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The Influence of Local Potential Integration in Problem Based Learning Model on Problem Solving Skills and Biology Learning Outcomes of Senior High School Students in Industrial Agricultural Area

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ABSTRACT

Problem-solving are skill that students need to have in this era. However, PISA 2022 data shows that the problem-solving skills aspect of students in Indonesia is still low, so a learning model is needed to develop problem-solving skills. The model that can be used is problem-based learning with the integration of local potential. Problem-based learning integrated with local potential makes learning more active and contextualized to improve problem-solving and student learning outcomes. This study aims to determine the influence of local potential integration in the problem-based learning model on problem-solving skills and biology learning outcomes of Senior High School students in industrial agricultural area. This research is a type of quasi experiment with a pretest-posttest non-equivalent control group design conducted at SMA Negeri Mumbulsari. Analysis of the data obtained was done with ANCOVA. The results of data analysis on the score of problem-solving skills obtained a significance (sig.) of 0,000 <0,05. While data analysis on the score of learning outcomes obtained a significance (sig.) of 0,009 <0,05. The results showed that there was an influence of local potential integration in the problem-based learning model on problem-solving skills and biology learning outcomes of Senior High School students in industrial agricultural area.

Keywords: Local Potential, Problem-Based Learning, Problem-Solving Skills, Learning Outcomes

1. INTRODUCTION

Problem-solving skills are skills that students need to have to live life. Students need these skills to overcome every problem they face. The importance of problem-solving skills for students makes the development of these skills one of the goals of 21st-century education (Gunawan *et al*., 2021). According to PISA data in 2022, Indonesia has 370 points in education while the international average is 471 points. The quality of education in Indonesia is still at a low level, including in the aspect of students' skills to solve problems (Solihin *et al*., 2024). Learning requires a model that provides opportunities and facilitates the improvement of students' skills to solve problems. One of the models that can be chosen is problem-based learning (PBL).

Problem-based learning (PBL) is a model that can hone students' skills to solve problems so that they can improve after learning. This model uses problems as the basis for implementing learning. Students will gather information and develop solutions so that they gain new knowledge and abilities in solving problems (Mardiyanti, 2020). Students will process the information that has been collected to understand concepts related to the learning material. This concept is then built into new knowledge to solve problems (Asiyah *et al*., 2021). The process carried out by students makes the thinking capacity increase higher during learning. Increasing thinking capacity makes it easier for students to analyze problems carefully. Thus, students' problem-solving skills can also improve (Istiqomah *et al*., 2023).

In addition to problem-solving skills, problem-based learning models can also have an impact in the form of increased student learning outcomes. Learning outcomes are the main thing to be achieved in learning. Learning outcomes can also be a sign of students' level of understanding and a reference for the development of quality learning (Rodiah *et al*., 2020). The increased learning outcomes are due to the implementation of PBL which can activate students during learning. Students actively learn so that they acquire more meaningful knowledge and last longer in memory (Lutfiah *et al*., 2021).

The problem-based learning model is characterized by the use of problems in learning that can increase students' interest and enthusiasm for learning (Choerunnisa & Yani, 2024). These benefits can be obtained if the obstacles in the implementation of this model are overcome. One of the obstacles in the application of this model is the lack of interest of students in the problems discussed because they tend to be boring and difficult (Yuli *et al*., 2023). Therefore, the problem must be presented appropriately so that it is attractive to students. Problems can come from something unique and familiar, such as local potential.

Local potential is a natural and cultural resource owned by a region. Local potential can be integrated into the problem-based learning model, especially in biology subjects with various complex concepts to learn (Simatupang *et al*., 2024). The integration of local potential makes the material clearer and more interesting through examples that are close to students. The integration of local potential in PBL can be done by using problem sources from the student's surrounding environment which are then seen in the implementation of syntax and learning tools (Fara *et al*., 2022).

