

Second, assessment of cognitive aspects. In the cognitive aspect, the assessment was carried out by taking evaluation score data in cycle I. In cycle I, the evaluation questions consisted of 5 description questions with a total score of 100. The data on student scores in cycle I is as follows: The results of the evaluation in the first cycle showed an increase in student learning outcomes compared to pre-cycle conditions. Of the 23 students who participated in the learning, as many as 63% had reached the Minimum Completeness Criteria (KKM) set, while 39% of students had not reached completeness. The average learning outcome in the first cycle reached 62, an increase compared to the average score in the pre-cycle stage of 54.2. The highest score obtained by students is 90, while the lowest score is 10. Despite the increase in learning completeness, these results have not met the established research success indicators, namely classical completeness of at least 75%. In addition, there is still a considerable difference in ability between students, which is shown by the wide range of grades between the highest and lowest grades. This condition shows that some students still have difficulties in understanding the concept of FPB, so it is necessary to improve actions in cycle II so that student learning outcomes can increase more optimally. The results of observation of affective aspects in the first cycle showed that students' attitudes began to develop during the learning process using the Problem Based Learning (PBL) model. The honesty aspect obtained the highest percentage of 75% in the good category, followed by the discipline aspect of 68% which was also in the good category. Meanwhile, the cooperation aspect obtained a percentage of 56% and responsibility of 50%, both of which are still in the sufficient category. The confidence aspect showed the lowest achievement, which was 42% with the less. These results show that even though learners have started to show a disciplined and honest attitude during learning, the ability to work together, responsibility, and especially confidence still needs to be improved. Therefore, in cycle II, action improvements were carried out through more intensive motivation, more targeted division of group tasks, and appreciation to students to be more courageous in expressing opinions and presenting the results of discussions in front of the class. Fourth, assessment of psychomotor aspects.

Assessment of psychomotor aspects was carried out to measure students' skills in implementing FPB problem-solving procedures during group discussion and presentation activities. The results of the psychomotor aspect value in cycle I are as follows:

Table 2. Value of Psychomotor Aspects Cycle I

Aspects	Scores obtained	Total Value	Percentage
Psychomotoric	10	50%	Enough

Based on the results of student psychomotorism, students' skills in interacting and sharing roles in the group are still very minimal. The dominance of certain students makes other students' motor skills in compiling LKPD not develop.

Cycle II

Cycle II Planning

The Action Plan in Cycle II is almost the same as the planning in cycle I, but adjusted based on the results of the reflection of the previous cycle. The Cycle II Action Effort was carried out in the hope of answering the evaluations faced during Cycle I. Develop a comprehensive learning implementation plan (RPP). Making learning observation sheets including observation of teacher activities, observation of affective activities and psychomotor observations of students. Create group worksheets and design evaluation questions. Optimize learning and media use throughout the learning process to improve student understanding. Encourage quiet students to actively participate in asking or answering questions.

Implementation of cycle II

The implementation of actions in Cycle II will be carried out on March 2 and 6, 2026. In general, the learning procedure in Cycle II remains consistent using the Problem Based Learning (PBL) model which consists of five main stages. However, the actions in this cycle are focused on improving the obstacles that arise in Cycle I, especially in terms of students' understanding of the FPB story question material and the effectiveness of group work. The description of the implementation of learning in Cycle II is as follows: First, student orientation on the problem. The activity began with the presentation of contextual problems that are closer to students' daily lives through interactive media. If in Cycle I students still seem confused with the definition of factors, in Cycle II educators present real problems. Educators provide a stimulus of questions that provoke students to think critically about how to divide an equal number of objects without residue. Second, organizing students to learn. At this stage, educators divide students into heterogeneous groups as in Cycle I. However, based on previous reflections, teachers emphasize the division of tasks within the group so that no student dominates or just sits still. Students are directed to pay attention to the LKPD which has been improved in appearance so that it is more communicative and the instructions are easier to understand independently. Third, assisting the group's investigation. During this investigation process, educators provided more intensive assistance, especially to groups that experienced difficulties in Cycle I. Educators provide gradual directions without directly providing answers, so that students continue to find the FPB concept through the help of factor trees or number tables independently. The classroom atmosphere at this stage looks more conducive and students show increased focus compared to the previous cycle. Fourth, develop and present results. Each group completed the LKPD which contained FPB story questions. The group representative came forward to present the results of their discussion in front of the class. Unlike Cycle I where students tend to be shy, in Cycle II communication between students begins to thaw. Educators give rewards in the form of praise to groups that succeed in solving problems with the right steps. Fifth, analyze and evaluate. In the final stage, educators and students evaluate the steps that have been taken. Educators re-emphasize the points that must be present in finding FPB. The activity ended with the

implementation of the Cycle II evaluation test to measure the extent of improvement in student learning outcomes after action improvements were made.

