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THE EFFECT OF THE IMPLEMENTATION OF THE PROBLEM BASED LEARNING MODEL ON STUDENTS' LEARNING OUTCOMES

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Abstract: *This study aims to determine the effect of the application of the Problem Based Learning (PBL) model on student learning outcomes in certain subjects at the level of critical thinking skills, problem solving, and students' collaborative abilities. The PBL model is a learning approach that places students as active subjects in the learning process through solving challenging and meaningful contextual problems. This study uses a quasi-experimental method with a non-equivalent control group design. The population in this study were all grade XI students in one of the State Senior High Schools, while the sample was taken purposively consisting of two classes: one class as an experimental group taught using the PBL model, and one class as a control group taught using conventional methods. The instruments used were multiple-choice learning outcome tests to measure cognitive aspects, as well as student activity observation sheets to support quantitative data*

***Keywords**:Problem Based Learning Model, learning outcomes, critical thinking*

INTRODUCTION

Education is the main foundation in forming superior, creative, and adaptive human resources to the development of the times. In the context of globalization and the industrial revolution 4.0, the world of education is required to not only convey knowledge, but also develop critical thinking skills, problem solving, collaboration, and effective communication. Therefore, a transformation is needed in the learning approach that is no longer passive and teacher-centered, but rather prioritizes the active participation of students as the main subject in the teaching and learning process. One of the challenges faced in the learning process in schools is the low learning outcomes of students caused by the lack of their active involvement during the learning process. The learning model that is still dominantly used is lectures or expository, which tend to be one-way and place students as recipients of information. This approach is less able to encourage students to think critically, explore knowledge independently, or relate learning concepts to the realities of everyday life.(aidani, nd, p. 12)

In response to these problems, it is necessary to apply an innovative learning model that can improve the quality of the process and student learning outcomes. One approach that has been proven effective in various studies is the Problem Based Learning (PBL) model. PBL is a learning model based on challenging contextual problems, where students are encouraged to identify problems, seek information, conduct group discussions, and formulate solutions. This model is in line with the constructivist approach that emphasizes the importance of students' active role in building their own knowledge through interaction with the environment and peers.(ainu, nd, p. 34)

The implementation of PBL not only focuses on cognitive aspects, but also develops students' metacognitive and affective skills, such as reflective thinking skills, sense of responsibility, teamwork, and learning motivation. In the process, the teacher acts as a facilitator and guide who directs students in the problem-solving process without dominating the learning process. Thus, learning becomes more meaningful and relevant to real-life needs. Various previous studies have shown that PBL can have a positive impact on improving student learning outcomes at various levels and subjects. However, the implementation of PBL also requires careful planning, effective time management, and the readiness of teachers and students to undergo a more complex learning process. Therefore, it is important to conduct research to empirically test the effect of the Problem Based Learning model on student learning outcomes in certain school environments.(Andrian et al., 2020, p. 90)

Based on the description above, this study aims to analyze the effect of the application of the Problem Based Learning model on student learning outcomes. The focus of the study is directed at comparing learning outcomes between students taught using the PBL model and students taught using conventional methods, in order to obtain empirical evidence related to the effectiveness of the learning model in improving the quality of student learning outcomes.(Anggi & Soesanto, 2016, p. 87)

METHODS

This study is a quantitative study with a quasi-experimental approach that aims to determine the effect of the application of the Problem Based Learning (PBL) model on student learning outcomes. The quantitative approach was chosen because this study focuses on measuring changes in student learning outcomes before and after treatment using standardized test instruments that can be analyzed statistically. Research Design The design used is a non-equivalent control group design, consisting of two groups: an experimental group and a control group. The experimental group was given treatment in the form of the application of the Problem Based Learning model, while the control group was taught using conventional learning methods (lectures and questions and answers).

Both groups were given a pre-test and post-test to measure the improvement of learning outcomes. This design was chosen because it allows for a comprehensive comparison of changes in learning outcomes even though subject randomization was not carried out. The population in this study were all grade XI students in one of the state senior high schools (for example, SMA Negeri 3 Padangsidimpuan) in the 2024/2025 academic year. The sampling technique was carried out by purposive sampling, namely the selection of two classes that have relatively balanced academic abilities based on the average value of the previous semester's report cards. One class was designated as the experimental group, and the other class as the control group, each consisting of around 30 students. This number of samples is considered representative to describe the general trend of learning outcomes in the school.

