Application of Problem Based Learning Model to Student Learning Outcomes Students on Ecosystem Material

Rizky Wahyu Sholikhah, Lina Agustina*

Biology Education Department, Faculty of Teacher Training and Education, Universitas Muhammadiyah Surakarta.
Jl. A. Yani Tromol Pos I, Pabelan, Kartasura, Surakarta 57162, Jawa Tengah, Indonesia
*Corresponding Author. E-mail address: la263@ums.ac.id

ABSTRACT

Problem Based Learning (PBL) model in learning biology helps students in solving a problem, because with PBL students learn from problems or cases that exist around us, this can affect student learning outcomes. This study aims to determine the application of the *Problem Based Learning* model to student learning outcomes on ecosystem material. The research method used was experimental research with *Post-test Only Control Group Design*, the research was conducted in class X of one of the high schools in Pacitan Regency. Data collection techniques in the form of tests conducted at the end of treatment *(post test)* both control class and experimental class. The results showed that the application of the *Problem Based Learning* model on ecosystem material had an effect on learning outcomes where the t test results counted 6.066 > t table 3.218, meaning that there was an average difference learning outcomes in control and experimental classes. It can be concluded that there is an effect of using the *Problem Based Learning (PBL)* learning model on learning outcomes in ecosystem material.

1. INTRODUCTION

There are various challenges faced by teachers in implementing the new curriculum in biology learning such as not having experience with the curriculum, limited references, uneven access to learning and time management (Rahmayumita, 2023). The biology learning process with the new curriculum can help teachers and students in learning biology concepts broadly so that students have the opportunity to learn in depth about important concepts or issues according to the development of their learning stages (Nugraha, 2022).

Effective learning is something that is expected by every teacher and student. In the context of biology lessons, effective learning becomes an important thing considering that biology lessons have many complex and diverse concepts and theories. Therefore, it is necessary to have a learning method that can help students to understand the concepts and theories taught better. One of the learning methods that can improve students' understanding in learning activities is the Problem Based Learning (PBL) model. The PBL method is based on a learner-centered learning approach, where learners are invited to be active in solving problems that are relevant to everyday life (Minasari, 2023).

According to Setiyadi (2019) the Problem Based Learning learning model is a learning model that uses real-world or real-world problems that are structured or ill-structured and open-ended as a context for students to develop problem-solving and critical thinking skills and at the same time build new knowledge (Hosnan, 2014). So it can be concluded that Problem Based Learning (PBL) is an active student learning model that links new information with students' pre-existing cognitive structures (meaningful learning) through learning activities in groups to find solutions to real-world problems to develop problem-solving skills with the help of various learning resources.

The Problem Based Learning model was chosen because this learning model requires students to be active in the investigation and problem solving process in learning (Sumitro, 2017). This is supported by research from Fauzan (2017) which states that the Problem Based Learning learning model can improve student learning outcomes besides that through the Problem based Learning model can improve problem solving skills for students. This method encourages students to play an active role in the learning process through investigation, problem solving, and reflection on their learning experiences. PBL not only emphasizes the achievement of cognitive learning outcomes, but also critical thinking skills, collaboration, and communication skills.

The application of the Problem Based Learning model is expected to be a solution to improve student learning outcomes on ecosystem material. By using PBL, students will be faced with situations that require them to think critically and creatively in finding solutions to problems related to ecosystems. In addition, PBL also encourages students to work together in groups, so as to improve their social and communication skills.

The Problem Based Learning (PBL) learning model has several advantages and disadvantages. The advantages of Problem Based Learning are 1) encouraging students to have the ability to solve problems in the real world, 2) building student knowledge through learning activities, 3) learning material that is in accordance with the problem, 4) scientific activity occurs through group work for students, 5) communication skills will be formed through discussion activities and presentation of work results, 6) through group work students who experience difficulties individually can be overcome, 7) develop problem solving skills, 8) promote critical thinking skills, 9) encourage collaboration and communication, 10) convey knowledge in a real context (Shoimin, 2017).