Observation cycle II

The implementation of actions through the Problem Based Learning (PBL) model in Cycle II is completed, educators collect data through activity observation sheets and evaluation tests. Based on the data obtained, it can be seen that there is a significant improvement in the quality of the process and student learning outcomes in the FPB material. The following are the results of class action research in cycle II: The results of observations on teacher activities in cycle II showed an improvement in the quality of learning implementation compared to cycle I. Improvements made after reflection in cycle I succeeded in improving the implementation of the Problem Based Learning (PBL) syntax, especially in providing clearer directions for the use of Student Worksheets (LKPD), guiding the presentation process of discussion results, providing reinforcement to students' answers, and carry out closing activities in the form of evaluation and reflection of learning more optimally. Overall, the teacher's activity score increased from 105 in the first cycle to 113 in the second cycle or increased from 87.50% to 94.17%. This improvement shows that teachers are increasingly able to implement each stage of the PBL model systematically in accordance with the learning plan. This more optimal implementation also creates a more conducive learning atmosphere, reduces students' confusion in understanding LKPD instructions, and encourages more equitable participation in group discussion activities. Thus, the quality of learning implementation in cycle II has met the expected criteria and supports the improvement of student learning outcomes. The results of the evaluation in cycle II showed that the cognitive learning outcomes of students had increased compared to cycle I. Of the 23 students who took part in the evaluation, as many as 78% had reached the Minimum Completeness Criteria (KKM), while 22% of students still had not achieved completeness. The average score of students increased to 76, higher than the average in the first cycle of 62. In addition, the highest score obtained by students reached 100, while the lowest score was 50. The improvement in learning outcomes in cycle II shows that the application of the Problem Based Learning (PBL) model is able to help students understand the concept of FPB better. Compared to the first cycle, students were seen to be more able to solve the problems given, actively discuss, and be more precise in applying the FPB concept to evaluation questions. Although there are still some students who have not reached the KKM, classically the results obtained have shown a significant improvement and met the indicators of success of the actions that have been set. From the table, a comparison of student learning outcomes between cycle I and cycle II can be drawn, as follows:

Table 3. Comparison of Cycle I and Cycle II

Indicator	Cycle I	Cycle II
Total Values	1435	1750
Class average	62	76
Completion percentage	63%	78%

Based on data obtained from Cycle I and Cycle II, it can be seen that there is an improvement in the quality of students' cognitive learning outcomes. It is evidenced by the percentage of classical completeness in Cycle I reaching 63% with only 13 students achieving KKM. Meanwhile, during Cycle II, the percentage of classical completeness increased to 78% with the number of students who completed increased to 18 students. There was an increase in completeness by 15%. This increase proves that the learning obstacles experienced by students in Cycle I can be overcome in Cycle II. Third, the assessment of affective aspects. The assessment of affective aspects is carried out through observation during the learning process in cycle II. The following is data on student scores in the affective aspect:

Table 4. Assessment of Affective Aspects Cycle II

Indicator	Total Value	Percentage	Remarks
Discipline	11	68%	Good
Honest	6	75%	Good
Responsibilities	6	75%	Good
Cooperation	12	75%	Good
Confidence	8	67%	Good

From the table above, the results of the students' affective aspects in Cycle II have increased. All indicators reach the good category. This shows that the learning environment is more conducive and students feel more comfortable expressing themselves. Improvements in the indicators of responsibility, cooperation, and confidence prove that the use of the applied learning model is able to stimulate active involvement and positive character of students in the classroom. Fourth, assessment of psychomotor aspects. The assessment of psychomotor aspects in Cycle II is focused on measuring the improvement of students' skills in applying FPB problem-solving measures through the Problem Based Learning (PBL) model. Based on the results of actions in Cycle II, the following data was obtained:

Table 5. Assessment of Psychomotor Aspects Cycle II

Aspects	Scores obtained	Total Value	Percentage
Psychomotoric	15	75%	Good

Based on the results of observations in Cycle II, students' psychomotor skills classically obtained a score of 15 with a percentage achievement of 75%. Referring to the assessment criteria, this achievement is in the "Good" category. This shows that most students have been skilled in executing problem-solving procedures, from the discussion stage to the presentation stage.

