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Problem-Based Learning Model with Zoom Breakout Rooms Application: Its Impact on Students' Scientific Literacy

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Abstract

This study aims to determine whether there is an effect of the PBL model assisted by the Zoom Breakout Rooms application on the scientific literacy abilities of the students in Grade X SMA Qur'an Darul Fattah Bandar Lampung on environmental change material. The design used in this study was a quasi-experimental design with a Pretest-Postest Non-equivalent (The Non-equivalent Control Group Design). The population of this study was all students of class X SMA Qur'an Darul Fattah Bandar Lampung for the academic year 2020/2021 with a sample of 24 students selected using cluster random sampling technique, namely class X IPA A and X IPA B. The instrument used in this study is test and questionnaires. The data in this study are quantitative data obtained from the average pretest, posttest, and N-gain scores which are then analyzed statistically using an independent sample t-test at a significance level of 5% through the SPSS 26.0. The results showed the average N-gain class (55,71 ± 22,51) in the medium category and the control class (19,50 ± 16,90) in the low category. Then, the questionnaire data on student responses to Zoom Breakout Rooms and the learning implementation observation sheet were analyzed descriptively. The results showed that there was an effect of the PBL model assisted by Zoom Breakout Rooms on students' scientific literacy skills on environmental change material.

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INTRODUCTION

The results of the PISA survey in 2015 showed that Indonesian students were still below the OECD country's average science score. The average science score for the OECD country's scientific literacy domain is 493, while Indonesia has only achieved a score of 403. This shows that there is a gap in treating science education (OECD, 2015). Many factors cause the low scientific literacy in Indonesia, namely gender, economic and social, and immigration. In addition, Anggraini (2014) states that the causes of students' scientific literacy are students are not accustomed to working on questions that use discourse, the learning process is also less supportive of students in developing scientific literacy, and students' learning habits in learning tend to emphasize aspects of understanding based on memory or rote. In addition, scientific literacy applied to students may be influenced by the increasing importance of digital technology (Leu., et al, 2004) and increase students' use of interactive media (Beschorner & Hutchison, 2013).

The covid-19 pandemic has forced schools to conduct distance learning. This forces educators to be able to take advantage of online learning media (Jaelani., et al, 2020). Based on the results of an interview with one of the biology teachers at SMA Qur'an Darrul Fattah Bandar Lampung, Friday, December 18, 2020, the same situation also occurred at the school. However, during the online

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learning process, there are still many students who do not follow the learning process well. During online learning, educators use the WhatsApp and Google Classroom applications. Educators will send material to provide opportunities for students to ask questions, then open a discussion room. However, students are less active during learning. Only a few students asked about the material, while most other students only read and appeared in groups to carry out attendance only.

Biology learning at the school is more teacher-centered. Teachers play more of a role in the learning process. The lack of educator strategies to teach using interesting media and learning models causes a lack of opportunities for students to be active in learning biology. Students also feel bored and bored in learning. The lack of active role of students in learning also causes skills and applications in the field of biology in students' daily lives to be less than optimal so that it has an impact on students' scientific literacy.

Realizing the importance of students' scientific literacy today, it is necessary to have a model that can provide a learning atmosphere that encourages the improvement of students' scientific literacy skills through problem-solving processes in everyday life (Aulia., et al, 2021; Kimiyanti & Prasetyo, 2019). The learning model that is expected to meet these criteria is the PBL model (Bybee, 2009). The PBL model emphasizes the many problems that require authentic investigation that require real solutions to real problems (Al-Tabany, 2014). The PBL model has a method that focuses on problem identification and can develop analytical frameworks and solutions, this method is done by forming small groups, lots of cooperation and interaction and can discuss things that are not understood as well as various roles to carry out tasks and report to each other. That way students are more active in participating in each lesson (Nelfiyanti & Sunardi, 2017).

The Ministry of Education and Culture issued circular No. 4 of 2020 contains the implementation of education policies in the emergency period of the spread of COVID-19. One of the circulars mandates learning from home with online learning activities. This condition requires educators to use applications in the learning process. Applications that support the learning process with the PBL model are Zoom meetings. Zoom Breakout Rooms have (host) or hosts to divide the meeting into smaller rooms and place participants in each room. Students are in separate virtual rooms and join their respective groups so that there is no overlap (Nelfiyanti & Sunardi, 2017). The host can also jump from one session to another easily, with this application the host can supervise students in group work, then students can work together and interact with their group friends. Based on research conducted by Sari (2020) the PBL model with Zoom Breakout Rooms can increase student activity and ability to solve problems both individually and in groups. With the PBL model assisted by Zoom Breakout Rooms, students will better understand the material on environmental change because students will be faced with the problems from environmental change data and can find solutions to these problems to improve students' scientific literacy ability.