According to Shoimin (2017) the shortcomings of the Problem Based Learning learning model are: 1) not all learning materials can apply PBL, 2) the teacher must still play an active role in presenting the material (and will have difficulty in large classes), 3) high student diversity in a class will make it difficult to divide tasks based on real problems, while according to Abidin (2014) the shortcomings in problem-based learning models are as follows, 1) students who are accustomed to getting information obtained from the teacher as the main source will feel uncomfortable with learning by themselves in problem solving, 2) if students do not have a sense of belief that the problem being studied is difficult to solve then they will feel reluctant to try to solve the problem, and 3) without students understanding why they should try to solve the problem being studied then they will not learn what they want to learn.

In Surya's research (2019), it is stated that the application of the Problem Based Learning learning model can improve the learning outcomes of high school class X students in the Banda Aceh area. The results showed that hypothesis testing gave the meaning of the t-test at a significant level of 0.05 obtained a t-count price of 2.54 while the t-table value was 1.68 so that the t-count> t-table that the effect of Problem Based Learning on student learning outcomes on the concept of ecosystem systems. The results of hypothesis testing show that the learning outcomes of students taught with the problem-based learning model are better than the learning outcomes using conventional. Reinforced by Apriyani's research (2020), there are differences in student learning outcomes which indicate that the Problem Based Learning learning model is effective. The learning outcomes obtained a pretest score of 78.30 and a posttest score of 82.74, meaning that there was a significant increase. This research aims to determine the application of the Problem Based Learning model to student learning outcomes in ecosystem material.

2. MATERIALS AND METHODS

This type of research includes quantitative research using experimental methods, namely true-experimental research with a posttest-only control design. In the posttest-only control design there is a posttest that is equally given to the control group and the experimental group but only the experimental group receives treatment. This study consists of two research variables, namely

the Problem Based Learning learning model as the independent variable and student learning outcomes as the dependent variable.

This research was conducted at one of the State High Schools in the Pacitan area, Pacitan Regency, East Java. The population in this study were all students of class X and the samples taken in this study were class X-2 and X-3 totaling 34 students using random sampling technique, namely simple random sampling.

Data Collection Techniques are test and observation. The test used in this research was a posttest after PBL learning. The number of posttest questions is 20 with multiple choice questions. Observations were made by observing student discussion activities during classroom learning. The instrument used in making observations is a checklist in the form of a Likert scale in the range of points 1-5.

The data analysis technique used in this research is the T test. The T test is one of the statistical tests to measure the average difference (mean) in two groups of data and how they are related. The criteria of T test:

If the value of t count < t table then H0 is accepted and Ha is rejected, which means there is no difference in the average student learning outcomes between the experimental class and the control class.

If the value of t> t table then H0 is rejected and Ha is accepted, which means there is a difference in the average student learning outcomes between the experimental class and the control class.

3. RESULTS AND DISCUSSION

3.1. Result

This research was conducted at one of the State High Schools in the Pacitan area with 34 students in the even semester of the 2023-2024 school year. This study uses a type of true experimental research with a Post-test Only Control Group Design. The experimental class was given a treat, namely the application of the Problem Based Learning learning model in the biology learning process.

3.1.1. T-Test

The t test results using the Independent Sample t Test test on the SPSS 20 program, show that the posttest data in the experimental class and control class on class X learning outcomes in one of the high schools in Pacitan Regency with the criteria if the value of t count < t table then H0 is accepted and Ha is rejected, which means there is no difference in the average student learning outcomes between the experimental class and the control class. If the value of t> t table then H0 is rejected and Ha is accepted, which means there is a difference in the average student learning outcomes between the experimental class and the control class, as shown in Table 1.

Table 1. T-Test Results Data Using Independent Sample T-Test Learning Outcomes Grade X Senior High School in Pacitan Regency

Learning Outcomes	Class	Uji Independent Sample t-Test			
		Mean	df	t-value	t-tabel
Post test	Eksperimen	76,21	66	6,066	3,218
Post test	Kontrol	57,65	65,726	6,066	3,218
Conclusion					**Ho rejected**

Thus the calculated t value of 6.066> t table 3.218, then based on the basis of decision making through the comparison of the calculated t value with t table, it can be concluded that H0 is rejected and Ha is accepted, which means that there is a difference in the average student learning outcomes between the experimental class and the control class or in other words the application of conventional learning methods with PBL learning methods will produce different learning outcomes.