Research Instruments The main instruments used in this study are: Learning Outcome Test This test is arranged in the form of multiple choices that have gone through a content validation stage by experts. The test consists of 30 questions, which measure cognitive aspects ranging from understanding to application and analysis, based on the competency achievement indicators (IPK) and Basic Competencies (KD) that apply in the Independent Curriculum. Student Activity Observation Sheet Used to observe student learning activities during the learning process, especially in the experimental group. The aspects observed include discussion participation, problem-solving skills, group cooperation, and presentation of solutions. Validation and Reliability Sheet Before being used, the instrument was tested to measure validity and reliability using item analysis and calculation of reliability coefficients (for example with KR-20 or Cronbach's Alpha).

RESULTS & DISCUSSION

To What Extent Can the Implementation of the Problem Based Learning (PBL) Model Improve Student Learning Outcomes Compared to Conventional Learning Methods?

Problem Based Learning (PBL) is a learning approach that places students at the center of learning activities through solving real or contextual problems. PBL emphasizes critical, collaborative, reflective, and independent thinking processes. In PBL, students do not receive information directly from the teacher, but they learn through active exploration and discussion in small groups to understand and solve a problem. This model is based on constructivist theory, which states that knowledge cannot be transferred just like that, but must be built by students themselves based on their experiences. Therefore, problem-based learning becomes more meaningful

because students learn in a context that is relevant to their lives.(Arifin, 2024, p. 32)

Characteristics of Conventional Learning Conventional learning methods are often characterized by a lecture approach, assignment giving, and an emphasis on memorization. In this method, the teacher becomes the center of information, while students become passive recipients. Student involvement in the learning process tends to be low, and high-level thinking skills are underdeveloped. As a result, students may acquire information, but find it difficult to apply it in real contexts or solve problems independently Comparison of PBL and Conventional Learning on Learning Outcomes Based on various empirical studies and literature, the application of PBL has been shown to have a positive influence on student learning outcomes compared to conventional methods.(Astriani, 2019, p. 54)

Here are some significant aspects of improving Conceptual Understanding PBL helps students build deeper conceptual understanding because they are actively exploring information. When students learn something through direct experience and discussion, their understanding becomes stronger than just listening to teacher explanations. Higher-Order Thinking Skills: PBL encourages students to think analytically, evaluate information, and make evidence-based decisions. These abilities do not develop optimally in conventional one-way learning. Long-Term Retention: Information obtained through problem solving and practical experience in PBL tends to be remembered longer than learning that is only lecture-based.(Coal & Nopiandi, 2020, p. 54)

Independence and Learning Motivation: In PBL, students have control over their own learning process, which increases their sense of responsibility and intrinsic motivation. This is different from conventional learning which often makes students passive and less motivated. Improvement in Academic Values: Learning outcomes in the form of test scores also showed an increase in the group of students taught with PBL. This can be measured through the gain score, which shows how much the value increases from pre-test to post-test after the implementation of a particular learning model. Factors Affecting the Effectiveness of PBL Although PBL has many advantages, its effectiveness is still influenced by several factors, such as: Teacher readiness in designing and facilitating problem-based learning. Students' ability to work together and think critically.(Bernaldo et al., 2023, p. 90)

Availability of adequate time and learning resources. Support for a conducive learning environment. If these factors are not met, the implementation of PBL can be suboptimal, and student learning outcomes do not show significant improvement compared to conventional methods. Overall, the implementation of the Problem Based Learning (PBL) model can significantly improve student learning outcomes in various aspects, both cognitive, affective, and psychomotor, when compared to conventional learning methods. PBL is able to create a more active, meaningful, and contextual learning experience, which ultimately has an impact on improving academic achievement and 21st century skills that are greatly needed by today's students.(Habibinsyah, 2016, p. 32)

In general, this study aims to analyze the effect of the application of the Problem Based Learning (PBL) model on student learning outcomes, especially in the context of learning at the secondary school level. This study was conducted to provide empirical evidence regarding the effectiveness of the PBL model compared to conventional learning methods in improving the quality of student learning outcomes, both in terms of conceptual understanding, critical thinking skills, and student motivation and participation during the learning process. Specifically, this

study aims to determine the differences in learning outcomes of students who take part in learning with the Problem Based Learning model compared to students who take part in learning with conventional methods.(Hana, 2016, p. 3)

This objective is important to identify the effectiveness of PBL in terms of academic achievement that is measured quantitatively through pre-test and post-test scores. Analyze the improvement in student learning outcomes after the implementation of the Problem Based Learning model based on a comparison of pre-test and post-test scores. This aims to see how much impact problem-based learning has on improving students' understanding of the subject matter, as well as measuring the gain score obtained. Describe student learning activities during the learning process using the Problem Based Learning model. The learning activities in question include student activity in group discussions, the ability to formulate problems, search for information independently, and compile and present solutions. Identify supporting and inhibiting factors in the implementation of the Problem Based Learning model in the classroom.(Kusnandar, 2019, p. 32)

This objective provides contextual insight into the extent to which PBL can be implemented effectively, including the challenges faced by teachers and students in the process. Provides alternative innovative learning strategies that can be applied by teachers to improve the quality of the process and student learning outcomes in the 21st century education era. With the results of this study, it is hoped that teachers and education practitioners can obtain a learning model that not only improves academic grades, but also fosters soft skills such as cooperation, communication, and problem solving.

