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# ENHANCING LEARNING OUTCOMES THROUGH PROBLEM-BASED LEARNING IN PLANT REPRODUCTION TOPICS

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**Abstrak**

Penelitian ini bertujuan untuk meningkatkan hasil belajar siswa pada topik perkembangbiakan tumbuhan di kelas IX melalui penerapan Problem Based Learning. Penelitian ini menggunakan metodologi Penelitian Tindakan Kelas (PTK) dengan dua siklus pembelajaran untuk meningkatkan hasil belajar siswa pada topik perkembangbiakan tumbuhan di kelas IX. Pada siklus pertama, nilai rata-rata hasil belajar adalah 72, yang berada di bawah kriteria ketuntasan minimum (<75). Pengamatan dilakukan oleh seorang observer mengenai aktivitas belajar siswa dan proses pengajaran yang dilakukan oleh guru selama siklus pertama. Pengamatan ini kemudian dijadikan sebagai acuan untuk siklus pembelajaran berikutnya. Pada siklus kedua, terdapat peningkatan hasil belajar dengan nilai rata-rata 85, yang menunjukkan bahwa siswa, secara rata-rata, telah mencapai kriteria ketuntasan minimum (nilai ketuntasan minimum 75). Penelitian tindakan kelas ini melibatkan empat tahap: perencanaan, pelaksanaan, pengamatan, dan refleksi. Hasil penelitian menunjukkan bahwa penerapan PBL secara bertahap meningkatkan hasil belajar siswa pada topik perkembangbiakan tumbuhan.
**Kata kunci:** Hasil Belajar, Penelitian Tindakan Kelas, Perkembangbiakan Tumbuhan, Problem Based Learning (PBL)

***Abstract***

*This study aims to enhance students' learning outcomes on the topic of plant reproduction in 9th-grade classes through the application of the Problem-Based Learning (PBL) model. This study used a Classroom Action Research (CAR) methodology with two learning cycles to improve student learning outcomes on the topic of plant reproduction in 9th grade. In the first cycle, the average learning outcome score was 72, which is below the minimum mastery criterion (<75). Observations were made by an observer regarding the students' learning activities and the teaching process conducted by the teacher during the first cycle. These observations served as a reference for the subsequent learning cycle. In the second cycle, there was an improvement in learning outcomes, with an average score of 85, indicating that students, on average, had achieved the minimum mastery criterion (minimum mastery score 75). The classroom action research involved four stages: planning, implementation, observation, and reflection. The results show that the gradual application of the PBL model progressively improved students' learning outcomes on the topic of plant reproduction.*
***Keywords:*** *Learning Outcomes, Classroom Action Research, Plant Propagation, Problem Based Learning (PBL).*

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## INTRODUCTION

Education is closely related to human life. Education is a necessity that must be fulfilled throughout a person's life. Every individual has inherent potential within themselves. Education is an effort made to develop that potential to achieve maturity and become a complete person for themselves and able to play a role in society (Nugraha, 2018; Pagarra & Idrus, 2018). Education is inseparable from learning, which is an activity to learn something from a learning activity. Essentially, learning is an interaction process between teachers and students, either directly through learning activities in school or indirectly through various supporting learning media (Permatasari et al., 2021). Good learning is learning that can achieve the desired goals, thus it can be said that the learning has been successful.

The success of a learning process can be seen from the achievement of the minimum mastery criterion obtained by students. Learning outcomes can be considered as the final result of classroom learning and represent the optimal ability after receiving lessons. The success of a learning process largely depends on the teacher, who plays a role in conducting effective learning and using appropriate teaching methods or models (Hidayah et al, 2022; Nurmadiah & Asmariani, 2020). Low learning outcomes indicate that the learning process has not been effective and there is a need for efforts to improve these outcomes. The desired learning outcomes include improvements in students' knowledge, attitudes, and skills after receiving their learning experiences (Hamid, 2019).