The availability of local potential can be influenced by the existence of an agricultural sector that continues to develop in the area around the school. Agriculture has changed a lot from traditional to more modern with the use of machines in land cultivation and processing of agricultural products. Agriculture with this characteristic is called industrial agriculture (Pusairi, 2022). Industrial agricultural areas are a potential source of learning to improve the quality of learning. The use of this environment provides meaningful experiences for students (Damayanti *et al*., 2021). The environment as a source of learning is more in demand by students (Suratno & Kurniati, 2017).

A number of studies by integrating local potential have an effect on improving the quality of learning. In the research of Aisa et al. (2023), the results of increasing student learning independence and problem-solving skills were obtained. The research of Destiara et al. (2020) also resulted in an increase in the acquisition of learning outcomes in students. Against this background, research was carried out on the integration of this local potential.

2. RESEARCH METHOD

The research conducted is a type of quasi-experiment with a pretest-posttest non-

equivalent control group design. The research was carried out at SMAN Mumbulsari during the odd semester in 2024. The sample used was two classes from the grade X level. The first class was given a problem-based learning treatment with local potential integration (experiment). The second class applies conventional learning with a direct instructional (control) model. The design of the study is shown in Table 1 below.

Table 1. Research Design

E	P1	X	P2
K	O1	Y	O2

E : Experimental class
K : Control class
X : Learning with the PBL model integrated with local potential
Y : Learning with the conventional model Direct Instructional
P1 : Pretest in the experimental class
P2 : Posttest in the experimental class
O1 : Pretest in the control class
O2 : Posttest in the control class

The data collection methods used in this study include interviews, observations, tests, and documentation. Interviews are conducted to find out the implementation of learning and experience obtained by students. The observation was made by observers on the implementation of the syntax of the learning model. Meanwhile, tests are conducted before and after learning to measure students' problem-solving skills and learning outcomes. Problem-solving questions are made based on indicators according to Polya in Christina (2021) which is shown in Table 2 below.

Table 2. Indicators of Problem Solving Skills

Number	Problem-solving Aspects	Indicators
1	Understand the problem	Students can identify and describe the problem appropriately
2	Develop a problem-solving plan	Students can make a solution plan based on relevant theory
3	Implementing the problem-solving plan	Students can perform problem-solving based on the plan that has been made
4	Check and explain the results obtained	Students can evaluate and communicate the results of problem-solving

The data analysis technique is carried out by statistical tests on the test scores obtained by students. The statistical test used is the covariance analysis test (ANCOVA). Through the results of statistical tests, it will be known whether there is an influence of the integration of local potential in the problem-based learning model on students' problem-solving skills and biology learning outcomes.

In addition to the statistical test, the problem-solving skills test scores obtained by students were also analyzed using a formula according to Palennari et al. (2021) which is shown in Table 3 below.

Table 3. Criteria for Problem Solving Skills

Interval	Criteria
81-100	Very Good
61-80	Good
41-60	Good Enough
21-40	Less Good
0-20	Not Good

$$P = \frac{\text{score of each indicator of problem solving skills}}{\text{Maximum score for each indicator}} \times 100$$

3 RESULT

3.1 Problem-Solving Skills

Problem-solving skills were analyzed descriptively to find out the average score obtained by each sample class. The results of the descriptive analysis are shown in Figure 1 and Figure 2 below:

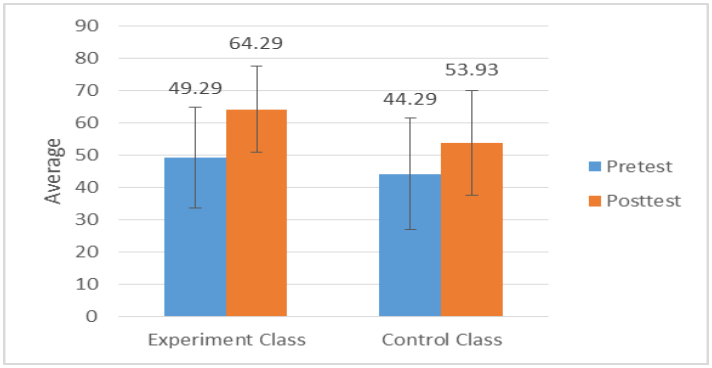

Figure 1. Average Problem Solving Skills Score

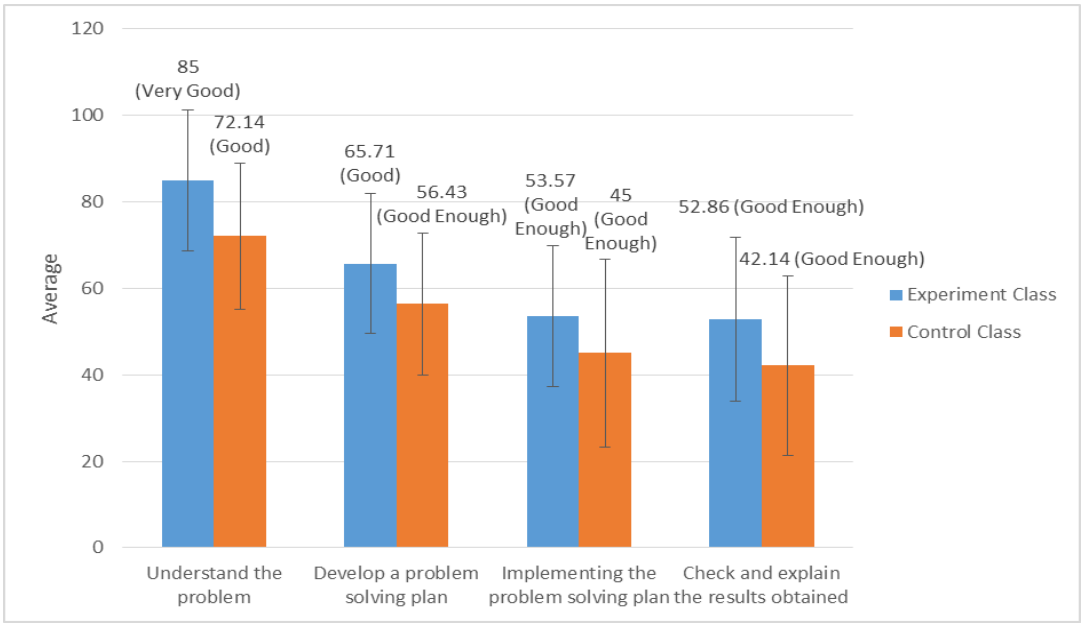

Figure 2. Posttest Scores Indicators of Problem Solving Skills

After descriptive analysis, the average score in the class that was given treatment (experiment) increased higher than that of the control class. The average score in the class given PBL treatment integrated with local potential (experiment) increased by 15 points after learning. Meanwhile, the average score in classes that applied the direct instructional (control) model increased by less than 10 points. The difference is also seen in the value of the problem-solving indicator. The class that was given the integrated PBL treatment with local potential (experiment) obtained the highest score of 85 with the category of very good after learning. Meanwhile, the control class obtained the highest score of 72 with the category of good after learning. After descriptive analysis, the test score was statistically tested by covariance analysis (ANCOVA).

Table 4. ANCOVA Test Results Problem Solving Skills

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	14386.964[a]	2	7193.482	189.629	.000
Intercept	3112.029	1	3112.029	82.037	.000
Pretest	12509.732	1	12509.732	329.772	.000
Kelas	661.722	1	661.722	17.444	.000
Error	2541.607	67	37.934		
Total	261484.375	70			
Corrected Total	16928.571	69			

The covariance analysis test (ANCOVA) obtained a significance value (sig.) of 0.000 < 0.05 which can be seen in table 4. The significance value obtained has met the criteria for the influence of the treatment given on the research sample. Thus, it can be concluded that there is an influence of the integration of local potential in the problem-based learning model on the problem-solving skills of high school students in industrial agricultural area.