4. CONCLUSION

The application of the Problem Based Learning (PBL) learning model to the Biggest Common Factor (FPB) material in grade V of SD Negeri 3 Larangan has been proven to be able to improve overall student learning outcomes in the cognitive, affective, and psychomotor domains. Before the action was taken, student learning outcomes were still low with an average score of 54.2 and a completeness rate of 30.43%, but after the implementation of PBL in two cycles, there was a significant increase. Cognitive learning completeness increased from 63% in Cycle I to 78% in Cycle II, accompanied by an increase in students' attitudes of discipline, responsibility, cooperation, and confidence during the learning process. In addition, students' skills in discussing, solving problems, and presenting results have also experienced better development. These findings show that PBL is effective in creating more active, meaningful, and student-centered learning so that it can improve the quality of the Mathematics learning process and outcomes in FPB materials. Teachers are advised to apply the Problem Based Learning model in an ongoing manner in mathematics learning and other subjects that require critical thinking and problem-solving skills. Schools also need to provide support in the form of providing adequate learning facilities and encouraging the development of teachers' competencies in implementing innovative learning models. For future researchers, this research can be developed on different materials, educational levels, or variables to obtain a broader picture of the effectiveness of PBL in improving student learning outcomes.

5. ACKNOWLEDGEMENTS

This article was compiled as one of the requirements to graduate from the undergraduate program at the University of Muhammadiyah Purwokerto. The researcher expresses his deepest

gratitude to the supervisor who has provided direction, input, and guidance during the research and writing process of this article. Gratitude was also addressed to grade V students of SD Negeri 3 Larangan and the school for providing opportunities and full support in the implementation of research. In addition, the researcher stated that use Microsoft Copilot's artificial intelligence (AI) technology in this writing process was limited to the preparation of the writing framework and the translation of the manuscript into English and use Google NotebookLM to create graphics. All analysis, data interpretation, and conclusions are the work of the researcher himself.