3.1.2. Observation Data of student's activities during learning

The results of descriptive statistical analysis of the results of observations of student activities during learning, with average percentage criteria of 86% - 100% = excellent, 76% - 85% = good, 66% - 75% = sufficient, 56% - 65% = less, 30% - 55% = significantly less. It can be seen in Table 2:

Table 2. Student Activity Observation Data during Learning

Kelas	Meeting	Percentage (%)	Average
Experiment	I	89.7%	89,9 %
	II	90.2%	
Control	I	87,2%	87,7 %
	II	88,2%	
	Category		**Very Good**

Based on Table 2, shows that the average acquisition of descriptive statistical analysis is 89.9% and 87,7%, so effective learning outcomes are categorized as very good.

3.2. Discussion

The Problem Based Learning model was implemented in one of the high schools in Pacitan Regency. This research aims to determine the application of the Problem Based Learning model to student learning outcomes in ecosystem material. The implementation of the Problem Based Learning model was carried out for four meetings, where the two class samples that had been selected for the implementation of the research were given different treatments. Before the ecosystem learning activities in everyday life, students were given an initial test first. The initial test was used to find out how far the students' knowledge in understanding the biology lessons they will learn next.

Based on the descriptive analysis of student activity statistics during PBL learning, the results obtained were in the very good category, namely 89.6%. Assessment of student activity during PBL learning by observing student behavior during group learning discussions in class and through LKPD media. The results of teacher observations of student activities are written on the observation sheet that the teacher has prepared before learning according to the rubric. Discussion activities carried out by students during group learning are very good because students have learned the material and activities that will be carried out in class through the LKPD media. So that students already know what will be discussed and what must be prepared for group learning in class.

The following is a data display from the results of a descriptive analysis of student activity statistics during Problem Based learning:
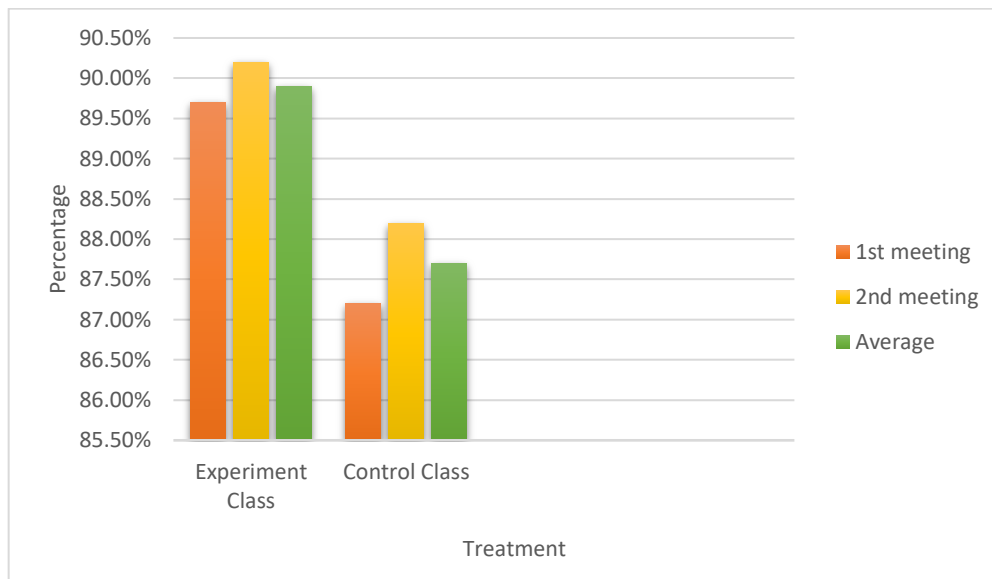
Figure 1. Chart of Descriptive Analysis Results of Student Activity During Learning Problem Based Learning at one of the senior high schools in Pacitan Regency

The lowest results were found at the first meeting in the control class rather than the experimental class, because in the control class the learning process was still using a conventional learning model and had not been applied to the learning model using PBL. The Problem Based Learning model has a positive influence on student knowledge scores. Learning in experimental classes uses a problem-based learning model where learning is not only centered on the teacher. Students are divided into 4-5 groups in one class, students are given problems that exist in the ecosystem material that has previously been explained, and video learning media is shown in the form of problems in the surrounding environment first.