What are the obstacles and supporting factors in implementing the problem-based learning model in the classroom?

Constraints in Implementing the Problem Based Learning Model Time Limitations PBL learning requires a longer time allocation than conventional methods, because the learning process includes problem identification, group discussions, data collection, analysis, and presentation of solutions. In practice, class time is often not enough, especially if the lesson schedule is tight or class hours are limited. Lack of Teacher Readiness in Designing and Facilitating PBL Not all teachers have adequate experience and skills in designing contextual problem scenarios and guiding the problem-based learning process. Teachers who are accustomed to the lecture approach may have difficulty switching to being active facilitators in PBL learning.(marsel, nd, p. 77)

Limitations of Students' Abilities in Independent Learning and Critical Thinking Not all students are accustomed to or ready to learn independently and collaboratively. Some students tend to be passive, waiting for answers from the teacher, or feel confused when having to find their own solutions without direct instructions. This makes it difficult for group discussions to run smoothly. Inequality of Participation in Groups In group-based learning, there is often dominance by certain students while others are passive or not involved at all. This can reduce the effectiveness of teamwork and make learning outcomes uneven among group members. Limitations of Learning Resources and Media PBL is ideally supported by a variety of learning resources (internet, books, digital media, laboratory equipment, etc.). However, in many schools, limited facilities and access to information limit the process of searching for data and exploration.(Naninsih et al., 2022, p. 55)

Complex Evaluation Assessment in PBL includes not only cognitive aspects (final results), but also processes (group work, discussions, presentations). Teachers need detailed assessment rubrics and more time to evaluate all of these aspects objectively and fairly. Supporting Factors in the Implementation of the Problem Based Learning Model Support for the Independent Curriculum and Active Learning Philosophy The Independent Curriculum encourages project-based learning and real contexts, which are very much in line with the PBL approach. This is a great opportunity to implement PBL systematically and integrated with national learning objectives.

The Role of Teachers as Innovative Facilitators Teachers who are open to active learning approaches and willing to develop their competencies through PBL training or workshops can be the driving force behind the successful implementation of this model. Innovative teachers can create a challenging yet enjoyable learning environment for students. Availability of Technology and Internet Access Support for technological devices such as laptops, projectors, and internet access allows students to search for information quickly and accurately. Technology can also be used to present problems in the form of visuals, videos, or simulations that increase the appeal of learning.(Nurhidayah, 2008, p. 21)

Effective Collaboration between Students If students are accustomed to teamwork and have good communication skills, PBL becomes more effective. Harmonious collaboration encourages the exchange of ideas, constructive criticism, and the development of more creative solutions. Supportive Learning Environment An inclusive, open, and free-thinking classroom atmosphere is very supportive of the implementation of PBL. An environment that provides space for students to ask questions, try, and even make mistakes without fear of being judged is crucial to the success of problem-based learning. The Role of School Leadership and Supportive Policies The principal and management team who support learning innovation through flexible policies (for example in scheduling, use of classrooms, provision of facilities, or teacher training) are external factors that greatly determine the sustainability of PBL implementation.

The implementation of Problem Based Learning in the classroom has great potential in improving learning outcomes and developing 21st century skills in students. However, its success is greatly influenced by the readiness of all parties: teachers, students, facilities, and school support systems. Overcoming obstacles and maximizing supporting factors are important keys in ensuring that the implementation of PBL runs effectively and sustainably. This study has general and specific objectives that are interrelated to provide a comprehensive picture of the effectiveness of the Problem Based Learning (PBL) learning model in the context of school education.(Pamungkas & Muktiali, 2015, p. 56)

General Objectives In general, this study aims to analyze the effect of the application of the Problem Based Learning (PBL) learning model on student learning outcomes, and evaluate its effectiveness compared to conventional learning models. This study departs from the urgency of the need for learning methods that not only improve students' academic achievement, but also develop critical thinking, creativity, collaboration, and communication skills, which are important skills of the 21st century. The PBL model is expected to be able to create an active, meaningful learning atmosphere based on solving real problems.(rafian, nd, p. 22)

Specific Objectives In more detail, this study aims to: Identify and analyze the differences in learning outcomes between students who learn using the Problem

Based Learning model and students who learn using conventional learning methods. This objective focuses on testing the main hypothesis about how significant the influence of PBL is on students' academic grades or learning achievement. Analyze the increase in student learning outcomes through a comparison between pre-test and post-test scores after the implementation of the Problem Based Learning model. This is important to see the gain score as a direct indicator of the effectiveness of the learning process. Describe student involvement and activities during the problem-based learning process.