6. REFERENCES

- Abdillah, M. T., & Syifa, S. N. (2025). Membaca Kebijakan Pendidikan di Indonesia dan Malaysia Terkait Tes PISA. *REFORMASI*, 15(1), 137–152 <https://doi.org/10.33366/rfr.v15i1.6459>
- Argaw, A. S., Haile, B. B., Ayalew, B. T., & Kuma, S. G. (2016). The Effect of Problem Based Learning (PBL) Instruction on Students' Motivation and Problem Solving Skills of Physics. *Eurasia Journal of Mathematics, Science and Technology Education*, 13(3), 857–871. <https://doi.org/10.12973/eurasia.2017.00647a>
- Destari, D. E., Indriani, R., & Destari, E. E. (2026). Analisis Pembelajaran Matematika Sekolah Dasar. *Jurnal Ilmu Bahasa Dan Pendidikan Guru Sekolah Dasar*, 2(1), 15–24. <https://doi.org/10.61132/jibpgsd.v2i1.207>
- Herman, T. (2012). Meningkatkan Kualitas Pembelajaran Matematika Sekolah Dasar Melalui Lesson Study. *Jurnal Pendidikan*, 13(1), 56–63. <https://doi.org/10.33830/jp.v13i1.362.2012>
- Hopkins, D. (2014). *A Teacher'S Guide To Classroom Research*. McGraw-Hill Education (UK).
- Kemmis, S., McTaggart, R., & Nixon, R. (2013). *The Action Research Planner: Doing Critical Participatory Action Research*. Springer Science & Business Media.
- Majelis Luhur Persatuan Taman Siswa Yogyakarta. (2004). *Karya Ki Hadjar Dewantara Bagian Pertama: Pendidikan*. Majelis Luhur Persatuan Taman Siswa.
- Muliati, N., Kaimuddin, L. O., & Kansil, Y. E. Y. (2024). Penerapan Model Pembelajaran Problem Based Learning (PBL) pada Materi KPK dan FPB untuk Meningkatkan Hasil Belajar Siswa Kelas IV. *Journal of Basication (JOB): Jurnal Pendidikan Dasar*, 8(2), 56–63.
- Ni'mah, R. N. A., & Muryaningsih, S. (2024). Penerapan Model PBL dalam Meningkatkan Hasil Belajar Materi Penyajian Data Melalui Media Interaktif Canva Kelas IV di SD Negeri 2 Banjarsari Wetan. *Consilium: Education and Counseling Journal*, 4(2), 230–242. <https://doi.org/10.36841/consilium.v4i2.4693>
- Noviani, N., Cahyani, D., & Ali, Moh. (2025). Studi Literatur Tentang Peran Guru Dalam Perkembangan Peserta Didik. *Jurnal Manajemen Pendidikan*, 13(2). <https://journal.unpak.ac.id/index.php/JMP/article/view/13109>
- Nurmajumitasari. (2023). Kesulitan Siswa dalam Menyelesaikan Soal Cerita pada Materi FPB dan KPK di Sekolah Dasar. *Plusminus: Jurnal Pendidikan Matematika*, 3(2), 299–306. <https://doi.org/10.31980/plusminus.v3i2.1345>
- OECD. (2023). *PISA 2022 Results (Volume I): The State of Learning and Equity in Education*. PISA. <https://doi.org/10.1787/53f23881-en>
- Piaget, J. (1970). *Science of education and the psychology of the child* (D. Coltman, Trans.). Orion.
- Prastyo, H. (2020). Kemampuan Matematika Siswa Indonesia Berdasarkan TIMSS. *Jurnal Pädagogik*, 3, 111–117. <https://doi.org/10.35974/jpd.v3i2.2367>
- Romiszowski, A. J. (2016). *Designing Instructional Systems: Decision Making in Course Planning and Curriculum Design*. Routledge.
- Saputra, H. (2024). Perkembangan Berpikir Matematis Pada Anak Usia Sekolah Dasar. *JEMARI (Jurnal Edukasi Madrasah Ibtidaiyah)*, 6, 53–64.
- Savriliana, V., Sundari, K., & Budianti, Y. (2020). Media Dakota (Dakon Matematika) Sebagai Solusi untuk Meningkatkan Hasil Belajar Matematika Siswa Sekolah Dasar. *Jurnal Basicedu*, 4(4), 1160–1166. <https://doi.org/10.31004/basicedu.v4i4.517>
- Sinulingga, E., Desfita, V., Ali, L., K.Ginting, M., & Sya'diah, Y. (2025). *Pendidikan dan Pembelajaran di Sekolah Dasar*. Akiopedia Press.
- Sudjana, N. (2006). *Penilaian Hasil Proses Belajar Mengajar*. Remaja Rosdakarya.

-
- Suryani, M. (2023). Hakekat Pendidikan dalam Kehidupan Manusia: Studi Analisis Empiris Perilaku Masyarakat. *Edu Cendikia: Jurnal Ilmiah Kependidikan*, 3(03), 537–544. <https://doi.org/10.47709/educendikia.v3i03.3397>
- Susanto, A. (2016). *Teori Belajar dan Pembelajaran di Sekolah Dasar*. Kencana.
- TIMSS & PIRLS International Study Center. (2015). About TIMSS 2015 – TIMSS 2015 and TIMSS Advanced 2015 International Results. <https://timssandpirls.bc.edu/timss2015/international-results/timss-2015/about-timss-2015/>
- Trisanti, Y., Saleh, H., & Amin, M. (2025). Analisis Berpikir Kritis Matematis Siswa dalam Menyelesaikan Masalah Perbandingan. *Jurnal Bersama Ilmu Pendidikan (DIDIK)*, 1(3), 161–167. <https://doi.org/10.55123/didik.v1i3.300>
- Wedi, A. (2017). Konsep dan Masalah Penerapan Metode Pembelajaran: Upaya Peningkatan Mutu Pembelajaran Melalui Konsistensi Teoretis-Praktis Penggunaan Metode Pembelajaran. *Edcomtech: Jurnal Kajian Teknologi Pendidikan*, 1(1), 21–28.