



INCREASING STUDENTS' LEARNING OUTCOMES ON THE VOLUME OF CUBES AND BEAMS LEARNING MATERIAL USING PROBLEM-BASED LEARNING MODEL

Anik Sundari¹, Vinencia Ika Indralin², Siti Dewi Maharani³

^{1,3} Universitas Sriwijaya, Palembang, Indonesia

² SD Negeri 112, Palembang, Indonesia

¹aniksundari06@gmail.com, ²vinenciaindralin888@gmail.com, ³siti_dewi_maharani@fkip.unsri.ac.id

ABSTRACT

This paper discusses a type of Classroom Action Research (CAR), which is based on the low students' Math learning outcomes of students in class V.B SD Negeri 112 Palembang. The purpose is to improve students' learning outcomes through the implementation of the Problem-based Learning model. The research was conducted in two cycles. Each cycle consists of four stages, which are planning, action, observation, and reflection. The techniques used to collect data were observation, tests, and documentation. The initial condition of the research showed that the percentage of students' learning completeness was only limited to 10.34% (Very Less), which subsequently increased in the first cycle to 55.17% (Sufficient). The students' learning outcomes increasingly improved in the second cycle with the percentage of students' completeness, which reached 89.66% (Very Good). The results indicate that the application of the PBL model in learning implies a significant effect on the improvement of students' learning outcomes in class V.B, especially on the volume of cubes and beams that have been studied. Thus, the PBL model can be said to be one of the effective learning models that can improve the student's learning outcomes, which will be more effective if it continues to be examined as long as keeping up with the times.

Keywords: *problem-based learning, students' learning outcomes, the volume of cubes and beams*

PENINGKATAN HASIL BELAJAR SISWA PADA MATERI VOLUME KUBUS DAN BALOK MENGGUNAKAN MODEL PEMBELAJARAN BERBASIS MASALAH

ABSTRAK

Artikel ini membahas jenis Penelitian Tindakan Kelas (PTK) yang dilatarbelakangi oleh rendahnya hasil belajar peserta didik dalam pelajaran Matematika di kelas V.B SD Negeri 112 Palembang. Tujuan agar meningkatkan hasil belajar peserta didik melalui penerapan model pembelajaran berbasis masalah. Penelitian dilakukan dalam dua siklus. Tiap siklusnya terdiri dari empat tahapan yakni perencanaan, tindakan, pengamatan, dan refleksi. Teknik yang digunakan untuk mengumpulkan data adalah observasi, tes, dan dokumentasi. Kondisi awal penelitian menunjukkan bahwa persentase ketuntasan belajar peserta didik hanya sebatas 10,34% (Sangat Kurang), yang kemudian meningkat di siklus I penelitian menjadi 55,17% (Cukup). Hasil belajar peserta didik semakin meningkat di siklus II dengan persentase ketuntasan peserta didik yang mencapai 89,66% (Sangat Baik). Hasil tersebut menunjukkan bahwa penerapan model PBL dalam pembelajaran memberikan pengaruh yang signifikan terhadap peningkatan hasil belajar peserta didik di kelas V.B, khususnya pada materi volume kubus dan balok yang sedang dipelajari. Dengan begitu, model PBL dapat dikatakan sebagai salah satu model pembelajaran efektif yang mampu meningkatkan hasil belajar peserta didik, yang tentunya akan semakin efektif apabila terus dieksplorasi mengikuti perkembangan zaman.

Kata Kunci: pembelajaran berbasis masalah, hasil belajar siswa, volume kubus dan balok

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INTRODUCTION

Education is one aspect that plays a very important role in efforts to improve the quality of human resources (Mukrimatin et al, 2018). Education is a process that not only equips human intellectual abilities in the field of literacy, but also as a process that helps develop their abilities optimally in intellectual, social, and also

personal aspects (Taufiq in Septika et al, 2022). Teachers who are educators play an important role in the success of education in schools through learning activities, so that students can have mastery of the knowledge and life skills needed to face real life. Therefore, teachers must be able to design an effective and interesting

learning, so that the learning material presented will make learners feel happy and feel important to learn it (Sukanto, 2021).

