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ANALYSIS OF LEARNING MATH BASED (HOTS) THROUGH PROBLEM BASED LEARNING MODEL IN CLASS V SD

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ABSTRAK

This study aims to determine (1) the implementation of higher order thinking skill (HOTS) based mathematics learning through problem based learning model in class V SD Negeri Kapasa, (2) the level of effectiveness of problem based learning (PBL) model on HOTS based mathematics learning, (3) factors that hinder HOTS based mathematics learning through problem based learning (PBL) model. This research uses a qualitative approach, with a descriptive qualitative research type. The objects in this research are students and fifth grade teachers of SD Negeri Kapasa. In this study, the data collection techniques used were observation, tests, interviews and documentation. The implementation of HOTS-based mathematics learning through the PBL model makes students think systematically, able to analyze problems from various aspects, train creative and innovative thinking levels and make students more confident. Factors that can hinder HOTS-based mathematics learning through the PBL model are the lack of time allocation in applying the model and the different grasping power of students so that the solution that can be done by the teacher is able to manage the time allocation properly as well as the seating arrangement of students, give additional assignments to students and provide additional tutoring to students who are lacking in mathematics subjects..

1. INTRODUCTION

Education encompasses a comprehensive process of equipping individuals with not only the basic skills required for cognitive intelligence, but also essential emotional and psychomotor abilities, thus ensuring the holistic development of the child, so that they can emerge as well-rounded individuals who possess the competencies necessary to navigate and deal with the ever-evolving complexities and diverse challenges that characterize all domains of life and social interaction.

Technological advancements and the evolution of lifestyles in this information technology age require that educators not only transition their instructional media from traditional paper and whiteboard formats to digital or audio-visual platforms, but furthermore, educators must cultivate students who engage in critical thinking, demonstrate independence, exhibit effective communication skills, are adept at utilizing technology, and collaborate successfully with others. Characteristics of Pancasila students

include creative and critical thinking, suggesting that students should have a high level of understanding in analytical challenges to effectively address problems with inventive solutions. The pursuit of knowledge is essential for all individuals across structured and unstructured educational frameworks.

There are six critical focuses contained within the Pancasila Understudy Profile that must be caught on and connected by understudies. These six critical focuses are enunciated through melodic composition to encourage students' understanding of the song's centrality. Pancasila understudies have confidence and veneration for the One God, show respectable qualities, and are universally disapproved, legitimate, autonomous, inventive, and basically mindful **(**Hasan dkk., 2023).

Noteworthy instruction could be a frame of instruction that effectively engages learners, where they are specifically included within the prepare of information building, encouraged and guided by teachers. Education encompasses a comprehensive prepare of preparing people with not as it were the essential aptitudes required for cognitive insights, but moreover basic passionate and psychomotor capacities, in this way guaranteeing the all encompassing improvement of the child, so that they can rise as well-rounded people who have the competencies essential to explore and bargain with the ever-evolving complexities and differing challenges that characterize all spaces of life and social interaction. Characteristics of Pancasila understudies incorporate imaginative and basic considering, proposing that understudies must have a tall level of understanding in explanatory challenges to successfully address issues with creative arrangements. The interest of information is basic for all people over organized and unstructured instructive systems. The securing of logical understanding starts at the minute of human birth and expands until the person returns to the beginnings of presence. The move from obliviousness to illumination speaks to a nonstop endeavor within the journey for information.

The golden generation cohort consists of individuals who possess the full range of skills required to thrive in the complex 21st era. These traits include strong character, critical thinking skills, the ability to inspire and be creative, the ability to communicate effectively, a spirit of cooperation, and excellence in working with teams to achieve innovation (Jaenudin dkk., 2020). In the context of 21st century education, indicators of success include adherence to learning protocols and the overall learning experience. Comprehensive learning fosters proficiency in knowledge, skills, attitudes, or values that are an integral part of cognitive and behavioral patterns (Afni dkk., 2021).The Problem Based Learning (PBL) learning model or problem-based learning model is a learning model that uses real problems encountered in the environment as a foundation for acquiring knowledge and concepts through critical thinking and problem-solving skills.

According to (Mokambu, 2022) work contains complex tasks based on problems as a first step in collecting and integrating new knowledge based on experience in real activities and guiding students in carrying out design activities, solving problems, making decisions, carrying out investigative activities, and providing opportunities for students to work independently or in groups to solve real problems. According to (Ardianti dkk., 2021) argues that the problem-based learning model is a teaching and learning process that presents contextual problems so that students are stimulated to do so.