Improving students' learning outcomes can be achieved, among other ways, by implementing effective learning models. The learning model in question is one that supports effective learning with a student-centered approach. A learning model is a conceptual framework that serves as a foundation for designing and implementing learning activities (Mawardi, 2018). One of the learning models that can be applied to improve learning outcomes is the Problem-Based Learning (PBL) model. The PBL model is a student-centered learning approach that involves students in their own learning process, making them more active. Students strive to find solutions to problems using information from various sources to achieve comprehensive learning outcomes (Kusuma, 2020; Miranti et al., 2022). The PBL model is a learning strategy that helps students absorb important information, develop problem-solving skills, create their own learning models, and actively participate in groups (Al-Abdullatif & Gameil, 2021). It also stimulates higher-order thinking in students by orienting them toward real-world problems to understand the relevance of the subject matter to their own lives (Maryati, 2018).

Various classroom action research studies have demonstrated the success of the Problem-Based Learning (PBL) model in improving learning outcomes (Husnidar & Hayati, 2021). Research conclusions indicate that the application of the PBL model can enhance learning outcomes in science subjects (Aris & Hindun, 2021; Gambu, 2022; Sumargiyani et al., 2023). It also improves students' ability to understand concepts and think critically (Rani & Nasrul, 2022; Sopanda et al., 2022). Based on these various research findings, teachers can strive to improve students' learning outcomes by applying the problem-based learning model.

Plant reproduction is one of the topics in the natural science (IPA) subject. The teaching of natural science plays a role in developing a generation capable of thinking critically, creatively, and logically (Fitria, 2017). One of the subtopics in natural science is plant reproduction through vegetative and generative methods. This subtopic includes the competency standard (KD) 3.2, which involves analyzing the reproductive systems in plants and animals and the application of

technology in these systems, and KD 4.2, which involves presenting work on plant reproduction. Plant reproduction is an important topic in science education because understanding this process is fundamental to many other biological concepts. In this subtopic, students' learning outcomes have not been satisfactory, as seen from the pre-test results, where many students scored below the established minimum mastery criterion (KKM) of 75. Based on this issue, an action is needed to improve students' learning outcomes. The objective of this study is to enhance students' learning outcomes by implementing the Problem-Based Learning (PBL) model.

## METHOD

This study uses classroom action research, which is a type of research that describes the cause and effect of an intervention, details what happens when the intervention is given, and explains the entire process from the beginning of the intervention to its impact (Septian & Ramadhanty, 2020). Classroom action research consists of four steps: planning, implementation, observation, and reflection, based on Kurt Lewin's model (Arikunto, 2010).

Data collection was carried out using an observation technique, employing an instrument in the form of an observation sheet based on (Kamala, 2011). The observation sheets were filled out by colleagues and the biology subject teacher to assess the success of the learning activities implementing the PBL model. The PBL model was used to evaluate students' learning outcomes throughout the cycle by administering tests. Subsequently, the assessment of learning outcomes was given to students at the end of each cycle through a set of 10 multiple-choice questions.

The indicator of success in this study is the alignment between the steps of the learning process implemented and the planning in the lesson plan (RPP) using the PBL model. This indicator is used to assess the success level of the classroom action research activities conducted (Kunandar, 2010). In this study, the learning process is considered successful if the percentage of alignment of the stages on the observation sheet is more than 75%. Students are considered to have achieved mastery in learning if their results reach the school's minimum mastery criterion (KKM) of ≥75.

Planning is the stage to determine what the teacher will do and to develop the lesson plan. This planning involves designing the lesson plan (RPP), creating learning media, planning and creating student worksheets, preparing evaluation questions, and observation sheets. Implementation and observation during the implementation stage involve the teacher conducting the teaching process in the classroom. In this stage, the teacher directly teaches in the classroom, explaining the topic of vegetative plant reproduction in cycle 1 and generative plant reproduction in cycle 2. The observation stage involves monitoring the students' behaviors/activities and the teaching process conducted by the teacher. Reflection is the stage of recording observation results, analyzing learning outcomes, and noting any weaknesses in cycle 1 for planning cycle 2.

## RESULT AND DISCUSSION

This classroom action research was conducted in August in class IX-G at SMP Negeri 12 Pontianak. The research results include evaluation scores from cycle 1 and cycle 2. This classroom action research focuses on efforts to improve students' learning outcomes, with the expectation that students' test scores will improve from the previous cycle. Table 1 presents the results of the data analysis of the achievement indicators for competency attainment (Cycle 1).