The results of the t test with the Independent Sample T-test test using SPSS 20 show that the posttest data in the experimental class and control class on class X learning outcomes in one of the high schools in Pacitan Regency has a t value of 6.066 > t table 3.218, so based on the basis of decision making through the comparison of the t value with the t table, it can be concluded that H0 is rejected and Ha is accepted.

The success of student learning is evident when a t-test or hypothesis calculation is carried out to see if there is a significant difference between the learning outcomes of experimental class students and the learning outcomes of control class students. From the t-test conducted based on data from the average student scores of the two classes, the learning outcomes of the control class students were obtained. From the t-test conducted based on data from the average student scores of the two classes, the t value is 6.066 and the t table is 3.218. Because t value (6.066) > t table (3.218), then Ha is accepted and proves that there is indeed a significant difference between the learning outcomes of experimental class students and the learning outcomes of control class students.

The application of the Problem Based Learning learning model has better learning results in experimental class students than in control class students who apply conventional methods, because in the experimental class students are given learning to solve problems independently and in groups so that students can solve ideas and find their opinions, and learning activities become more active in involving students. Of course this also affects students' enthusiasm for learning to achieve success in learning.

Based on the research that has been conducted, the effect of the learning process using the problem-based learning model can make students remember more about the material taught for a longer period of time, this is because students are more actively involved in understanding the material in the learning process using the problem-based learning model. This causes students to

not easily forget the material taught. Because this learning process can significantly improve student learning outcomes (Surya, 2019).

The problem-based learning model of learning in the form of group work within a problem-solving framework has been able to show excellent results. This can be due to the process of constructing knowledge together, replacing the lecture learning process where the knowledge process is carried out individually according to what the students capture individually. Constructing knowledge together through group work allows students to express ideas, opinions of others and jointly build understanding. Smith (2009) argues that problem-based learning provides benefits for students, one of which is in terms of increasing understanding so that it is easier to remember, this can indirectly improve student learning outcomes (Kristianus, 2020).

Surya's research (2019), among others, on the application of the Problem Based Learning learning model can improve the learning outcomes of class X students in the Banda Aceh area with the value obtained the tcount price of 2.54 while the ttable value is 1.68 so that the tcount> ttable so that the alternative hypothesis (ha) which reads allegedly there is an effect of the application of problem-based learning (PBL) strategies is very significant on student learning outcomes on ecosystem material, can be accepted properly. Kristianus' research (2020), concluded that there is a difference in the average value of student learning outcomes in ecosystem lessons in everyday life between groups of students who apply the Problem Based Learning model and those who apply Conventional methods. The results obtained in the initial test carried out before the core activities of implementing the research obtained the average value of the initial test of the experimental class of 67.14 and the average value of the initial test of the control class of 63, meaning that there was a significant increase. Both of these studies are in line with the results of this study which concluded that the application of PBL learning is effective.

4. CONCLUSIONS

Based on the research results, it can be concluded that the application of the Problem Based Learning model influences student learning outcomes in ecosystem material..

5. REFERENCES

Abidin, Yunus. (2014). Desain Sistem Pembelajaran Dalam Konteks Kurikulum 2013. Bandung: PT Refika Aditama.

Alfath, J. (2023). Peningkatan Motivasi Belajar Peserta Didik Melalui Problem Based Learning Pata Mata Pelajaran Biologi Kelas X SMAN 1 Ketungau Hulu. SECONDARY : Jurnal Inovasi Pendidikan Menengah. 3(1). 47-53.

Arikunto, S. (2019). Prosedur penelitian suatu pendekatan praktik.

Hosnan, M. (2014). Pendekatan Saintifik dan Kontekstual dalam Pembelajaran Abad 21. Ghalia Indonesia.