Based on some of the opinions of the experts above, it can be concluded that the Problem Based Learning model is a student-centered learning model that starts with a problem and continues with solving a problem so that students are able to gain a new experience in learning. In using the learning model. Problem Based Learning (PBL) the teacher relates real problems or problems in the environment around students.

Characteristics of issue based learning the iBased learning or PBL strategy has the taking after characteristics: learning begins from a issue, the issue is associated to the student's world, organizing learning based on issues, not information disciplines, giving awesome obligation to understudies specifically and carrying out the learning prepare themselves, using little bunches, requiring understudies to illustrate what they have done, learning within the frame of items or exhibitions.

(Eismawati dkk., 2019)The steps of the Problem Based Learning model are as follows: a. Prepare the material to be taught. b. The teacher makes groups heterogeneously dividing students who have a

high, medium and low level of understanding into small groups. c. Provide guidance so that students are younger to understand the material being taught when explaining. d. Students receive problems given by the teacher. e. Students investigate the problems given. f. Students receive problems given by the teacher. f. Students investigate the problems given. Students receive problems given by the teacher. e. Students investigate the problems given. f. Students analyse the data obtained and observe the data. Students analyse the data obtained and observe the data. g. Students make a report on the results of the discussion. h. Students make a report on the results of the discussion. Students make a report on the results of the discussion. h. Students reflect on their investigation. Before learning is carried out, a plan related to implementation using a particular model is needed.

The advantage of the Problem Based Learning (PBL) learning model is that meaningful learning will occur. Learners who learn to solve a problem and will apply their knowledge or try to find out new knowledge related to the learning needed. As for the weaknesses in the Prolem Based Learning (PBL) Model, namely, students are more likely to be easily frustrated, students' access to questions given by the teacher is reduced, and makes students less confident when learning independently.

Mathematics shapes quality human resources through its role as a basic science. Mathematics is important in the development of science and technology because it organises reasoning and shapes students' attitudes. Mathematics is based on logic for the discovery and development of science and technology in improving human welfare. Therefore, it is undeniable that to support the success of national development, the role of mathematics is very decisive (Nurdiansyah, 2018). Maths is the ability, confidence and willingness to access quantitative information or opportunities to make decisions in all areas of daily life (Mahdawanty dkk., 2022). Another view is that mathematics is defined as a compulsory subject at all levels of education because it can train students to have critical and creative thinking skills (Nursyifa dkk., 2020).

Mathematics is one of the compulsory subjects to be studied at the primary school level. Maths is a subject that uses a lot of numbers and various formulas so students don't like maths. Maths lessons are very important to use in everyday life. Through learning mathematics, students are equipped with the ability to think logically, analytically, systematically, critically, creatively, and the ability to work together, so that students can understand and solve problems well.

Higher order thinking in learning mathematics is a process that involves students to use brilliant new ideas so as to support students' critical, creative thinking skills. Critical thinking can be trained and developed through the process of learning mathematics and the material in mathematics learning is understood through critical thinking, critical thinking skills are interrelated and continuous. So it can be concluded that critical thinking skills are important in learning mathematics.

HOTS-Based Mathematics Learning Through Problem Based Learning (PBL) Model, divided into the first, namely the steps in the problem-based learning model: Organising students towards problems, Organising students for learning, Assisting group investigations, Developing and presenting work, Analysing and evaluating the problem-solving process. Indicators in higher order thinking-based mathematics learning through problem-based learning models are analysing, evaluating, and creating indicators. Next, the steps of the problem-based learning model based on higher order thingking skills are as follows, Preliminary Activities: 1. The teacher opens the lesson by saying greetings 2. Learners begin to pray together before starting learning 3. The teacher checks the presence of students 4. Learners sing the national compulsory song. The teacher gives reinforcement about the importance of instilling the spirit of nationalism 5. The teacher makes an apperception regarding the relationship between the previous material and the material to be studied 6. The teacher conveys the learning objectives that will be studied. Orientation of students to the problem 2. Organizing students to learn 3. Guiding individual and group investigations 4. Developing and presenting work 5. Analyzing and evaluating the problem solving process Closing Activities 1. Students together with the teacher reflect on the learning that has taken place 2. The teacher provides reinforcement of the material that has been learned 3. The teacher informs the outline of the material to be learned at the next meeting 4. The learning activity ends with

prayer with students.

