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The Influence of Problem-Based Learning Model with the Integration of Socio Scientific Issues on Students' Problem-Solving Skills and Mastery of Biology Concepts in High School

Imelda Eka Wati[1], Suratno Suratno[2], Dwi Wahyuni[3]

[1,2,3]Department of Biology Education, University of Jember, Jember, Indonesian.

Corresponding Author: Suratno Suratno

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ABSTRACT

Problem solving is a skill that every student must have in facing the challenges of learning and everyday life. However, many students still have difficulty in developing skills due to one-way learning methods that focus on memorization. Concept mastery is the ability of students to understand, connect, and apply knowledge in depth in various contexts. Concept mastery can be improved by using the Problem Based Learning model that focuses on providing real problems at the center of learning. One of them is the Socio Scientific Issue approach which is integrated into the Problem Based Learning model. The purpose of this study was to determine the effect of implementing the Problem Based Learning model with Socio Scientific Issue integration on problem solving skills and mastery of biology concepts of high school students. The type of research used was a quasi-experiment conducted at SMAN Mumbulsari. The research sample used class X students of SMAN Mumbulsari consisting of one experimental class and one control class. The data analysis techniques used were normality test, homogeneity test, ANACOVA hypothesis test and assessment of the implementation of learning syntax. The data obtained were obtained from the results of the pretest and posttest. The results of the study were obtained based on the results of the assessment of the syntax implementation sheet of learning showing that all steps were implemented with a percentage of 100%. The results of the ANACOVA test for both students' problem-solving skills and mastery of biology concepts of high school students obtained a significance value (Sig.) <0.05. This indicates an influence on the learning model applied, namely the Problem Based Learning model with the integration of Socio Scientific Issues on problem-solving skills and mastery of biology concepts of high school students.

Keywords: *problem-based learning, socio scientific issue, problem-solving skills, conceptualization*

INTRODUCTION

National education in the 21st century is an effort to realize a prosperous Indonesian society both locally and globally. In order to create a prosperous society, according to Nabilah and Nana (2020), every Indonesian must have at least 6 aspects of skills, including (1) critical thinking and problem solving, (2) collaboration, (3) good communication, (4) creative and innovative thinking skills, (5) social responsibility, (6)

work ethic. The results of the Program for International Student Assessment (PISA) survey show that the first skill aspect, namely the ability to think critically and problem solve, Indonesian people are still in the low category with an average score of 403 and an international average of 493, thus placing Indonesia in 62nd place out of 70 participating countries (Simatupang & Lonita, 2020). Critical thinking is a thinking process that involves creating new relationships from various information received, remembered, and analyzed, so that the results can be used to solve problems (Anugraheni, 2020). Problem solving is an effort made by students to integrate previously learned concepts to find a solution to a problem (Wahyuningsih et al., 2023).

Problem solving is an important skill that every student must have in facing the challenges of learning and daily life. It involves identifying problems, analyzing information, developing solutions, and evaluating the effectiveness of the actions taken. Problem solving not only helps students to understand the subject matter better, but also trains critical thinking skills, creativity, and independent decision making (Jamaluddin et al., 2022). However, there are still many students who have difficulty in developing skills due to one-way learning methods or focusing on memorization, as well as a lack of mastery of concepts where usually subject matter is often delivered theoretically without linking to real applications, making it difficult for students to understand the relevance of the concepts learned in solving everyday problems.

Concept mastery is the ability of students to understand, connect, and apply knowledge deeply in various contexts. Concept mastery can be improved by using the Problem-Based Learning model. Problem-Based Learning (PBL) is a learning model that focuses on providing real problems as the center of learning (Dewi et al., 2019). In this approach, students are given complex and open problems, thus encouraging students to be active in thinking critically, analyzing information, finding solutions, and working collaboratively to solve these problems (Asslan, 2021). In the learning process, students are encouraged to be able to solve problems that require them to understand and apply concepts directly.

