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Problem Based Learning Model Assisted by Nearpod and Its Effect on Learning Outcomes of Environmental Changes

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ABSTRACT

The learning process in today's era expects students to be active in the learning proces, In addition, a common problem encountered is the minimal cognitive learning outcomes in biology. Contributing factors include limited learning facilities, teachers' inability to deliver material systematically, and a lack of effective communication, which leads to a decline in students' cognitive engagement. This study aims to determine the effect of the Problem Based Learning model assisted by Nearpod on learning outcomes related to environmental change material. The research method is Quasi-Experimental, with a Non-equivalent Control Group design involving two classes. Data analysis was performed using ANCOVA. The results of the study indicate that the Problem Based Learning model supported by Nearpod has a significant effect on the learning achievement of Environmental Changes (Sig. 0.042 < 0.05). The results of this study indicate that there is an effect of the Nearpod-assisted Problem Based Learning model on the subject of environmental change.

INTRODUCTION

The learning process in today's era expects students to be active in the learning process. Learners are asked to act as subjects of their lessons and to develop their own interests and potentials. In addition, a common problem encountered is the minimal cognitive learning outcomes in biology. Contributing factors include limited learning facilities, teachers' inability to deliver material systematically, and a lack of effective communication, which leads to a decline in students' cognitive engagement. Research from (Hatru, 2024) shows that there are children who do not yet have an interest in engaging in learning and have difficulty understanding due to the teacher's explanation that is not interesting to the students.

Case studies of biology learning activities at State High School 10 Palembang show that although the PBL model is used in discussion methods, only a few students truly participate in the discussions. This can lead to participatory imbalances and influence students' thinking processes in addressing issues. Research results also indicate that components contributing to the low learning outcomes in biology education are the lack of students' desire to study biology, insufficient concentration on concepts, and learning activities being more teacher-centered (Mulyono et al., 2018).

To address this issue, 21st-century learning processes must apply diverse learning models that align with the subject matter. One solution is the PBL model. The PBL model has many advantages in learning activities because it guides them to engage in problem-solving through group discussions. The application of the PBL model supports students in demonstrating problem-solving skills, understanding what they know better, and increasing participation in learning (Saputri, 2020). In line with the research (Lutfiah et al., 2021) that there is an influence from the implementation of the Problem Based Learning model. In addition, several of the students' activities during learning have also increased, such as group discussions and expressing opinions. To make learning more

interesting and varied, it can be integrated with the use of various interactive learning media. Furthermore, research (Asiyah et al., 2021) shows that there is an influence of the PBL model on the improvement of students' cognitive learning outcomes at State High School 10 in Bengkulu City. The use of the PBL model in the experimental class significantly influences the improvement of students' cognitive learning outcomes.

Therefore, the PBL model must be supported by interactive media. The media applied is Nearpod, a web-based platform focused on audiovisual content. Nearpod is an interactive web-based learning media with many interesting features that support learning (Yeni Widiawati et al., 2022). In addition, discussion and collaboration features make the learning process more interactive and communicative because they allow learners to discuss, share ideas, and answer questions freely. Interactive elements include quizzes, multiple-choice questions, open-ended questions, and text boxes that can be applied to see if learners are truly engaging with the material. Moreover, Nearpod is very flexible as it can be used for free, without being tied to time or place. Research results also show that Nearpod can create learning presentations that engage learners in interactive learning. For example, it has an interactive presentation feature that combines text, images, videos, and audio to make the learning material more interesting (Ratna Fauziah & Astutik, 2024).

Nearpod is a media that can be used on mobile phones and other technological devices that are accessed via the internet to help students see and understand learning concepts (Nurhamidah, 2021). Nearpod provides an interactive learning space for teachers and students equipped with interesting features as a support for innovative, effective, and efficient learning (Nurmasita et al., 2022). The Nearpod media can be operated on both smartphones and laptops, and can be used either by downloading the application or using the website by entering the learning code shared by the teacher, allowing students to directly access the media, thus facilitating students in operating and accessing the media (Ningsih et al., 2023) and can be used either together or independently (Wahyudi et al., 2022).

Media-assisted PBL using Nearpod combines interactive technology with PBL learning to create a more engaging, involved, and effective learning atmosphere. PBL can be used in both synchronous and asynchronous learning modes, and it can help teachers guide students' learning activities in real-time to enhance skills. In accordance with the statement (Mustikarani et al., 2025) The Nearpod media enables more interactive and in depth Problem Based Learning and to determine the effect of the Problem Based Learning model assisted by Nearpod on learning outcomes related to environmental change material The PBL model requires students to analyze, evaluate, and make decisions about complex phenomena such as environmental change materials, which include aspects of causes and efforts of environmental pollution. Nearpod is used as an interactive medium and participates in learning activities that can enhance learning outcomes.

MATERIALS AND METHODS

1. Research Time and Place

The research was conducted in March 18-21 of the even semester of the 2025 at State High School 10 Palembang, South Sumatra.