Research by Nurul Dewi K (2023) "Analysis of Higher Order Thinking Skills (HOTS) of Students at SD Negeri 5 Metro Barat". This research focuses on how the HOTS abilities of students and how the procedures for implementing learning to support students' HOTS at SD Negeri 5 Metro Barat. The results obtained in the study related to students mostly answered questions correctly on applying level questions and some students did not write what they knew in the question. There are differences in this study, namely the location of this research is at SD Negeri 5 Metro Barat Bandar Lampung while the researcher is located at SD Negeri Kapasa Makassar City.

Agung Nugroho's research (2020) "Increasing Higher Order Thiking Skills (HOTS) and Cooperation Between Learners Through Problem Based Learning (PBL) Learning Model with Kokami Media in Class IV SD Negeri 2 Dukuhwaluh". The results of this study can improve students' higher order thinking through kokami media by conducting two cycles. Cycle I has not met the minimum completeness criteria due to students who are not focused on problem solving. Whereas in cycle II it increased and was better than cycle I. This is due to changes in students and students' behavior. This is due to changes in students and teachers in the learning process. The difference in this study is that the type of research uses class action research (PTK) while researchers use qualitative research. Likewise, the subject of research is grade IV students while researchers are grade V students.

Yumnia's research (2023) "The Effect of Problem Based Learning on Critical Thinking Skills of Grade V Students on the Material of Unity and Unity at MI Attaqwa 18". This study discusses the relationship between the ability to think of students by using the Problem Based Learning (PBL) learning model. The results of this study on the material of unity and unity show that the ability to think between experimental and control class students is significantly different. The difference in this research is on Ppkn learning materials while researchers use Mathematics subjects. For research methods using quasi-experimental methods or pseudo-experiments while researchers use qualitative methods

2. METHODS

In this study, the author used a descriptive research design. Descriptive in nature, qualitative research focuses on gaining a deeper comprehension of an issue (Hamzah, 2021). One subset of qualitative research includes descriptive research. An explanation of the research approach, population and sample (research targets), data collection techniques, instrument development, and data analysis techniques are all included in this study, which aims to investigate a life event or phenomenon and gather fresh information from people. It is essential to document the specifications of the instruments and materials used in research. While material standards specify the kind of materials used, tool specifications indicate the complexity of the tools utilized. The nature of socially created reality and the intimate connection between the researcher and the topic of the study are highlighted by qualitative research, which is also referred to as naturalistic and naturalistic research. This study focuses on measuring and evaluating causal correlations between different variables, rather than processes, since qualitative researchers aim to answer questions that explain how social experiences emerge and finally acquire a new meaning.

This study was carried out in the VA class at UPT SPF SDN Kapasa in Makassar City's Tamalanrea District. UPT SPF SDN Kapasa is situated in class V UPT SPF SDN Kapasa, Tamalanrea District, Makassar City, specifically on Jl. Kapasa Baru No. 17 Kel. Kapasa Raya Kec. Tamalanrea. The study was carried out during July and August of 2024. All fifth-grade students from UPT SPF Kapasa State Elementary School in the Tamalanrea District of Makassar City served as the study's subjects; there were 34 pupils in the VA class and 32 in the VB class. There are sixty-six pupils in all. Purposive sampling or sampling procedures were used to gather research participants or samples. One sampling method with some implications is purposeful sampling. The research participants in this study were the homeroom teacher V UPT SPF SD Negeri Kapasa, Tamalanrea District, Makassar City, and the pupils of class VA UPT SPF SD Negeri Kapasa, Tamalanrea District, Makassar City.

Direct observation was the method of data collection used in this investigation carried out before the

study with the aim of obtaining an initial description of the school environment. Interview, The first interview question conducted to the VA homeroom teacher of SD Negeri Kapasa which can be seen in the list of attachments, namely, the first attachment. The second interview was conducted with students of class VA SD Negeri Kapasa to students who have high understanding, moderate understanding and low level of understanding. Documentation, Documentation aims as a form of archive that is used as evidence that research has been carried out in the form of letters that support research, photos, and so on. The test that the author carried out in this study was a written test containing multiplication and division math problems arranged randomly. Can be seen in the seventh attachment. In addition, there is an essay test containing math material, namely numerical numbers up to 100,000.