Learning that prioritizes the application of concepts, it is important to connect the knowledge learned with real issues that are relevant to everyday life. One way to achieve this is by integrating the Socio-Scientific Issue (SSI) approach into the Problem-Based Learning (PBL) model. The SSI approach allows students to not only learn concepts in theory, but also understand how these concepts are applied in a broader social and scientific context (Siska et al., 2020). The application of SSI in education can help students to develop students' thinking skills about social science topics.

Kurniawan et al (2024) found that the problem-based learning model integrated with socio-scientific issues had an effect on students' problem-solving skills. Research conducted by Hestiana and Rosana (2020) found that problem-based learning combined with SSI can improve knowledge and real learning outcomes on students' problem-solving skills. If students' problem-solving skills increase, it can also help increase concept mastery in students. Based on this description, the researcher wants to find the effect of the Problem Based Learning model with the integration of Socio Scientific Issue on problem solving skills and mastery of biological concepts of high school students.

MATERIALS & METHODS

The population of this study was class X students of SMA Negeri Mumbulsari in the 2024/2025 academic year. From several classes, 2 classes were taken, namely 1 experimental class and 1 class as a control class. Conducting normality test and homogeneity test first on all class X SMA Mumbulsari. Conducting a normality test with Kolmogorov-Smirnov which refers to SPSS with the criteria used, namely a significant level greater than or equal to

0.05 so that the data is normally distributed, if the significant level is smaller than 0.05 the data is not normally distributed. The homogeneity test with the Levene Test has criteria, namely, a significant level greater than or equal to 0.05 the data obtained is homogeneous, if the significant level is smaller than 0.05 the data obtained is not homogeneous. If the data is homogeneous, then determine the sample to determine the class used as the experimental class and control class. These two selected classes must have student equality and have the same student characteristics. The steps that must be taken in conducting quasi-experimental research are as follows:

a. Make observations at SMA Negeri Mumbulsari to explain directly the state of the school and the school environment and conduct licensing at SMA Negeri Mumbulsari to complete the necessary documents.
b. Conducting interviews to obtain school information.
c. Designing learning designs and assessment instruments for students by compiling complete materials with pre-test and post-test sheets.
d. Conduct validation related to the learning tools used. If there are things that are currently being improved, the device will be improved until a valid learning device is obtained.
e. Determining the population to be studied, namely class X
f. Conduct a normality test and homogeneity test on the population to be studied. Homogeneity test and normality test are obtained from students' daily test scores to determine the sample class that will be used as an experimental class consisting of one control class and one experimental class. The control class and experimental class were obtained by random sampling.
g. After determining the control class and experimental class, then hold a pre-test on the experimental class and control class before learning.
h. Applying the treatment to the control class and the experimental class. One class is used as an experimental class, namely a class that applies the Problem Based Learning model with Socio Scientific Issue Integration and one other class as a control class that uses the usual lecture and discussion method.
i. Analyze the results of students' problem-solving process.
j. Conducting posttests on the control class and experimental class.
k. Collecting data on students' problem-solving skills and students' mastery of biological concepts.
l. Performing data processing using SPSS normality test, homogeneity test, and ANOVA test.
m. Discussing the results of the data obtained.

Data collection methods in quasi-experimental research are carried out through several stages, namely observation, interviews, tests and documentation. Data analysis of students' problem-solving skills was then carried out with ANOVA test. The results of this test were carried out to determine the effect of Socio Scientific Issue integration in the Problem Based Learning model on students' problem-solving skills. Analysis of student's mastery of biological concepts from pre-test data and from post-test data between experimental classes using the Problem Based Learning model and control classes using conventional learning models was tested using ANOVA test.

RESULT

This study successfully answered the formulation of the problem that there is an influence between PBL learning model with SSI integration on problem solving skills and mastery of biological concepts of students in high school. The population in this study was all students of class X SMAN Mumbulsari to determine two research classes, so that X2 class was obtained as the experimental class and X6 as the control

class based on the pre-requisite test and ANOVA test.