One of the subjects that have a very important role in real life is Mathematics. Mathematics is a universal science that underlies the development of modern technology, which has an important role in various disciplines to build critical human thinking (Widyastuti et al, 2022). But in fact, the quality of education in Indonesia, especially in mathematics is still included in the lower class. This is evidenced by the results of research *Trends in International Mathematics and Science Study* (TIMSS) in 1999, which states that the quality of Mathematics learning in Indonesia is ranked 34th out of 38 countries (UNESCO). While research from the *Programme of International Student Assessment* (PISA) in 2001 showed that Indonesia ranked 39th out of 41 countries in the category of Mathematical literature. This shows that the mathematics learning process carried out in Indonesia has not been running effectively and efficiently (Budianti & Azis, 2023).

One of the weaknesses that exist in learning in Indonesia, especially in Mathematics learning is that most of the learning techniques used still emphasize the memory factor of students against Mathematical formulas themselves. The methods used in learning are also fairly conventional, for example, lecture methods that make learners passive and do not have the opportunity to find the concept of the material taught on their own (Lestari, 2022). As a result, learners tend to feel bored and assume that Mathematics is a difficult and unpleasant lesson. In this case, learners will also not be able to apply the theory in the form of formulas learned at school to solve problems in everyday life because they are not used to problem-solving-based learning (Budianti & Azis, 2023).

Dharmayani (in Ghozelin et al, 2021) mentioned that one of the factors that affect learning outcomes is the concentration of learners. Concentration in learning is intended so that students can focus all their attention only to the learning that is being done so that it will have an impact on improving their learning outcomes because the understanding gained becomes more

profound. However, from the results of observations and interviews conducted to class V.B's teacher in SD Negeri 112 Palembang, there is information that there are still many students in class V.B those who do not have a good concentration of learning, which causes the learning results in Mathematics are still in the low category range. Learners also tend to be passive during math learning activities with their teachers. This is because the learning process has not been able to invite students to be able to actively participate in learning. Most of the students in the class tend to only listen to the explanation of the teacher, not too actively involved in the learning activities carried out. This is one of the reflections that must be followed up so that the quality of education in Indonesia becomes better.

To overcome these problems, one of the efforts that can be done is to use a variety of learning models that are appropriate to the needs of learners in the classroom. Learning models that can be used are diverse, one of which is the PBL (*Problem Based Learning*) model. This *Problem Based Learning* model is believed to be a solution for teachers in increasing the concentration and activity of students so that it can help them improve the learning outcomes they will get (Lestari, 2022). This is in line with research conducted by Isnaeni (2016) and Haryanto (2019) which states that the use of *Problem Based Learning* (PBL) model can increase the activity and learning achievement of students at the elementary school level. This is evidenced by the increasing percentage of students' learning completeness after the PBL model is applied in learning.

Referring to research conducted by Septika, et al. (2022), which states that the PBL model can be used as one of the thematic learning models because it is proven to be effective and innovative to improve the activeness and learning outcomes of students in accordance with the goals of the 2013 curriculum, so this time the researcher will also apply this PBL model to learning, but not thematic learning, but mathematics learning which is basically very closely related to problems in the real world. The many successes in research and the advantages

that the PBL model has do not make it escape the disadvantages, one of which is that it takes quite a lot of time for its application to be maximum. The fact mentioned by Widjajanti (in Tyas, 2017) reveals that most learners are not familiar with the application of real problems into learning. Even though critical thinking skills are one of the learning skills that are indispensable in the 21st century. Therefore, as has been recommended by Santosa, et al. (2022), then this research will use three observers so that observation activities can be carried out more carefully and optimally in observing the activities of learners in learning. Tyas (2017) also mentioned that the application of PBL model can run well if the teacher prepares all the devices properly.