Qualitative data is information that is presented as words rather than a string of numbers throughout the analysis process. Observations, interviews, document digests, and tape recordings are just a few of the methods used to gather data. Although these methods are often processed before use, qualitative analysis still employs words that are typically organized in expanded text. Data reduction, data presentation, and conclusion drawing are the three lines of action that comprise analysis in this perspective (Sarosa, 2021).

3. RESULTS AND DISCUSSION

The Result

The comes about of this consider depict the investigate destinations carried out in this consider, to be specific, to get it the usage of higher arrange considering expertise (HOTS)-based arithmetic learning through problem-based learning (PBL) demonstrate in course V SD . To decide the level of adequacy of the problem-based learning (PBL) demonstrate on higher arrange considering expertise (HOTS)-based arithmetic learning in course V SD To decide the variables that ruin arithmetic learning based on higher arrange considering abilities (HOTS) through problem-based learning (PBL) demonstrate in lesson V SD .

Higher Order Thinking Skills (HOTS)-Based Analysis of Mathematics Learning is the focus of this study. By using the Problem-Based Learning Model, arranged according to the question format according to the core skills, basic skills, and subject values that will be made for these questions. The analyzed questions are available on the test question writer panel, analyzed for their initial quality, then used as a guide for writing questions to produce results in the form of test questions. The results were tested on Kapasa Elementary School fifth grade students. The test consisted of 10 written questions related to the material of numerical numbers up to 100,000.

The indicators in this study are starting from C4, C5, and C6. At the C4 (Analysis) stage, learners solve mathematical questions and problems at hand, and the problems contained in the problem are combined with everyday student problems to make them easier for learners to understand. So that learners can solve the question. At stage C5 (Evaluate), learners are enabled to approach mathematical problems from a higher-order cognitive perspective and enable them to understand, analyze, and critique the teacher's questions. Stage C6 (Creating), learners foster creativity and innovation, students must possess the capacity for both critical and creative thought., which can lead them to uncover new concepts or apply them to make innovative discoveries from their own ideas or examples.

Discussion

a. Using the Problem Based Learning (PBL) Model to Implement Higher Order Thinking Skills (HOTS) Based Mathematics Learning Enough time is suggested to run the problem-based learning (PBL) model in order to implement hots-based mathematics learning since the model requires a long time in learning then the teacher as an educator must understand the model so that when using the model it becomes easy and not difficult. Additionally, it is essential to set up a range of problems with low, medium, and high difficulty levels in hots-based mathematics learning. Furthermore, the problem's shape in relation to the students' life might affect their high level of thinking, enabling them to think critically, artistically, and innovatively as well as to envisage highly. Therefore, in order for younger children to grasp the teacher's queries, they must be simple for them to understand.

b. The degree to which the Problem Based Learning (PBL) model improves the learning of mathematics

based on higher order thinking skills (HOTS) The use of the problem-based learning (PBL) approach in mathematics education places the emphasis on issues. According to the findings of the research, PBL learning models are useful in HOTS-based mathematics instruction because they help students develop their critical thinking skills, enhance their analytical thinking, foster their creative thinking, and help them solve problems, able to collaborate with other students by working together between students, innovating, increasing students' learning motivation and by using PBL models can support a fun learning process that is student-centered.

c. Factors that Prevent Learning Mathematics Using the Problem-Based Learning (PBL) Model and Higher Order Thinking Skills (HOTS) According to the research findings, a number of factors, including students' varying capacities for capturing information, their degree of trust, their cognitive ability, and a lack of skills, impede hots-based mathematics learning in class V SD Negeri Kapasa through the problem-based learning (PBL) model in communicating with each other, lack of ability of students to work in groups. The solution that can be done is that the teacher is able to manage the time allocation with this model and arrange the seating of students in an orderly manner according to those who are smart and moderate or less so that classmates who understand the material help their classmates, provide additional assignments and provide additional tutoring to students who still do not understand.

HOTS-Based Mathematics Learning through Problem Based Learning (PBL) Model :

No	Indicator	No	Steps of HOTS-Based PBL Model
1.	analyze	1.	Preliminary Activities: 1. The teacher opens the lesson by saying greetings 2. Learners begin to pray together before starting the lesson 3. The teacher checks the presence of students 4. Learners sing the national compulsory song. The teacher gives reinforcement about the importance of instilling the spirit of nationalism 5. The teacher conducts apperception regarding the relationship between the previous material and the material to be learned 6. The teacher conveys the learning objectives to be learned.
2.	evaluate	2 .	Core Activities : 1. Orient learners to the problem 2. Organize learners to learn 3. Guiding individual and group investigations 4. Developing and presenting work 5. Analyze and evaluate the problem-solving process
3.	create	3.	Closing Activities : 1. Learners together with the teacher reflect on the learning that has taken place 2. The teacher provides reinforcement of the material that has been learned 3. The teacher informs the outline of the material that will be studied at the next meeting 4. The learning activity ends with a prayer with the students.