Normality test was conducted to fulfill the first prerequisite test. The normality test was carried out using the One-sample Kolmogorov-Smirnov Test method to prove that the data of all classes were normally distributed. The normality test results were obtained from daily exam scores using general biology material in class X SMA Negeri Mumbulsari consisting of classes X1, X2, X3, X4, X5, X6, and X7. Data is said to be normally distributed if the value > 0.05.

Table 1. Normality Test Results of Daily Test of X Students of SMAN Mumbulsari

Test of Normality						
	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Class X1	0.083	35	0.200	0.968	35	0.386
Class X2	0.092	35	0.200	0.970	35	0.442
Class X3	0.152	35	0.039	0.910	35	0.007
Class X4	0.164	35	0.018	0.910	35	0.008
Class X5	0.141	35	0.077	0.940	35	0.055
Class X6	0.091	35	0.200	0.975	35	0.592
Class X7	0.155	35	0.032	0.896	35	0.003

Table 1. Normality Test Results of Daily Test of X Students of SMAN Mumbulsari

Based on the results obtained in table 4.1 shows that the results of the normality test of the daily test scores of classes X1 to X7 are 0.200, 0.200, 0.039, 0.018, 0.077, 0.200, 0.032. The data shows significant > 0.05 which means normal distribution in classes X1, X2, X5, and X6. Non-normally distributed data <0.05 in classes X3, X4, and X7.

After obtaining the normality test results in all classes, then a homogeneity test is carried out which functions to determine whether the data from the four normal classes are homogeneous or not. Data is said to be homogeneous if it has a significant value> 0.05, to test the homogeneity of the data is done using Levene's Test

Table 2. Results of Homogeneity Test of Students' Biology Daily Test Score

Test of Homogeneity of Variances			
Levene statistic	df1	df2	Sig.
1.709	3	136	0.168

Table 2. Results of Homogeneity Test of Students' Biology Daily Test Score Based on Table 4.2 shows that the daily test scores of Mumbulsari High School students in classes X1, X2, X5, and X6 have homogeneous or equal variants, this can be seen from the significance value greater than 0.05 (0.168 > 0.05) so that these four classes are assumed to have the same level of ability. After that, determining the experimental class and control class was carried out by random sampling and obtained class X2 which became the experimental class and class X6 as the control class in this study.

Problem solving skills have indicators consisting of 4 aspects. The first aspect is understanding the problem by identifying the problem and describing it. The second aspect is to develop a problem-solving plan that is prepared in accordance with the theory. The third aspect is implementing the problem-solving plan according to the plan that has been made. The fourth aspect checks and explains the results obtained by evaluating and communicating the results that have been obtained. The results of problem-solving skills are obtained from the results of students' pretest and post-test in class.

Table 3. Average Value of Each Indicator of Problem-Solving Skills

Indicator	Mean ± SD			
	Experiment		Control	
	Pretest	Posttest	Pretest	Posttest
understanding the problem	57.86 ± 18.68	77.85 ± 17.70	44.29 ± 24.70	57.86 ± 14.36
Develop a solution plan	70.71 ± 18.40	82.14 ± 12.77	65.00 ± 12.25	74.29 ± 7.28
Implementing the plan	48.57 ± 17.87	66.42 ± 13.29	54.29 ± 1935	66.43 ± 14.56
Checking the problem solving answer	69.29 ± 14.74	79.29 ± 15.22	65.00 ± 16.04	72.86 ± 13.85

Table 3. Average Value of Each Indicator of Problem-Solving Skills Based on table 4.3 shows that the average value of each indicator of students' problem-solving skills has a difference, namely the average student problem solving skills in the experimental class is higher than the control class on all indicators. In addition, students' problem-solving skills also have certain criteria based on the average scores obtained from the experimental and control classes, which can be seen in table 4.