**Table 1. Percentage of Achievement Indicators for Competency Attainment in Cycle 1**

| Competency achievement indicators | Test items | Percentage | |
|---|---|---|---|
| | | Complete (%) | Incomplete (%) |
| Explain vegetative reproduction in plants | 1, 2, 3 | 73.30 | 26.70 |
| Mention the types of vegetative | 4, 5, 6 | 67.70 | 32.30 |

| Competency achievement indicators | Test items | Percentage | |
|---|---|---|---|
| | | Complete (%) | Incomplete (%) |
| reproduction in plants<br>Identify the parts of the plant involved in the vegetative reproduction process | 7, 8, 9, 10 | 62.50 | 37.50 |
| Mean | | 67.83 | 32.16 |

The findings from the data analysis in Table 2 show that the achievement of student evaluation results in the first indicator has a higher mastery level compared to the other indicators. The average mastery score obtained is still quite low, at 67.83%.

**Table 2. Percentage of Achievement Indicators for Competency Attainment in Cycle 2**

| Competency achievement indicators | Test items | Percentage | |
|---|---|---|---|
| | | Complete (%) | Incomplete (%) |
| Identify the tools of generative reproduction in plants | 1, 2, 3, 4 | 88.00 | 12.00 |
| Explain the process of pollination and fertilization | 5, 6, 7 | 84.40 | 15.60 |
| Identify the various agents of pollination | 8, 9, 10 | 76.60 | 23.40 |
| Mean | | 83.00 | 17.00 |

The data analysis results in Table 2 show that student achievement in learning for the first indicator has a higher mastery percentage compared to the other indicators. Based on Table 1 and Table 2, it can be seen that the average achievement of the competency indicators increased from 67.83% in the first cycle to 83% in the second cycle.

**Table 3. Percentage of Student Learning Outcomes in the Application of the Problem-Based Learning Model on the Subtopic of Plant Reproduction**

| Cycle | Percentage | | Improvement (%) |
|---|---|---|---|
| | Complete (%) | Incomplete (%) | |
| 1 | 60.00 | 40.00 | 26.70 |
| 2 | 86.60 | 13.30 | |

The data analysis presented in Table 3 shows that the application of the Problem-Based Learning model in the context of plant reproduction material can improve student learning outcomes, as evidenced by a 26.7% increase in learning outcomes from cycle 1 to cycle 2.

The implementation of the learning process can determine the learning outcomes achieved by students. Therefore, the execution of all stages in the applied learning model is something that must be carefully considered. The following table, Table 4, presents the percentage of implementation for each learning stage when applying the Problem-Based Learning model.

**Table 4. Implementation of the Problem-Based Learning Model**

| Meeting | PBL stages | Achievement (%) | Mean (%) |
|---|---|---|---|
| Cycle 1 | Problem orientation | 75 | 83.2 |
| | Student organization | 66 | |
| | Guidance for student investigation | 100 | |
| | Presentation of discussion results | 75 | |
| | Analysis and evaluation of problem-solving | 100 | |

| Meeting | PBL stages | Achievement (%) | Mean (%) |
|---|---|---|---|
| | process | | |
| Cycle 2 | Problem orientation | 100 | 93.2 |
| | Student organization | 66 | |
| | Guidance for student investigation | 100 | |
| | Presentation of discussion results | 100 | |
| | Analysis and evaluation of problem-solving process | 100 | |

Based on the Table 4, it is known that there was an increase in the percentage of learning implementation from cycle 1 to cycle 2. The implementation results in the second cycle showed an average value of 100%, indicating that all stages were carried out well, while in the first cycle, the average value was 83.2%, indicating that not all learning stages were executed properly.

The learning process was conducted using the Problem-Based Learning (PBL) model. Problem-Based Learning is a model that can enhance conceptual understanding and critical thinking regarding the material, thus improving student learning outcomes (Dewi & Primayana, 2019; Küçük - Avcı et al., 2024). The learning proceeded with syntax oriented towards problem-solving abilities. The first syntax is problem orientation. In this cycle, material and concepts were briefly introduced, and various concrete problems were presented. The second syntax is the organization of students, involving the division of the class into heterogeneous groups. The third syntax involves guiding and identifying individuals and groups by providing guidance on how to address the given problems. The fourth syntax is developing the presentation of results and acting as a facilitator in planning appropriate work. The fifth syntax is analyzing and evaluating the problem-solving process by giving each group the opportunity to present the results of their discussions (Yuafian & Astuti, 2020).