Research on the application of PBL using zoom meetings has been carried out by several previous researchers. Samung (2021) conducted research on the application of PB: based on e-learning using zoom meetings, but his research focused on seeing how it affects critical thinking variables in terms of learning motivation. In addition, Allwatie (2021) also conducted the same research, namely the application of the PBL model using Zoom Meetings to measure students' critical thinking skills with the subject being studied, namely in fifth-grade Elementary School students. Based on previous research, there has been no research on the application of PBL using Zoom Meeting to measure how it affects students' scientific literacy skills at the High School level, especially for the environmental change material.

Based on this description, the researcher is interested in conducting research on the application of the PBL learning model using Zoom Breakout Rooms and seeing its effect on students' scientific literacy skills, which is formulated with the research title "the effect of Problem Based Learning (PBL) model assisted by the Zoom Breakout Rooms application on scientific literacy.

METHOD

The research design used in this study was a quasi-experimental design. The research design is a non-equivalent pretest-posttest control group design. The population used in this study were all students of class X science at SMA Qur'an Darul Fattah Bandar Lampung for the academic year

2020/2021 totaling 96 students. In this study the group that was set the sample was class X IPA B totaling 24 students as the control class and X IPA A totaling 24 students as the experimental class, so the total sample size was 58 students. Class X IPA A and X IPA B as research samples because they have a relatively high heterogeneity level and have an equal number of experimental and control classes. So, this research chooses the purposive sampling technique.

The procedure for this research was carried out in three stages, which are presented in Figure 1,

Figure 1. Research Syntax

In the pre-research stage, the researcher conducts a preliminary study (observation) in the school that will be used for research, the research prepares learning tools, such as syllabus, lesson plan, and worksheet, makes research instruments in the form of test questions, then tests the test instrument. In the implementation phase, the researcher collected quantitative data obtained from the pretest and posttest scores. Learning activities are carried out using the PBL model, but in the experimental class with the help of Zoom Breakout Rooms and the control class with help of WhatsApp. At the end of the experimental class meeting, a questionnaire was given to students' responses to zoom Breakout Rooms. The completion stage, in which the researcher response to zoom-Breakout Rooms. The completion stage, in which the researcher processes all the data obtained during the research. The test carried out in this study were the N-gain test and data analysis using SPSS 26.0

RESULTS

Research that has been conducted on the influence of the PBL model assisted by the Zoom Breakout Rooms application on the scientific literacy of class X SMA Qur'an Darrul Fattah Bandar Lampung on environmental change material, the results obtained in the form of qualitative and quantitative data are as follows.

Scientific Literacy Ability

Data analysis in this study was carried out using statistical analysis software, namely SPSS 26.0. the results of the pretest posttest calculation in the experimental class and control class can be seen in the following table 1,

Table 1. Results of Pretest, Posttest Data Processing

Score	Class	$\bar{x}$ ± Sd
Pretest	Experiment	46,54 ± 10,887
	Control	33,08 ± 6,587
Postest	Experiment	77,41 ± 10,455
	Control	46,54 ± 10,426

Based on Table1, learning outcomes when viewed from the average value, the experimental class has a higher average value, the experimental class has a higher average value than the control class. Furthermore, the pretest-posttest values will be transformed in the form of N-gain. The following are the results of the N-gain statistical test in Table 2,