2. Research Methodology

A quasi-experimental method with a Non-Equivalent Control Group Design was applied to the research subjects consisting of two classes, namely the control class and the experimental class. In the experimental class, the Problem Based Learning model assisted by Nearpod was used, while the control class used the Problem Based Learning model.

3. Population and Sample

The research population is all the students of State High School 10 Palembang. The research sample consists of 2 classes, namely students from class X.6 (n=23) as the experimental class, and class X.8 (n=24) as the control class. The experimental class applied the PBL model supported by Nearpod.

4. Research Procedure

The stages in this research include planning stages, implementation stages, and final stages. The Planning Stage consists of designing learning devices, Nearpod media, and Learning Devices consisting of teaching modules, worksheets, pretest and post-test questions, as well as critical thinking skill questions. Several activities are carried out by applying PBL and PBL supported by the Nearpod application in table 1.

Table 1. Stage of Implementation

No.	Control Class	Experiment Class
1	The researcher presents the problems obtained from a reading.	Researchers using learning videos presented by teachers on the Nearpod application.
2	Researchers organize students to work together and divide tasks in searching for new information and tools to solve problems.	Researchers organize students to work collaboratively and divide tasks in finding new information and tools to solve problems in the LKPD on Nearpod using the Open-Ended Question feature.
3	Researchers guide students to find accurate sources, complete experiments, and discover the correct solutions.	Researchers guide students to find accurate sources, complete experiments, and discover the correct solutions.
4	The researcher guides the students in preparing the discussion results.	Researchers guide students in preparing appropriate works using the discussion feature on Nearpod.
5	The researchers conduct evaluations and review the material that has been learned by presenting PowerPoint slides.	The researchers evaluated the process that had been learned and reviewed the lessons by displaying presentations and conducting a post-test at the end of the learning using the Nearpod application on the time to climb feature.

At the final stage, the researchers analyze the data from the tests. Furthermore, the test results of the students will be analyzed using the scoring guidelines of the assessment.

5. Data Collection Techniques

The data collection technique required is to gather information such as questions and documentation. The type of data used is quantitative data. The data consists of pretest and posttest results after learning. The data instrument used is a multiple-choice test to measure the cognitive abilities of students. Nearpod learning can be accessed at the following link : https://np1.nearpod.com/sharePresentation.php?code=d224d2575888d347cea3e593d9827569-1&oc=user-created&utm_source=link

6. Data Analysis

The data analysis technique applied is normality test using the Shapiro-Wilk test based on that is, if the significant value (sig) > 0.05, then the data is normally distributed; if the significant value (sig) < 0.05, then the data is not normally distributed. Next, identify whether the variances of the two samples are homogeneous.. The test used is the Levene test. (Nasar et al., 2024) based on the decision-making criteria that if the significance value (sig) > 0.05, then the data has homogeneous variance. If the significance value (sig) < 0.05, then the data does not have homogeneous variance. Furthermore, for hypothesis testing, an ANCOVA test is used.

RESULTS AND DISCUSSION

The implementation of learning on the first day using PBL supported by Nearpod, after conducting a pretest and answering it using the Time To Climb feature, allows the researcher to help recognize and understand the problems presented interactively through the features of Nearpod, such as the Presentation feature. With the help of Nearpod media, students can improve their skills in gathering initial information and enhance their ability to collaborate critically. Therefore, students will be engaged in learning activities. In line with the research (Puspitaningsih

et al., 2023), the learning process using Nearpod in the problem orientation syntax through video presentations of environmental issues and the organization syntax for students to be enthusiastic about answering questions from the teacher when asked for their opinions based on the information they obtained regarding the issues presented on Nearpod.

The implementation of learning on the second day involved students applying Project-Based Learning (PBL) supported by Nearpod, which focused on the exploration process and solution development, where they participated in groups to discuss and create solutions or answers based on information they had previously acquired. Nearpod supported this process by providing interactive presentation media and allowing students to answer questions on the LKPD through the Open-Ended Question feature. Subsequently, students conducted a post-test and answered using the Time To Climb feature. LKPD helps students understand concepts independently at a faster pace (Putra et al., 2022). Evaluation allows for feedback to be provided to students and educators (Isnaini et al., 2021).

The results of this test include normality test, homogeneity test, and hypothesis test which will examine whether the learning outcomes have a significant effect on the PBL model supported by Nearpod. The results of the normality test are presented in table 2.