**Cycle 1**

The first step in conducting this research was to create the planning instruments to be used in the learning activities. These instruments included the lesson plan (RPP) implementing the PBL model, teaching media, student worksheets (LKPD), evaluation test questions, and the learning implementation observation sheets for the observers. Once the instruments were complete, the next stage was to carry out the learning activities in class IX G. The material discussed in cycle 1 was "vegetative reproduction in plants." The observations and reflections from cycle 1 revealed several shortcomings that need to be addressed in the next cycle. These shortcomings include: 1) Class management and conditioning; 2) Guiding students in learning or group discussions; 3) Attending to students' needs.

The learning outcomes of the students in cycle 1 showed a mastery percentage of 60%, with an average score of 72. These scores indicate that the expected learning outcomes have not been achieved. The low learning outcomes may be due to implementation issues, meaning the learning process did not go according to the planned actions (Aris & Hindun, 2021). Therefore, actions need to be taken in cycle 2 to improve the subsequent learning outcomes. The data obtained through observation and reflection on the educational activities during cycle 1 will be used as a basis to enhance the learning implementation in cycle 2.

**Cycle 2**

The first step in the second cycle, just as in the first cycle, is planning the activities. Cycle 2 was designed based on the reflections provided by the observer in cycle 1. This was done to improve the learning process from the previous session for better results. The subtopic discussed during the learning process in cycle 2 was "generative reproduction in plants." After implementing

cycle 2, the observation and reflection data on the learning process carried out by the teacher using the PBL model indicated that the teacher could manage and condition the class optimally. Additionally, the educator provided guidance to students during learning activities and paid attention to the students by approaching them and inquiring about their problems in completing tasks.

The success in achieving the desired indicators in cycle 2 is demonstrated by the observed graduation percentage of 85%. These results indicate that the application of PBL in science learning can improve student learning outcomes (Aris & Hindun, 2021; Gambu, 2022). This outcome impacts the overall class performance, as the percentage of student learning outcomes increased, resulting in the research class achieving classical completeness with a graduation percentage of 85% (Munawarah, 2021).

**Improvement in Student Learning Outcomes**

There was a general improvement in student learning outcomes in cycle 2. This indicates that the use of the Problem-Based Learning (PBL) model can positively impact and enhance student learning outcomes (Husnidar & Hayati, 2021). This improvement occurred due to changes in teaching from the previous cycle to cycle 2. These changes were implemented based on the reflections conducted with the observer from cycle 1. According to the findings in Table 1, the average student score increased from 72 in cycle 1 to 85 in cycle 2. The increase was not only in the number of students scoring above the minimum mastery criteria (KKM). The findings in Table 2 show that there was a 26.7% improvement in learning outcomes, from 60% mastery to 86.6%. These scores indicate that the learning outcomes per class improved, reaching classical mastery. The improvement in learning outcomes in cycle 2 can be attributed to increased teacher and student activity (Azizah, 2019; Gambu, 2022). Based on this, it can be concluded that learning by implementing the Problem-Based Learning model can enhance the learning outcomes of students in class IX G at SMP Negeri 12 Pontianak. These results are consistent with the findings of Harahap et al (2023), demonstrating that PBL can effectively enhance students' critical thinking skills in the context of biology education.

## CONCLUSION

Classroom action research was conducted by applying the Problem-Based Learning (PBL) model in class IX G at SMP Negeri 12 Pontianak, involving 30 students. The average learning outcome score in cycle 1 was 72, which is still below the minimum mastery criterion (<75). In cycle 2, the average learning outcome score increased to 85, indicating that the class, on average, had achieved the minimum mastery criterion (>75), with a graduation percentage of 86.3% and achieving classical completeness (>85%). These results show an improvement in learning outcomes with the application of PBL between cycle 1 and cycle 2. Future research should explore the long-term effects of PBL on student retention and application of knowledge in various subjects

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