Table 4. Description of student problem solving skills criteria

Class	Number of students	Mean ± SD		Difference	Criteria
		Pretest	Posttest		
Experiment	35	61.61 ± 12.95	76.43 ± 10.36	14.82	Good
Control	35	57.14 ± 15.75	67.86 ± 10.04	10.72	Good

Table 4. Description of student problem solving skills criteria Based on table 4.4, it can be seen that the average value of the experimental class pretest is 61.61 with a standard deviation of 12.95 and the average value of the posttest of students' problem-solving skills in the experimental class is 76.43 with a standard deviation of 10.36 with good student problem solving skills criteria. While in the control class the pretest average value was 57.14 with a standard deviation of 15.75 and the posttest average value was 67.86 with a standard deviation of 10.04 with good student problem solving skills criteria. it shows that the average problem-solving skills of experimental class students are higher than the control class.

The results of the normality test of the pretest and posttest of problem-solving skills using the Kolmogorov Smirnov normality test can be seen that the significance value obtained is 0.105 for the experimental class pretest and the experimental class posttest is 0.115. Meanwhile, the control class pretest was 0.058 and the control class posttest was 0.144. This shows that the pretest and posttest significance values of problem-solving skills are normally distributed because the value> 0.05. The problem-solving skills data were analyzed using the homogeneity test with Levene's test that the experimental and control class students' problem-solving skills data were homogeneous because the significance was more than 0.05 (0.794 > 0.05). Furthermore, the data was tested using the ANCOVA test to analyze the effect of the Problem Based Learning model with the integration of Socio Scientific Issue on students' problem-solving skills. The following are the results of the covariance test (ANCOVA) of problem-solving skills in table 5.

Table 5. ANCOVA Test Results Problem Solving Skills

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5144.996[a]	2	2572.498	50.335	0.000
Intercept	6735.718	1	6735.718	131.795	0.000
Pretest	3859.281	1	3859.281	75.513	0.000
Kelas	672.416	1	672.416	13.157	0.001
Error	3424.201	67	51.107		
Total	372890.625	70			
Corrected Total	8569.196	69			

Table 5. ANCOVA Test Results Problem Solving Skills The covariance test results (ANCOVA) in table 4.5 show the significance value of the learning model which is less than 0.05, namely 0.001 <0.05, which means that there is an effect of the Problem Based Learning model with the integration of Socio Scientific Issue on problem solving skills.

Concept mastery consists of 6 indicators including remembering, explaining, applying, analyzing, evaluating, and creating. In Table 4.6 there are average results for each indicator of concept mastery questions. In the experimental class, the average value of each indicator of concept mastery questions is higher than the average value of each indicator of control class concept mastery questions. This is due to the influence of the learning model applied in the experimental class.

Table 6. Average value of each indicator of concept mastery

Indicator	Cognitive levels	Mean ± SD			
		Experiment		Control	
		Pretest	Posttest	Pretest	Posttest
Analyzing	C4	78.29 ± 14.63	90.86 ± 13.81	73.71 ± 17.74	85.12 ± 13.81
Evaluating	C5	49.50 ± 18.79	81.64 ± 10.82	43.57 ± 17.69	69.00 ± 14.07
Creating	C6	30.71 ± 15.91	49.29 ± 24.99	20.71 ± 9.42	37.86 ± 21.85

Table 6. Average value of each indicator of concept mastery Based on table 4.6, the average of each indicator of concept mastery questions on indicators C4, C5, and C6 shows a difference, namely the average in the experimental class has a higher average value compared to the control class.

Table 7. Pretest and Post-test Values of Mastery of Biology Concepts of High School Students

Class	Jumlah Siswa	Mean ± SD	
		Pretest	Post-test
Experiment	35	54.00 ± 9.15	74.61 ± 9.41
Control	35	47.35 ± 10.79	64.33 ± 8.90

Table 7. Pretest and Post-test Values of Mastery of Biology Concepts of High School Students Based on table 4.7, the average value of the experimental class pretest was 54 with a standard deviation of 9.15 and the average value of the experimental class post-test was 74.61 with a standard deviation of 9.41. The average value of the control class pretest was 47.34 with a standard deviation of 10.79 and the average value of the control class post-test was 64.33 with a standard deviation of 8.90.