Based on the description that has been presented, the main focus in this research to

determine whether the application of PBL model in mathematics learning, especially on the volume of cubes and blocks that are being studied by students in grade V.B SD Negeri 112 Palembang can also help improve the learning outcomes of students in the classroom.

LITERATURE REVIEW

Siswono (in Assegaf & Sontani, 2016) suggested that the PBL model is a learning approach that starts with asking a problem and then looking for solutions to solve the problem. Arends (in Mahrani et al, 2017) mentioned that the core of learning with PBL approach is the presentation of authentic and meaningful problems so that it can be used as a foundation in inquiry investigations conducted by learners.

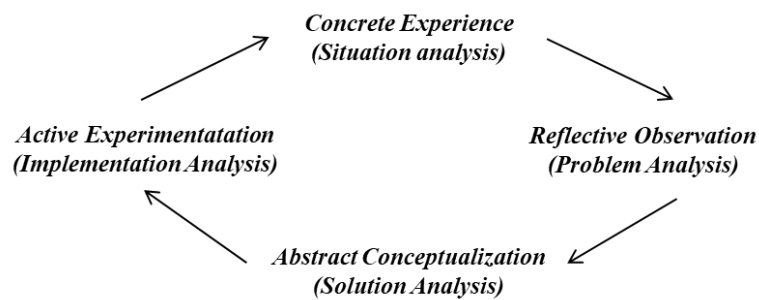


Figure 1. PBL management cycle
 (Source: Assegaf & Sontani, 2016)

The Syntax of Problem Based Learning Model

Problem Based Learning as a learning model certainly has steps in its application. Here

is an explanation of the steps (syntax) that exist in the PBL model:

Table 1. The Syntax of Problem Based Learning Model

	Syntax	Aktivitas Guru
Syntax 1	Orienting learners to the problem	The teacher explains the purpose of learning and the means or logistics needed. Teachers motivate students to engage in selected or specified real problem-solving activities.
Syntax 2	Organize learners to learn	The teacher helps students determine and organize learning tasks that deal with problems that have been oriented in the previous syntax.
Syntax 3	Conduct individual or group research	The teacher encourages students to collect appropriate information and carry out experiments to obtain the clarity necessary to solve the problem.

Syntax 4	Develop and present the work	The teacher helps students to share tasks and plan or prepare appropriate works as a result of solving problems in the form of reports, videos or models.
Syntax 5	Analyze and evaluate the problem-solving process	Teachers help students to reflect or evaluate the problem-solving process carried out.

(Sumber: Kemendikbud, 2018)

The PBL Model is a problem-based learning, where in the learning activity, learners will be directed to solve problems that exist in an illustration of the problem (Santosa et al, 2022). This learning model has a series of learning activities that learners must do. Its application in learning is also in accordance with the demands of developing 4C skills, namely *Critical Thinking*, *Creative Thinking*, *Collaboration*, and *Communication*. With five syntaxes integrated in it, this learning model expects students not only to hear, take notes, and then memorize the material taught, but so that students can be active in thinking, communicating, researching, processing data, and concluding a problem solution (Septika et al, 2022).

METHOD

This research uses the type of classroom Action Research (PTK) conducted collaboratively with lecturers and teachers. This research was conducted at SD Negeri 112 Palembang in learning in the even semester of the 2022/2023 school year, especially during the learning of Cube and block volume materials in the fifth grade of elementary school. Subjects used in this research were 29 students in class V.B SD Negeri 112 Palembang, consisting of 18 women and 11 men.

The class action research procedure offered by John Elliot consists of four stages in each cycle, starting from planning, acting, observing, and ending with reflecting, all of which stages are carried out repeatedly (Suginem, 2021) as shown below.