Darmawan, E. (2021). Pengaruh Pembelajaran Project Based Learning (Pbl) Pada Materi Ekosistem Terhadap Sikap Dan Hasil Belajar Siswa Sman 2 Malang. LENSA (Lentera Sains): Jurnal Pendidikan IPA. 2(1). 47-54.

Fauzan, M., Gani, A., dan Syukri, M. (2017). Penerapan Model Problem Based Learning Pada Pembelajaran Materi Sistem Tata Surya Untuk Meningkatkan Hasil Belajar Siswa. Jurnal Pendidikan Sains Indonesia (Indonesian Journal of Science Education), 5(1), 27–35.

Fembriani, Polin, R., dan Benu, A. B. (2022). Pengaruh Model Problem Based Learningterhadap Hasil Belajar IPA tentang Ekosistem. Journal of Character and Elementary Education. 1(1). 1-11.

Jayadiningrat, M. G., dan Ati, E. K. (2018). Peningkatan Keterampilan Memecahkan Masalah Melalui Model Pembelajaran Problem Based Learning (PBL) Pada Mata Pelajaran Kimia. Jurnal Pendidikan Kimia Indonesia, 2(1), 1.

Kristianus, F., Margiati, K. Y., dan Sugiarto, A. (2020). Pengaruh Penerapan PBL Terhadap Hasil Belajar Siswa Kelas X IPS SMAN 1 Sungai Raya. Jurnal Pendidikan dan Pembelajaran Khatulistiwa (JPPK). 8(1). 1-11.

Lestari, P., Wardani, S., dan Khusniati, M. (2019). Model Problem Based Learning Berbantuan Jurnal Belajar Terhadap Kemampuan Metakognitif Siswa. Jipva (Jurnal Pendidikan Ipa Veteran). 3(1). 38-51.

Maharani, S., Ardi, Helendra, dan Rahmatika, H. (2024). Pengaruh Model Problem Based Learning (Pbl) Terhadap Hasil Belajar Peserta Didik Pada Materi Ekosistem Fase E SMAN 12 Padang. Jurnal Lingkar Pembelajaran Inovatif. 5(5). 226-233.

Minasari, U., dan Susanti, R. (2023). Penerapan Model Problem Based Leaning Berbasis Berdiferensiasi berdasarakan Gaya Belajar Peserta Didik pada Pelajaran Biologi. Ideguru : Jurnal Karya Ilmiah Guru. 8(2). 282-287.

Nugraha, T. S. (2022). Kurikulum Merdeka untuk Pemulihan Krisis Pembelajaran Tono Supriatna Nugraha. Jurnal UPI . 19(2): 251–262.

Setiyadi, M. W. (2019). Penerapan Model Pembelajaran Problem Based Learning untuk Meningkatkan Motivasi dan Hasil Belajar Biologi Siswa. Justek : Jurnal Sains Dan Teknologi. 2(1), 22-28.

Shafira, I., Rahayu, F. F., Rahman, F. R., et. all. (2023). Penerapan Model Problem Based Learning Berbasis Berdiferensiasi berdasarkan Gaya Belajar Peserta didik pada Pelajaran Biologi Materi Ekosistem Kelas X SMA. Journal on Education. 6(1). 48-53.

Shoimin, A. (2017). *68 Model Pembelajaran Inovatif dalam Kurikulum 2013*. Yogyakarta: Ar Ruzz Media.

Sumitro, A. H., Setyosari, P., dan Sumarmi. (2017). Penerapan Model Problem Based Learning meningkatkan Motivasi dan Hasil Belajar IPS. *Jurnal Pendidikan:Teori, Penelitian, Dan Pengembangan*, 2(9), 1188–1195.

Surya, E., dan Noviyanti, A. (2019). Pengaruh Penerapan Problem Based Learning (Pbl) Pada Materi Ekosistem Untuk Meningkatkan Hasil Belajar Siswa SMA Negeri 11 Banda Aceh. *Seminar Nasional II USM 2019*. 1(1). 199-208.

Yuafian, R., dan Astuti, S. (2020). Meningkatkan Hasil Belajar Siswa Menggunakan Model Pembelajaran *Problem Based Learning (PBL)*. *Jurnal Riset Pendidikan Dasar*. 3(1). 17-24.