The results of the prerequisite test of normality test and homogeneity test of pretest and posttest values of experimental and control classes of mastery of biological concepts of high school students show that the significance value is greater than 0.05, so it can be concluded that the data is normally distributed and homogeneous. Furthermore, the data was tested using the ANOVA test which was used to analyze the effect of the Problem Based Learning model with the integration of Socio Scientific Issue on the mastery of biological concepts of high school students, can be seen in table 4.8 below:

Table 8. ANCOVA Test Results of High School Students' Mastery of Biology Concepts

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2281.529[a]	2	1140.765	14.481	0.000
Intercept	8222.894	1	8222.894	104.383	0.000
Pretest	430.307	1	430.307	5.462	0.022
Kelas	1165.510	1	1165.510	14.795	0.000
Error	5277.980	67	78.776		
Total	345387.952	70			
Corrected Total	7559.510	69			

Table 8. ANCOVA Test Results of High School Students' Mastery of Biology Concepts the ANCOVA test results show a significance value of (0.000) <0.05 which indicates H0 is rejected and H1 is accepted. So it can be concluded that there is an influence on the learning model applied, namely the Problem Based Learning model with the integration of Socio Scientific Issue on the mastery of biological concepts of high school students.

Observation of syntax implementation was carried out in each learning activity through an observation sheet. Observation of syntax implementation was conducted to determine the suitability of learning activities with the designed learning steps. Observation of syntax implementation was carried out by 3 observers, namely the subject teacher of SMAN Mumbulsari and students. The implementation of learning was carried out using the Problem Based Learning model with the integration of Socio Scientific Issue in the experimental class.

No	**Observer Name**	**Score**	
		Experiment	Control
1	Observer 1	100	100
2	Observer 2	100	100
3	Observer 3	100	100
Mean		100	100

Table 9. Results of Learning Syntax Implementation Assessment Based on the results of the observers that have been carried out, the average syntax assessment is 100. This shows that each stage in the experimental class was carried out with a percentage of 100%. The teacher carried out all stages well and in accordance with the syntax of PBL integrated with SSI. The control class also obtained an average result of 100 which means that each stage in the control class was carried out all with a percentage of 100%.

DISCUSSION

The research was conducted at SMAN Mumbulsari with X2 class as the experimental class and X6 class as the control class. The treatment carried out in the experimental class by applying the Problem Based Learning model with the integration of Socio Scientific Issue, while in the control class by applying the conventional model that is usually done by teachers at school with lecture and discussion methods. Before applying the treatment to the experimental class and control class, namely conducting a test in the form of a pretest and after that at the end after applying the learning model, a test in the form of a post-test is carried out. This is done to determine the level of student ability in learning biology.

The results of statistical tests that have been carried out show that the Problem Based Learning model with the integration of Socio Scientific Issue affects the problem solving skills and mastery of biological concepts of high school students. The difference in the results of problem solving skills can be seen from the results obtained between the experimental class and the control class due to differences in the treatment of the learning model applied, namely the Problem Based Learning model with the integration of Socio Scientific Issue in the experimental class and the conventional model in the control class.

SSI can encourage students to be more active in thinking about finding solutions to problems related to socio-scientific issues (Kurniasari & Fauziah, 2020). This also affects the results of students' mastery of biological concepts because the Problem Based Learning model with the integration of Socio Scientific Issues which raises real problems in society, can improve and stimulate students' thinking power well, therefore it affects students' mastery of concepts. This is because the control class

using the conventional model of lecture and discussion methods, the teacher only tells the material without paying attention to student responses, this makes students not want to ask even though students have not understood the lessons delivered by the teacher (Djonomiarjo, 2020).