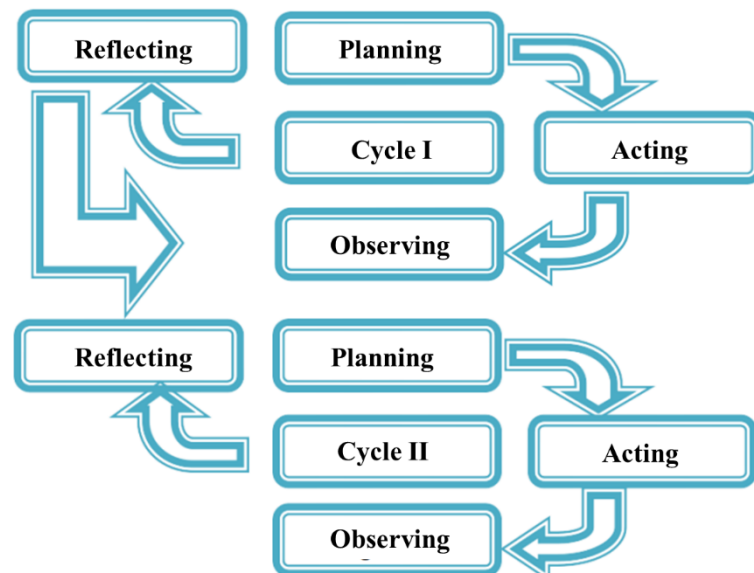


Figure 2. Class Action Research flow
 (Source: Widyastuti, 2022)

The planning stage is done in the form of preparing lesson plans, preparing Learning media, and preparing evaluation tools to measure the learning outcomes of students. Next is the implementation phase which is planned in two cycles, each cycle consisting of two meetings with one Test at the end of each cycle meeting (second meeting). If the expected goals or targets can be achieved in the first cycle, the research activities will be stopped. However, if it has not been achieved in cycle I, then the activity will be continued by repeating to cycle II to improve learning performance so that the target set can be achieved. Then in the observation phase, the researcher will see the extent to which the influence of the application of PBL model in improving the learning outcomes of learners. The research in each cycle will end with reflection, namely evaluating and recording the deficiencies and problems that arise in the implementation of cycle I, then preparing a follow-up plan for cycle II to obtain better results (Widyastuti, 2022).

The techniques used to collect data during the research process are observation, test, and documentation. The instruments used are interview guideline sheet and evaluation question sheet along with the answer key that will be used during the written test process. All data collected will be analyzed through the Stages: (1) reviewing the data that has been collected, either through observation or tests, (2) reducing data, namely

categorizing and classifying research results, (3) presenting data by organizing information that has been reduced, and (4) concluding research results (Davita & Zainil, 2021).

The way to find out the learning outcomes of students is to use the formula that has been explained by the Ministry of Education and culture (Davita & Zainil, 2021), namely:

$$\text{Value} = \frac{\text{acquisition score}}{\text{maximum score}} \times 100$$

The next is to know the level of success of learning, namely using the minimum completeness criteria (KKM) that must be achieved by students to be said to be complete in learning. KKM set SD Negeri 112 Palembang for Mathematics in class V is 65, which is still relatively low. Therefore, the researcher will take the value of 75 as KKM in this research, with the aim that learners can further develop their skills in learning mathematics, especially in the volume of cubes and blocks.

Sudjana (in Davita & Zainil, 2021) explained that to measure the percentage of learning completeness of students, the following formula can be used:

$$\text{Percentage of completeness learning} = \frac{\text{number of completed students}}{\text{number of students}} \times 100\%$$

Table 2. Table of Criteria for Learning Success

Percentage of Completeness	Criteria for Learning Success
≥ 80%	Very Good
60% – 79%	Good
40% – 59%	Sufficient
20% – 39%	Less
< 20%	Very Less

(Source: Aqib dalam Davita & Zainil, 2021)

Indicators of success in the implementation of this research include:

- 1) Implementation of learning is said to be successful if it reaches a success rate of ≥ 80%.
- 2) The completeness of students in learning is when they obtain the value of learning outcomes that reach KKM, namely ≥ 75.

RESULTS AND DISCUSSION

In this section, the results of the analysis of the data obtained during the research will be described in detail. This research began with data analysis during the pre-cycle activities, then continued with data analysis during the research cycle I and cycle II.