In expansion to interviews, the analyst too made coordinate perceptions to the homeroom educator straightforwardly, to be specific within the shape of perceptions of how the educator implemented hots-based arithmetic learning employing a problem-based learning demonstrate which is depicted as takes after :

No	Steps of PBL Learning Model	Aspects Observed
1.	Analyze and assess the problem solving prepare	The educator clarifies the learning goals, and the educator presents the issues that will be fathomed in bunches. Following, the instructor persuades learners to lock in in chosen genuine problem-solving exercises.
2.	Organizing students for learning	The educator makes a difference learners to characterize and organize learning errands related to the issue.
3.	Assist group investigations	The educator energizes learners to accumulate suitable data and carry out tests to pick up the clarity required to illuminate the issue. Learners are required to be dynamic agents.
4.	Develop and present work	The instructor makes a difference learners to share errands and arrange or get ready fitting work as a result of issue tackling within the frame of a report.
5.	Analyze and evaluate the problem-solving process	The instructor makes a difference learners to reflect or assess the problem-solving prepare.

From the comes about of the perceptions made, the comes about gotten that the homeroom educator V carried out all the stages that the analysts had depicted with respect to the learning stages of the problem-based learning demonstrate appropriately. beginning from the arrange of analyzing and assessing the problem-solving prepare, organizing understudies for learning, helping bunch examinations, creating and displaying work. The taking after are the comes about of the perceptions made :

No	Statement	Treatment	
		Yes	No
1	The instructor investigates the learners' starting understanding	✓	
2	Instructor passes on learning goals to understudies	✓	
3	The instructor separates the learners into little bunches	✓	
4	The instructor gives openings for understudies to distinguish issues	✓	
5	The educator gives openings for understudies to precise their thoughts	✓	
6	The instructor guides understudies to assemble suitable data to get a arrangement to the issue.	✓	
7	The instructor checks the comes about gotten by the understudies	✓	

Coordinate perceptions were too made of fifth review understudies to audit the usage of arithmetic learning exercises based on higher arrange considering aptitudes through the problem-based learning demonstrate, which the analysts portrayed as takes after :

No	Steps of PBL Learning Model	Aspects Observed
1.	Arrange learners to the issue	Learners watch and get it the issue displayed by the instructor
2.	Organizing understudies for learning	Learners talk about and partition assignments to discover information required to unravel the issue
3.	Directing person and bunch examinations	Learners conduct examinations within the shape of finding information for dialog materials
4.	Creating and displaying work	Each gather conducts a talk to deliver a arrangement to the issue and the comes about are displayed.
5.	Analyzing and assessing the issue fathoming handle	Each bunch will make a introduction and the other bunches give apperception. The another action is to summarize or make conclusions concurring to the input gotten by other bunches.

From the learner perception grid sheet, the comes about of perceptions to understudies with respect to the execution of higher arrange considering skill-based science learning through the problem-based learning show are gotten, which the analysts depict as takes after:

No	Indicator	No	Aspects Observed	Treatment	
				Yes	No
1.	HOTS-based PBL Learning Model	1.	Learners reply welcome from the educator some time recently the learning starts	√	
		2.	Learners examined supplication some time recently learning	√	
		3.	Learners tune in to their names when the instructor checks understudy participation	√	
		4.	Learners sing the national song of devotion	√	
		5.	Learners tune in to the instructor to continuously instill the esteem of patriotism nilai nasionalisme	√	
		6.	Learners tune in to the instructor give apperception around the past fabric and what will be learned.	√	
		7.	Learners get it the learning targets that will be learned	√	
		8.	Learners conduct bunch dialogs	√	
		9.	Learners make perceptions approximately critical things within the assignment	√	
		10.	Learners make introductions and pass on the comes about of	√	