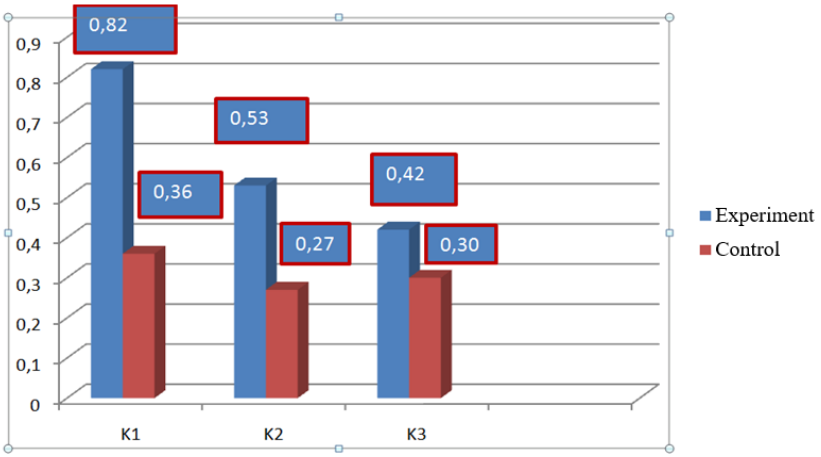
Table 2. N-gain Data Processing Results

Class	$\bar{x}$ ± Sd	Normality	Homogeneous	Independent T-test
Experiment	55,71 ± 22,51	Sig. 0,17 > 0,05 Sig. 0,35 > 0,05	Sig. 0,953 > 0,05	0,000<0,05
Control	19,50 ± 16,90			

Based on table 2, the data obtained that Sig. (2- tailed) 0,000 < 0,05 H_0 is accepted and H_1 is rejected. The results can be seen that there is a significant increase based on the results of the pretest and posttest scores from the experimental class and control class, meaning that the use of the PBL model assisted by the Zoom Breakout Rooms application has an impact on scientific literacy skills of the learners. The results of the calculation of N-gain in the experimental class, which is 55,71 are included in the medium N-gain criteria, while in the control class the N-gain value is 19,50 including the low N-gain criteria. So that the results of the N-gain calculation in the experimental class are higher than in the control class.

Distribution of Scientific Literacy Indicator Questions

The average value of N-gain based on aspects of scientific literacy in the experimental class and control class can be seen in Figure 2,



Note: K1: Identify scientific questions; K2: Explaining scientific phenomena; K3: Using scientific evidence

Figure 2. Average N-gain Indicator on Aspect of Science Literacy Competence

Based on Figure 2, the results of the average N-gain indicator in the aspect of scientific literacy competence in the experimental class with an average of 0.59 (Good) and for the control class an average of 0.31 (Less). From these data, it is evident that the average N-gain of scientific literacy abilities in the aspect of competence in the experimental class is higher than the control class.

Cognitive Aspect

Based on the questions spread in the scientific literacy indicators, there are cognitive aspects as shown in Figure 3,

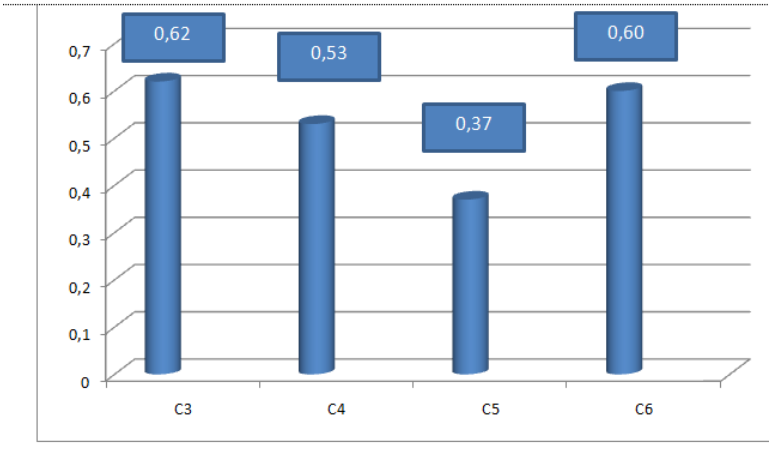


Figure 3. Average Value of Cognitive Aspects

Based on the cognitive aspect table above, the C3 aspect (understanding) has a value of 0,62. In the aspect of C4 (analyzing) it has a value of 0,52. Furthermore, the aspect of C5 (evaluating) has a value of 0,37. And the last on the aspect of C6 (creating) has a value of 0,60.

Student Response Questionnaire

The student response questionnaire obtained data with 24 respondents; this questionnaire was only given to the experimental class at the end of the environmental change material meeting. Analysis of the questionnaire data on student responses to the application used during the learning process was carried out to determine the success of using the Zoom Breakout Rooms application in learning, especially environmental change material. Following are the results of the student responses in table 3,

Table 3. Students Response Questionnaire

No	Indicator	Experimental Class	
		%	Interpretation
1	Show interest in learning biology by using Zoom Breakout Rooms	95	Very Good
2	Demonstrate active participation in biology lessons using Zoom Breakout Rooms	95	Very Good
3	Demonstrate the ability to participate in biology lessons using Breakout Rooms	94	Very Good
4	Demonstrate the benefits of taking biology lessons using Zoom Breakout Rooms	96	Very Good
	Average	95	Very Good

Based on the results of the analysis of student questionnaire data on the use of the Zoom Breakout Rooms application, from the 4 indicators of the questionnaire responses, the students received a very good criterion response, namely the percentage of 95%, indicating that the use of the Zoom Breakout Rooms application can be well received by students.