Initial Conditions (Pre-cycle)

In the initial condition, the researcher gave 4 evaluation questions in the form of descriptions in the volume of cubes and blocks to students. The evaluation questions given have a

maximum score of 40. The acquisition of learning outcomes of students in class V.B on these initial conditions will be described in the following table:

Table 3. Student' Learning Outcomes (Initial Conditions)

No.	Observed Aspects	Results Obtained
1.	Completed students (≥ 75)	3
2.	Percentage of completed students	10,34 %
3.	Incomplete students (< 75)	26
4.	Percentage of incompleted students	89,66 %
5.	Highest value	90
6.	Lowest value	35
7.	Total value	1.690
8.	Average value	58,28

(Source: Primary research data, 2023)

From table 3, it can be known that the success of learning in the initial conditions is very low, which is only 10.34% are included in the category of "Very Less". This is evidenced by only 3 out of 29 students who complete the value in mathematics lessons volume of cubes and blocks. The average value they get is still very low, which is only 58.28. Referring to these results, research was conducted in the first cycle to improve the quality of learning in this initial condition.

namely preparing lesson plans, preparing teaching materials, learning media, evaluation tools, and preparing assessment rubrics. After that, the implementation phase is carried out in the form of learning in the class under research, ranging from preliminary, core, to closing activities. Learning conducted in this first cycle integrates PBL model in it, to see the influence given PBL model on the quality of learning and learning outcomes of learners. At the observation stage, observations were made on the learning outcomes of students in this cycle I. The results of this research were obtained from a written test conducted, which worked on 3 questions with a maximum score of 30. Details are described in the following table:

Cycle I

Research in the first cycle which consists of two meetings began with the planning stages,

Table 4. Student' Learning Outcomes (Cycle I)

No.	Observed Aspects	Results Obtained
1.	Completed students (≥ 75)	16
2.	Percentage of completed students	55,17 %
3.	Incomplete students (< 75)	13
4.	Percentage of incompleted students	44,83 %
5.	Highest value	97
6.	Lowest value	57
7.	Total value	2.199
8.	Average value	75,83

(Source: Primary research data, 2023)

From table 4, it can be known that the learning done has increased, which initially only 10.34% increased to 55.17%. This percentage

indicates the quality of learning success in the "Sufficient" category. Of course, there is an increase in the number of complete learners,

which initially there were only 3 people, now increased to 16 people in this first cycle. The average value obtained in this cycle is 75.83. However, because the results obtained from this first cycle has not met the indicators of research success, it will be continued cycle II which is an improvement of all the shortcomings in this first cycle.

Cycle I ends with a reflection stage which is the evaluation stage of the deficiencies or problems that arise during the learning process. The deficiencies that exist in this first cycle include: (1) students have not fully focused on learning, (2) the atmosphere of the class still can not be when the division of groups, and (3) allocation and time management is still not going well, so that learning has not been maximized. These deficiencies will be corrected and followed up in the second cycle in order to obtain better learning outcomes.

Cycle II

The research continued with the second cycle consisting of two meetings, the same as the previous cycle. Research in the second cycle begins with the planning stage, namely preparing lesson plans to adjust the results of reflection in the first cycle, namely adjusting the allocation of time with the activities carried out so that learning can run optimally. In addition, the researcher also

prepared teaching materials, prepared learning media, prepared evaluation tools to measure the learning outcomes of students, and also prepared a learning assessment rubric. In this second cycle, learning is integrated with existing technology, namely asking presentation slides in front of the class with the help of a projector to clarify the understanding of students on the volume of cubes and cuboids material.