The difference in students' problem-solving skills is due to the learning model set such as the Problem Based Learning model with the integration of Socio Scientific Issue which refers to where students can solve real problems in the given problem to find the answer. Students can solve problems from the readings that are already available in the problem and provide their own arguments to strengthen their answers. In addition, the PBL model integrated with SSI can focus learning on socio-science issues that involve students in higher-level thinking processes. Students are required to use their thinking skills to always actively reason (Kenari & Subiantoro, 2023).

This problem-based learning process is more meaningful because it uses real problems. This is in line with the results of Hidayat and Dodego's research (2021) which states that the PBL model is very effective because students tend to learn more actively so that it can build students' mental activities in understanding concepts and thinking creatively. Based on table 5 the results of the ANCOVA analysis test which shows the difference in the average of the experimental class and the control class with a significance value of 0.000 which (Sig. = 0.000 <0.05) which means H_0 is rejected and H_1 is accepted so this shows that there is a significant effect on the value of problem solving skills carried out with different treatments, the two classes show that the problem solving skills are different. So it can be concluded that the Problem Based Learning model with Socio Scientific Issue integration can affect students' problem-solving skills. This is because students are trained to find concrete solutions by connecting with the material they have learned (Kurniawan et al., 2024).

Table 3 shows that the experimental class problem solving skills are higher than the control class. In the first skill indicator, namely understanding the problem, the pretest average value of experimental class students is 57.86 and the posttest average value is 77.85, while the control class pretest average value is 44.29 and posttest average value is 57.86. This effect can be caused by choosing the right problem and using issues that are relevant to the problems that have occurred. According to Tan (2021) the teacher's role in learning includes instructional design, facilitation and being a mediator. The selection of issues that exist in everyday life makes it easier for students to explore and understand the problem (Putra, 2022). In the second indicator of preparing the experimental class solution plan, the pretest average value of the experimental class was 70.71 and the posttest average value was 82.14. While in the control class results the pretest average value was 65.00 and the posttest average value was 74.29.

The third indicator of implementing the plan the average value of the experimental class pretest was 48.57 and the average value of the posttest was 66.42. While in the control class pretest average value of 54.29 and posttest average value of 66.43, the value in this third indicator is the lowest compared to other indicators because students are lacking in carrying out problem solving steps.

The fourth indicator of checking the answer shows the same pattern, where the value in the experimental class is higher than the control class. This indicator makes students ensure that the proposed solution is in accordance with the predetermined objectives and does not deviate from these objectives (Saherti & Hidayati, 2022). In the four indicators of problem-solving skills, there was an increase which proved the influence of the learning model applied. Overall problem-solving skills, the average score of experimental class students increased from 61.61 to 76.43 with a difference of 14.82 points increase. While the average value of the control class

increased from 57.14 to 67.86 with a difference of 10.72 points. This shows more significantly that the learning model with the Problem Based Learning model with the integration of Socio Scientific Issues can help students develop better problem-solving skills compared to the control class using the conventional model. Through the problem-based learning process, students are required to understand the problem in depth which involves collecting information data, then analyzing the data and determining the strategy steps. Socio Scientific Issue is integrated with the problem-based learning model so that the problem presented becomes more complex because it involves social issues such as ethics or environmental influences. So that it can encourage students to be active during learning and think more critically and creatively to find solutions and be socially responsible (Zahra et al., 2021).

The results of this study are in line with previous research conducted by Hanifa et al., (2021) which states that the application of SSI in learning can not only improve students' problem-solving skills, but also involve students in the process of critical thinking with real social and scientific issues in their lives. In this study, students who were taught with a problem-based learning model integrated with SSI showed that their ability was better in analyzing problems related to social and scientific issues compared to students who were taught using conventional models. The results of this study are also supported by the results of research by Firmansyah et al., (2022) which states that the success of this learning process shows the advantages of the Problem Based Learning model which can train students to find answers, be able to think creatively, be able to solve problems by identifying, and identifying and evaluating problem investigations and stimulating students to solve problems appropriately

The higher the student's problem-solving skills, the higher the learning outcomes. The Problem Based Learning Model affects students' problem-solving skills because PBL has characteristics whose learning is centered on students who are faced with real situations that can be applied in everyday life such as independent learning (Lathifah & Yolanda, 2023).