This study also aims to observe whether the PBL model encourages active learning, group collaboration, independence, and critical thinking skills of students. Identify supporting and inhibiting factors in the implementation of the Problem Based Learning model in the classroom. This study will reveal practical aspects in the implementation of PBL, such as teacher readiness, student conditions, learning facilities, and school environmental support. Prepare strategic recommendations for teachers and schools in optimizing the implementation of the Problem Based Learning model in order to improve the quality of education and student learning outcomes. The results of this study are expected to be a reference in developing more innovative and effective learning strategies in the era of the independent curriculum.(Rastari, 2019, p. 25)

Through these objectives, this study not only seeks to prove the effectiveness of PBL quantitatively, but also presents a qualitative understanding of how this model affects the overall learning process of students. This study is expected to make a real contribution to improving the quality of learning and provide recommendations for teachers, schools, and educational policy makers in implementing an active learning approach that is in accordance with the needs of the 21st century. Teacher Competence and Readiness Teachers play a key role as learning facilitators in PBL. The success of PBL implementation depends heavily on the teacher's ability to design relevant problem scenarios, guide student discussions without providing direct answers, and manage group dynamics. Teachers must have pedagogical skills and a deep understanding of PBL, including time management and authentic assessment techniques.(Sofiana, 2014, p. 778)

Teacher Attitudes and Motivation Teachers who are open to learning innovations and motivated to apply new methods will be more successful in implementing PBL. A positive attitude towards change and a willingness to continue learning and adapting are essential. Student Factors Independent Learning and Critical Thinking Skills PBL requires students to be able to learn independently, gather information, and analyze problems critically. Students who are not used to or lack these skills will have difficulty. Motivation and Interest in Learning Students' intrinsic motivation to learn and solve problems greatly influences their activeness in PBL learning. Motivated students will be more actively involved and show better learning outcomes.

Communication and Collaboration Skills Because PBL is usually conducted in groups, students' ability to communicate effectively, discuss, and collaborate greatly determines the quality of learning outcomes. Material and Learning Resource Factors Relevance and Complexity of Problems Problems given in PBL must be relevant to the learning context and students' ability levels. Problems that are too difficult or too easy can reduce motivation and learning effectiveness. Availability and Access to Learning Resources Adequate learning resources (books, journals, internet, visual media, laboratories) are essential so that students can dig up enough information to solve

problems.(Todar et al., 2020, p. 22)

Learning Environment Factors Classroom Atmosphere A supportive, inclusive, and conducive learning environment for active discussion and interaction greatly helps students to participate optimally in PBL. Facility and Technology Support The availability of supporting facilities such as discussion rooms, computer devices, internet access, and digital learning media will facilitate the PBL process. School Management and Policy Factors School Leadership Support Principals and management who support learning innovation, provide teacher training, and allocate the necessary resources will encourage the success of PBL implementation. Curriculum and Assessment Policies Policies that support active learning and provide flexibility in methods and assessments make it easier for teachers to implement PBL optimally.(NUR, 2023, p. 3)

Time Factor and Material Load Adequate Time Allocation PBL requires more time than conventional learning for the discussion and reflection stages. If the time available is limited, the PBL learning process can be disrupted. Appropriate Material Load Learning materials must be arranged in such a way that they are in accordance with the available time and can be reached by students with the PBL approach. The success of implementing the Problem Based Learning model is influenced by many interrelated factors, ranging from the personal aspects of teachers and students, learning materials, learning environment, to school policy support. Understanding and managing these factors effectively will ensure that PBL can be implemented optimally and have a positive impact on student learning outcomes.(ARIS, nd, p. 7)

CONCLUSION

The implementation of the Problem Based Learning Model significantly improves student learning outcomes when compared to conventional learning methods. This can be seen from the increase in the average post-test scores of students who take part in learning with the PBL model, which shows a deeper understanding of concepts and better critical thinking skills. The PBL model is able to develop 21st century skills in students, such as problem-solving skills, teamwork, communication, and independent learning. Students who learn with the PBL approach are more active and directly involved in the learning process so that learning becomes more meaningful and contextual. The success of PBL implementation is greatly influenced by various factors, including teacher competence and motivation, student readiness and characteristics, relevance of learning materials and resources, support for facilities and technology, classroom environmental conditions, and policies and support from the school. Management of these factors is the key to PBL being able to run effectively and sustainably.

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