After that, the implementation stage was carried out, namely carrying out learning activities with 29 students in class V.B, which starts from the preliminary activities, core activities, to end with closing activities. Learning conducted in the second cycle also integrates PBL model to see if there is a significant influence given PBL model on the quality of learning and learning outcomes of students from the previous cycle. At the observation stage, observations were made on the learning outcomes of students in this second cycle. The results of the research were obtained from a written test conducted, namely students working on 4 questions with a maximum score of 40. In this observation phase, the researchers found a good progress in terms of active learning of learners. The activity they show affects the learning outcomes obtained. The following is an analysis of the learning outcomes obtained by students in cycle II, which will be described in the following table:

Table 5. Student' Learning Outcomes (Cycle II)

No.	Observed Aspects	Results Obtained
1.	Completed students (≥ 75)	26
2.	Percentage of completed students	89,66 %
3.	Incomplete students (< 75)	3
4.	Percentage of incompleted students	10,34 %
5.	Highest value	100
6.	Lowest value	65
7.	Total value	2.565
8.	Average value	88,45

(Source: Primary research data, 2023)

From table 5, it can be known that learning has increased significantly from the previous cycle, which were previously only dipped 55.17% percentage of students who completed, now in the second cycle the

percentage increased to 89,66%. The percentage obtained this shows the level of success of the learning process which is done already is in the category of "Very Good". The average value obtained is also quite high, namely 88,45. In cycle

II, the number of students who completed are as many as 26 people, which is the opposite of the initial conditions of the research. In this second cycle, the highest score obtained by students reaches the maximum value, which is 100. Similarly, the lowest value obtained is 65, which means that all students continue to experience an increase in learning outcomes, although in the end there are still unfinished with the KKM that the researchers set (≥ 75). But when compared with the school KKM, the value of 65 can be said to be complete. With the results obtained in this second

cycle, the researchers stated that the research was successful because it has reached the target set earlier. That is, the research will be stopped until the second cycle only.

Research in the second cycle is also ended with the reflection stage which is the evaluation stage of the deficiencies or problems that arise during the learning process. In this second cycle, learning activities are already running better than before. The quality of the resulting learning has also increased from the previous cycle, so there is no need to follow up for the next cycle again.

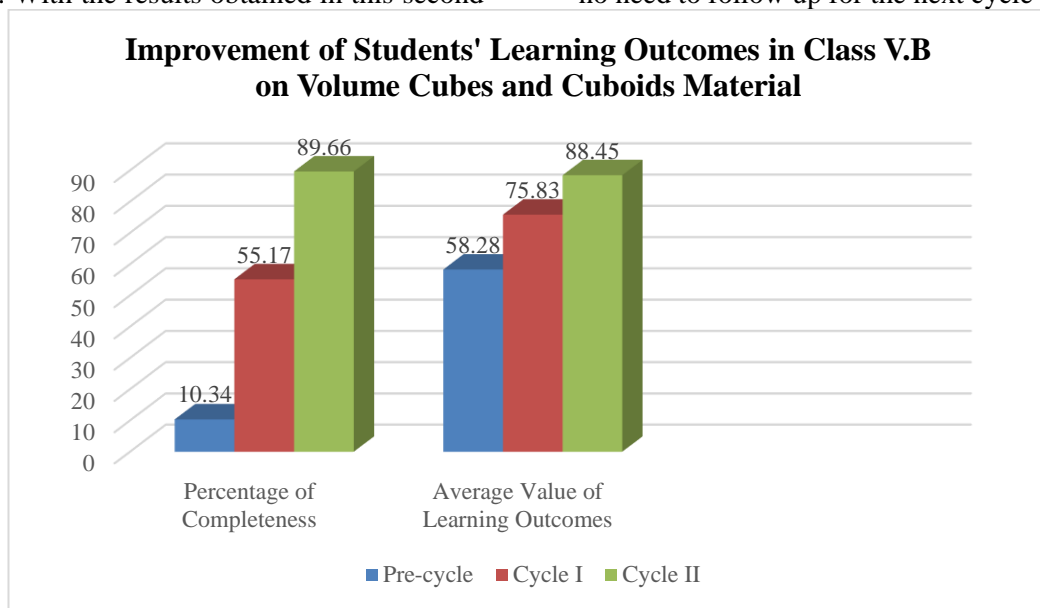


Figure 3. Graph of improvement students' learning outcomes

The graph shows that students' learning outcomes continue to increase significantly from the initial conditions after the PBL model is applied to the learning carried out, seen from the percentage of learning completeness that continues to rise. Similarly, the average value obtained by learners, the results continue to increase from the initial conditions before the research was conducted. This is in line with the results found by Magdalena (2015), which states that the PBL model has an influence on improving the learning outcomes of class XI students in biology learning conducted at SMAN 5 Samarinda. Puspitasari (2021) also got the same results in the research he conducted, where the PBL model also provided an improvement in the