Learning Implementation

Implementation of learning by applying the PBL model assisted by the Zoom Breakout Rooms application. Observation activities were carried out by the observer with the guidance of the learning implementation observation sheet guide. Based on the results of observations of recording data by observers on the implementation of learning assisted by the Zoom Breakout Rooms application, it can be seen in Figure 4,

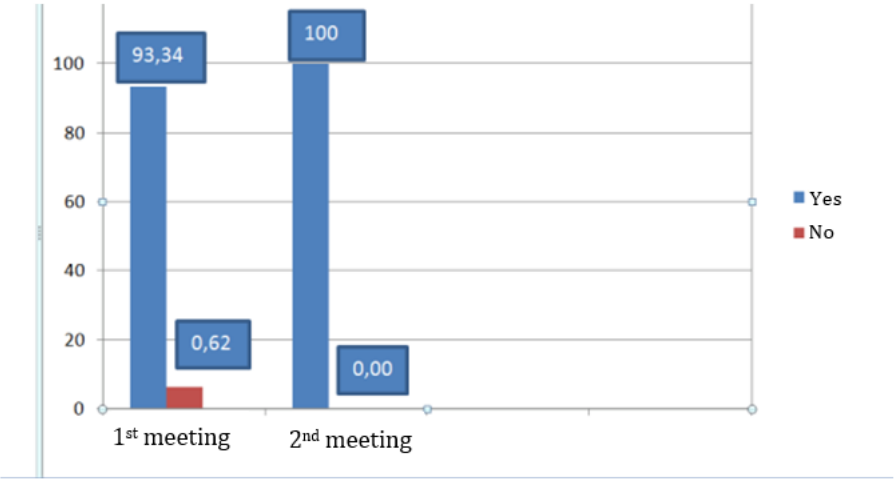


Figure 4. Learning Implementation

Based on the results of the data analysis of the learning implementation observation sheet in Figure 4, it shows that the implementation of the PBL model learning using the Zoom Breakout Rooms application is going well. This means that the learning process is in accordance with the stages that must be carried out.

Discussion

This research was conducted to determine the impact of the PBL model assisted by the Zoom Breakout Rooms application on the students' scientific literacy skills on the environmental change material. To find out whether there is an impact, the students' scores are taken using the pretest-posttest method. The results of data analysis showed that there were differences in the achievement of scientific literacy abilities between students who were treated using the PBL model assisted by the Zoom Breakout Rooms application and the control class that was treated with the discussion method. This can be proven from the average value of the pretest given at the beginning of the meeting, and the posttest given at the end of the meeting. When compared with the acquisition of the average score from pretest to posttest in the experimental class and control class, the experimental class obtained a higher average score than the control class. (Table 1).

Observations made to see the difference between the two tests should be further tested. Therefore, it is necessary to do the N-gain test to see the difference in learning outcomes obtained after conducting the pretest and posttest in both the experimental class and the control class. Judging from the difference in the N-gain value in the experimental class, namely 55,71 ± 22,51 with the criterion of 'medium', it is higher than the control class with a value of 19,50 ± 16,90 with the criterion of 'low'.

The improvement of students' scientific literacy skills in the experimental class cannot be separated from the influence and treatment given by the PBL model with the help of the Zoom Breakout Rooms application. The PBL model requires students to think about the problems that are displayed and be able to carry out scientific literacy to find solutions to the problems given during teaching and learning activities. The Zoom Breakout Rooms application during the Covid-19 period, distance learning can be carried out well using the PBL model because of the interaction and communication of students with educators such as in classes that carry out direct or face-to-face learning.

The Zoom Breakout Rooms application in this study encourages students to be more active in developing their own knowledge through group work. Through the PBL model assisted by the Zoom Breakout Rooms application, it can increase the active participation of students in working together in groups. This app is especially useful for meetings that require some time for group discussion. Group learning methods which are generally carried out in schools can still be applied, in line with Afifah's (2017) statement, namely the online group learning approach will have the potential to unite students who have the same interests, talents, and characteristics and build their familiarity, so that in the group discussion method students can share their ideas with each other.