The results of this study indicate that the Problem Based Learning model with the integration of Scoioscientific Issue is very effective in improving students' problem-solving skills. The difference in improving problem solving skills is due to the SSI applied in this study to develop students' problem-solving skills that discuss socio-scientific topics such as the COVID-19 virus material. This is because the experimental class showed a positive response from students. Students become more active in expressing their opinions related to solving the problems given. Through the application of the PBL model, students learn more in finding ideas and practicing to solve problems (Amin et al., 2020). This research applies PBL integrated with SSI because it can train students to think at a high level in solving problems. SSI can provide learners with knowledge of the relationship between problems, so they can feel the benefits of learning and increase knowledge and problem-solving skills (Hestiana & Rosana, 2020). In the implementation of this study, there are difficulties, one of which is the presence of students who are not focused when participating in the learning process, thus making contributions in discussions or when working on posttest questions given the results are not good. Therefore, teachers must always guide and control the course of learning activities properly and pay attention to their students, so that learning becomes more effective.

Concept mastery is the ability of students to understand the meaning of the material and be able to use or apply the material that has been learned in everyday life (Hidayat & Diego, 2021). Based on the analysis of the average pretest and posttest results in the experimental and control classes, table 4.6 shows that the average pretest of the

experimental class was 54.00 and the average posttest of the experimental class was 74.61. While the average value of the control class pretest was 47.35 and the average value of the experimental class posttest was 64.33. The results of this average value indicate that there was an increase of 20.61 in the experimental class and 16.98 in the control class. Based on the ANCOVA test results in table 4.8, it is known that the significance value is 0.000 which $p<0.05$ which means H_0 is rejected and H_1 is accepted, so there is a significant effect on the value of students' mastery of biological concepts after different learning models are applied. It can be concluded that the Problem Based Learning model with Socio Scientific Issue integration on students' mastery of biological concepts. Concept mastery is important and should be the main focus in the science learning process and take precedence over memorization. A good learning process does not only convey information about concepts, but also pays attention to the process of conveying concepts by using a good learning model such as the Problem Based Learning model (Manurung, 2021). This study uses virus material that discusses the COVID-19 pandemic by applying the PBL learning model integrated with SSI so that it is possible for students to learn science concepts related to real problems they experience and students can develop a deeper understanding of the material studied. In addition, discussions conducted by students based on problems based on this pandemic issue that occur in real situations make learning meaningful (Fita et al., 2021).

Problem-based learning model with Socio Scientific Issue integration that involves social issues can improve students' understanding of biology concepts. The application of this strategy is to train students in thinking using their cognitive structures fully and purposefully so that this model can encourage student activeness. So that students can evaluate scientific problems and concepts that exist in real life or around students (Fita & Jatmiko, 2021). The importance of students having an understanding of concept mastery as the ability of students not only to understand but to apply various concepts given. In addition, it makes students more active during the learning process and student responses become very enthusiastic and the learning process is more interesting because it is related to various social and scientific issues. This learning activity increases students' curiosity about the problems experienced and is responsible for the surrounding environment because the model applied is fun (Minin & Fauziah, 2022).

CONCLUSION

Problem-based learning model with Socio Scientific Issue integration significantly affects problem solving skills. ANCOVA test results Sig. ($0.001<0.05$) which means there is an influence on the learning model applied. Problem-based learning model with Socio Scientific Issue integration has a significant effect on students' mastery of biological concepts. ANCOVA test results Sig. ($0.000<0.05$) which means there is an influence on the learning model applied.

Declaration by Authors

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