Table 2. Test of Data Normality

Shapiro-Wilk Class		***Statistic***	***df***	***Sig.***
Result	Control Class Pretest	.942	23	.202
	Experiment Class Pretest	.945	24	.210
	Control Class Posttest	.932	23	.123
	Experiment Class Posttest	.945	24	.212

In this study, the Shapiro-Wilk test is used with a significance level of 0.05. If the value is >0.05, then the data is normally distributed. Whereas if the value is <0.05, then the data is not normally distributed (Sugiyono, 2008). Based on Table 2 in the experimental class and the control class, both at the pretest stage to the post-test stage have normality assumptions, which means the data is normally distributed, shows the pretest values for the control class Sig. 0.202 > 0.05, pretest for the experimental class Sig. 0.210 > 0.05, posttest for the control class Sig. 0.123 > 0.05, and posttest for the experimental class Sig. 0.212 > 0.05. This shows that data with a normal distribution has strong validity and does not have significant bias or skewness, making its distribution balanced and representative. This is in line with research (Zulfa Firstya Noor & Subuh Anggoro, 2024) In addition, the results of the normality test using Shapiro-Wilk showed that the pretest and posttest data have a normal distribution with correlation values of 0.527 and 0.548 indicating that the data follows a normal distribution pattern.

Table 3. Test of Data Homogeneity

		Levence Statistic	***df1***	***df2***	***Sig.***
Result	Based on Mean	1.021	1	45	.132
	Based on Median	.579	1	45	.223

The homogeneity test is used to determine the uniformity of the sample variance originating from the same population. The homogeneity test on data is conducted using SPSS. In table 3, a Sig. value of 0.132 > 0.05 indicates that the data has homogeneous variance. This is supported by research (Puspitasari, 2024) the results of the pretest homogeneity test showed a significance value of 0.116 > 0.05, while the posttest homogeneity test showed a significance value of 0.664 > 0.05, it can be concluded that the control class and the experimental class samples have the same or homogeneous variance.

Table 4. ANCOVA Test

Source	*Type III Sum of Squares*	*df*	*Mean Square*	*Sig.*
Class	148.133	1	148.133	.042

This study uses ANCOVA testing to compare the experimental class and the control class. ANCOVA is used to control the initial variable (pretest) so that the analysis of the influence of the PBL model becomes more valid and accurate. The results of the ANCOVA test usually include the F value and significance (p-value). If the significance value is < 0.05, it can be concluded that there is a significant effect of the learning model on learning outcomes after controlling for covariate variables. In Table 4 shows a Sig. value of 0.042 < 0.05 indicating a significant effect of applying Nearpod-assisted PBL on learning outcomes. According to the statement (Mustikarani et al., 2025) that PBL using Nearpod shows a difference between the experimental class and the control class; which proves that the control class score was lower and the hypothesis test results had a Sig. value of 0.037 < 0.05. Other findings also indicate that the Problem Based Learning strategy assisted by Nearpod media impacts cognitive learning outcomes, with the hypothesis test results showing a Sig. value of 0.000 < 0.05 (Cahyani et al., 2024)

Therefore, the learning activities by applying PBL supported by Nearpod on learning outcomes and student engagement have significantly increased through several aspects. The main aspects of Nearpod include several interactive features that can enhance student engagement. First, Nearpod provides interactive quizzes such as the Time To Climb feature and Open-Ended Questions that support problem-solving skills and optimize cognitive learning outcomes. These features can make them more focused and understand concepts in a more engaging way (SARAGI et al., 2025) . Second, Nearpod presents multimedia learning materials such as slideshows that facilitate the understanding of complex concepts. Third, the use of Nearpod presents materials with interesting and easily accessible interactive features, reducing boredom and directly enhancing student focus (Sholikhah et al., 2025) . This also supports the quality of education and positively impacts the cognitive outcomes of students. This is in line with the opinion (Hidayat & Effendi, 2024) that the application of Nearpod triggers student excitement, as the use of Nearpod is a new and first-time experience for them. There are no obstacles in allocating time for learning. Students are also enthusiastic in their learning with activities such as moving or scrolling their devices, flipping through books, and discussing.These features can make students more focused and understand concepts in a more engaging way.

Therefore, the learning process by applying PBL supported by Nearpod can significantly improve learning outcomes on environmental change material. This is evidenced by the implementation of the PBL model supported by Nearpod, which includes several interactive features that enhance student engagement. Nearpod has become an interactive learning media with interesting features and is accessible for free, thereby easing the workload of teachers when building interactive learning (Dewi, 2021). Nearpod also allows students to learn independently and enhance their curiosity about the material. Additionally, teachers can utilize its features to improve their teaching skills by leveraging technology. This media has been proven to increase student motivation, engagement, and understanding (Mutiara, Dwi Aninditya Siregar, 2021)

CONCLUSION

Learning activities using PBL supported by Nearpod have significantly improved student learning outcomes and engagement based on hypothesis testing through ANCOVA, which obtained a significance value of 0.042 < 0.05. This is evidenced by the implementation of the PBL model supported by Nearpod, which includes several interactive features that enhance student engagement. The learning activities by applying PBL supported by Nearpod on learning outcomes and student engagement have significantly increased through several aspects. First, Nearpod provides

interactive quizzes that support problem-solving skills and optimize cognitive learning outcomes. These features can make them more focused and understand concepts in a more engaging way. Second, Nearpod presents multimedia learning materials such as slideshows that facilitate the understanding of complex concepts. Third, the use of Nearpod presents materials with interesting and easily accessible interactive features, reducing boredom and directly enhancing student focus.

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