This research focuses on how much scientific literacy skills are obtained by the students in learning using the PBL model assisted by Zoom Breakout Rooms, especially on environmental change material. Based on the OECD (2015), there are 2 indicators that must be assessed, namely content and process. In this case, the researcher only measured the achievement of scientific literacy in the process aspect. This aspect includes 3 components that must be achieved by students, the first is to identify scientific questions, the second is to explain scientific evidence. From these three aspects, the average pretest-posttest experimental class and control class in each aspect of literacy are presented in table 3. Aspects of scientific literacy have a significant difference. Of course, the value obtained by the experimental class is higher than the control class.

Referring to Figure 3, at the cognitive level C3 (Applying) the highest average score is 0.62 which indicates that students can answer C3 questions well. The questions given are to determine problem-solving correctly on the questions, students are able to answer questions well. The good ability of students to apply ideas to solve a problem is because in the experimental class through PBL using the Zoom Breakout Rooms students are trained in groups to identify the phenomena or problems presented. This process provides an opportunity for each group member to be able to discuss with each other conveying ideas or ideas resulting from the identification process carried

out. The number or ideas or ideas generated will encourage students to analyze the best alternative answers to answer the problems they find related to environmental change. Furthermore, at the cognitive level C6 (Creating) gets a value of 0.60, this value is the second highest value compared to C3 because in learning the educator provides confirmation of the presentation of the results of the investigation that has been submitted, educators also provide opportunities for students to ask questions.

Next is C4 (Analysis) gain 0,53 value, students are able to answers the questions with cognitive level of analyzing, since students able to solve problems. On cognitive level C5 (Evaluating) is the lowest value from the other cognitive level which is 0,37, it is because students unusual to do the questions with the high cognitive level, students are still low in understanding or reading the questions. Sudarsyah (2013) stated that in his research the difficulty level of questions is in accordance with Bloom's cognitive taxonomy hierarchy. While the easy level will be developed according to knowing and understanding cognitive abilities. Category questions are being developed from the level of applying and analyzing. Then, the difficult questions are developed from level of evaluating and creating abilities.

Zoom Breakout Rooms is used as a discussion and collaboration place to solve the problems between students and teachers through online. This is in accordance with Dini's (2021) statement that the online learning approach will potentially unify the students who have same interest, talents and characteristics and build their solidarity. Even according to Laurillard (2009), technology must be explored and exploited by considering the needs of students. One application that supports the learning process is Zoom Breakout Rooms because this application can divide students into small spaces for discussion, making it easier for students to have group discussions.

Students' responses to Zoom Breakout Rooms are assessed using a questionnaire given when the lesson has been completed. The questionnaire contains 18 questions that students must respond to by ticking the column that corresponds to their response. The results of the analysis are based on table 3. Regarding the student response questionnaire to Zoom Breakout Rooms to improve scientific literacy, it shows that online learning assisted by Zoom Breakout Rooms on environmental change material that has been implemented by researchers has been effective and received positive responses from students with an average of all components of student responses to the Zoom Breakout Rooms application is 95% with very good criteria in the experimental class. This is in line with the opinion of Sandiwano (2016) namely learning using Zoom Breakout Rooms can accelerate the teaching and learning process, create enthusiasm in learning, provide opportunities for students to interact directly with their environment and the reality on the ground, and provide opportunities for students to self-study based on their abilities and interests. The use of the Zoom Breakout Rooms application is considered very helpful in improving student learning outcomes, as stated by Aristo (2004) the use of Zoom Breakout Rooms is not only for conveying messages, but also helps in simplifying the message delivery process so that communication becomes smoother.

The results of this study have a guarantor of the actual implementation of the research. In this case, the researcher used an observation sheet on the implementation of learning, which was assessed directly by the observer, namely the biology subject educator, to determine the success of the learning model applied during the study. The results of the observation on the implementation of learning can be seen from Figure 4 which shows that the PBL model assisted by the Zoom Breakout Rooms application can be carried out well on environmental change materials. This is in line with Setyowati's (2021) statement that the use of PBL learning really helps students in developing thinking skills and problem-solving presented by educators in accordance with those in the surrounding environment. By using the PBL model learning activities will be more meaningful.

CONCLUSION

Based on the results of the research and discussion, it can be concluded that learning with the Problem Based Learning Model assisted by the Zoom Breakout Rooms application in environmental change learning activities has a significant effect on the scientific literacy ability of students in class X SMA Qur'an Darrul Fattah Bandar Lampung. However, this study has limitations, namely, the

control class uses a method and not a model as a comparison for the experimental class PBL model. Further research is expected to compare between models to be more valid.

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