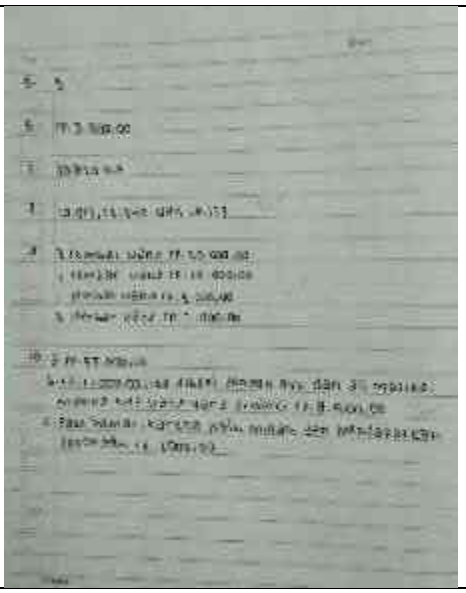
			gather discourses and react to them		
		11.	Learners reflect after the discourse	√	
		12.	Learners tune in to the teacher's clarification of the fabric considered in diagram.	√	
		13.	Learners reflect on what they have learned.	√	
		14.	Learners together conclude the fabric that has been learned	√	
		15.	Learners implore together some time recently going domestic	√	
2.	C4 (Analyze)		Capacity to analyze, illuminate, select, test, induce, and audit	√	
		1.	Through Issue Based Learning, learners can study numerical numbers up to 100,000 accurately.100.000 dengan tepat	√	
	C5 (Evaluate)		The ability to reassemble or combine components to make modern meaning, understanding or structure	√	
		1.	Through Issue Based Learning, learners can compose checking numbers up to 100,000 certainly.	√	
	C6 (Creating)		The capacity to judge and assess something based on indicated standards, references, or criteria	√	
		1.	Through Issue Based Learning, understudies can decide the put esteem of integrability up to 100,000 accurately.	√	

The taking after are the comes about of documentation conducted by analysts when conducting investigate specifically within the frame of meet documentation with understudies who have a tall level of understanding, a direct level of understanding and understudies who have a moo level of understanding. Analysts chose these three categories with the point that the answers from the meet comes about gotten differing answers concurring to the understanding had by these understudies which can be seen within the taking after table.

The analyst too tested the fifth review homeroom educator so that the analyst might discover out the usage of HOTS-based science learning through the problem-based learning demonstrate. The fabric instructed by the educator is arithmetic learning fabric for common numbers up to 100,000 and the test comes about can be seen within the taking after table:


Learner Interview Documentation and teacher interview documentation



Documentation of the application of the problem-based learning model and documentation after conducting learning

Documentation after conducting learning exercises employing a HOTS-based science learning demonstrate with answers understudies are way better able to organize the issues given and are able to analyze the issues given by the instructor, specifically numerical issues with c4, c5 and c6 scope. At that point the comes about of understudy answers are great and adjust. and by utilizing the 21st century learning demonstrate, to be specific the problem-based learning demonstrate in learning arithmetic, it is exceptionally compelling to be utilized among the basic school scope.

The utilize of problem-based learning models is exceptionally supportive for instructors in carrying out learning exercises within the classroom other than that by utilizing problem-based learning models in science learning can sharpen students' basic considering levels and prepare talking aptitudes amid bunch dialogs so that understudies can work well with other individual understudies and make detached understudies dynamic in bunch dialogs and with 21st century learning models making the learning prepare more comfortable and conducive.

4. CONCLUSIONS AND SUGGESTIONS

The findings demonstrated how the PBL approach of HOTS-based mathematics instruction at SD may enhance students' capacity for methodical thought, problem-solving, creativity, and self-assurance. Additionally, this learning style works well for raising students' motivation to learntion. However, factors that hinder learning include time allocation and differences in student understanding. Teachers need to manage time efficiently and adjust student seating to make learning more effective. Instructors may enhance their students' critical thinking skills by using the PBL learning approach. Students are motivated to learn well, collaborate, and master the material. Other researchers can utilize this study as a guideline for in-depth research related to this topic.

From the research results that have been presented previously, the suggestions that researchers can give are as follows: 1. For teachers, teachers can use the problem-learning model (PBL) during classroom learning. This program aims to improve students' critical, creative and creative thinking. 2. To achieve success, students must have a strong desire for education and the ability to cooperate with others, show enthusiasm for learning, and be more open to criticism. Thinking through warm learning. 3. For other researchers, this study can be used as a guideline for other studies so that researchers can develop or present more in-depth findings on research related to this study.

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