learning outcomes of students in building materials in the fifth grade of SDN 1 Jatisari.

The increased learning outcomes of students in this research are caused by learning that is integrated with the PBL model in it can help students to master the concept of the material being taught with the aim of helping them find problem-solving solutions (Sanjaya dalam Lestari, 2022). In order for the results to be more effective, the implementation of the PBL model in learning can also be supported by the use of interesting learning media, such as technology-based learning media. The use of PBL models can help learners to direct their focus or concentration fully towards learning because the syntax used in this PBL model requires learners to understand

the problem at hand in order to find the right solution to solve it. The impact of this good concentration of learning is an increase in the learner's learning activity, which increasingly directs him to learn something new in order to obtain a better understanding. Through a good understanding of the material presented, the learning outcomes of students will also increase.

This Problem Based Learning model emphasizes the utilization of students' intelligence abilities in solving learning problems that are meaningful, relevant, and also contextual (Agustina & Fitrihadajati, 2020). Learning with the PBL model is carried out through discussion activities so that students can practice their ability to communicate, namely when expressing opinions and ideas in their group (Febrita & Harni, 2020). This makes learners become more happy and start to be interested and motivated to learn, so it will give a deep and meaningful impression of what is learned. Knowledge that is applied by carrying out real activities can be stored longer in the memory of learners.

The results obtained in this research are in line with several studies that have been carried out previously. As research conducted by Anugraheni (2018) shows that the application of PBL models in learning can improve students' critical thinking skills, which is one of the important 4C skills in the 21st century. In addition, the use of PBL models can also improve scientific attitudes and students' learning outcomes. Budhi, et al. (2018) in his research also revealed that the PBL model can significantly provide good progress in the form of improving students' learning outcomes and helping them practice communication skills.

Based on these results, the PBL model is considered one of the effective ways in an effort to develop the quality and critical thinking abilities of learners, which can provide them with motivation and active learning capacity (Hintz in Lestari, 2022). Through the guidance provided by teachers, learners can learn to dig up as much important information relevant to learning as possible. Then, learners also learn to plan problem solving through discussion to exchange ideas to find the most appropriate idea. Here it can be said that learners are trained to be independent learners and free in expressing the ideas of his mind and

explore a variety of new knowledge. Learners are directed to be active and responsible and learn to evaluate themselves from what has been done (Tyas, 2017). The activeness of the learners is what ultimately helps them in improving their learning outcomes (Septika et al, 2022). Thus, the PBL model can also be used as one of the learning models that can certainly help teachers in achieving the learning goals that have been set.

CONCLUSIONS AND RECOMMENDATION

From the results of research conducted, it can be concluded that the application of the PBL model in the learning process has an influence on the quality of learning, namely there is a significant increase in the learning outcomes of class V.B students on the Mathematical material of the volume of cubes and cuboids. The percentage of completeness which was initially only 10.34% increased to 55.17% in cycle I, and increased to 89.66% in cycle II. Five syntax of PBL that is done guides learners to be actively involved in classroom learning. The activeness of the learners is what ultimately gives good results to the evaluation of learning.

This research still has many shortcomings. Therefore, it is expected that further researchers can add objects studied, such as activeness and critical thinking skills of learners. The aim is that researchers can better know the influence of PBL model to learners in various aspects. In addition, the advice for teachers who teach in schools is to continue to explore and develop existing models or methods so as to provide new and interesting variations in the learning process.

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