3.2 Biology Learning Outcomes

The learning outcomes analyzed are the cognitive aspects of students in mastering the learning material. The analysis was carried out descriptively to obtain information about the average values of the two sample classes. The results of the descriptive analysis are shown in the following figure:

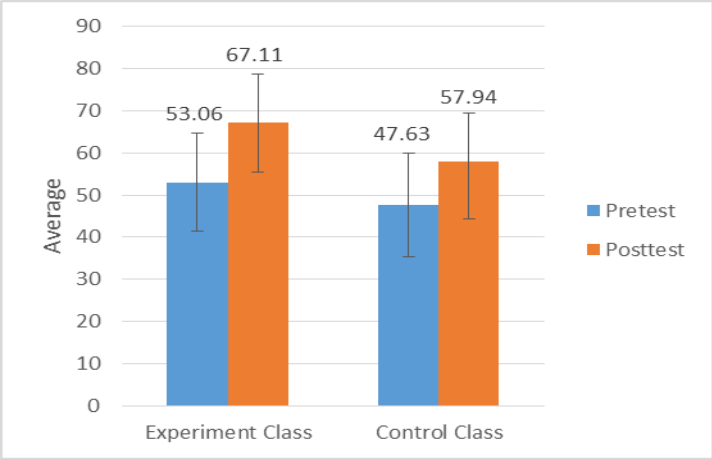

Figure 3. Average Biology Learning Outcomes Score

After descriptive analysis, it was found that the average learning outcome score in the treatment class increased higher than in the control class. The score in the class that was given the PBL treatment integrated with local potential (experiment) increased by 14 points from the initial average. Meanwhile, the score in the class that applied the direct instructional control (control) model increased by 10 points from the initial average. The students' scores were then tested with covariance analysis (ANCOVA) to determine the influence of learning on students' biology learning outcomes.

Table 5. ANCOVA Test Results Learning Outcomes

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	9711.324[a]	2	4855.662	119.338	.000
Intercept	1015.936	1	1015.936	24.969	.000
Pretest	8239.310	1	8239.310	202.498	.000
Kelas	295.720	1	295.720	7.268	.009
Error	2726.119	67	40.688		
Total	286125.000	70			
Corrected Total	12437.443	69			

The significance value (sig.) of the covariance analysis test in table 5 obtained was 0.009 > 0.05. The significance value obtained has met the criteria for the influence of the treatment given on the research sample. Thus, it can be concluded that there is an influence of the integration of local potential in the problem-based learning model on the biology learning outcomes of high school students in industrial agricultural areas.

4 DISCUSSION

4.1 Influence of Local Potential Integration in Problem Based Learning Model on Problem Solving Skills of Senior High School Students in Industrial Agricultural Area

The research conducted has proven that there is an influence of the integration of local potential in the problem-based learning model on the problem-solving skills of high school students in industrial agricultural areas. This is known from the results of the covariance analysis hypothesis test (ANCOVA) and descriptive analysis of the scores obtained by students. The covariance analysis hypothesis test (ANCOVA) produced a significance of 0.000 < 0.05. Descriptive analysis also showed that the average result of the class score given the treatment (experiment) increased higher than that of the control class.

The results in this study are in accordance with a number of studies on the integration of local potential in the problem-based learning model. The research of Fidia et al. (2024) shows the results of increasing students' problem-solving skills after learning local potential. The increase is due to the understanding of material that is easier for students to get through local potential. The research of Habellia & Suyanta (2021) also shows an increase in students' problem-solving skills after learning. During learning, students explore knowledge that builds thinking skills so as to improve students' problem-solving skills.

The integration of local potential during the research was carried out on the classification material of living things. Local potential that is integrated in learning is a phenomenon in natural resources in industrial agricultural areas. The main phenomenon discussed is in the form of pest attack problems and the need for fertilizer for plants. This local potential presented trains students to solve problems more easily. This is because problems are related to the life around students (Haryanto, 2018).

During learning activities, local potential is integrated in the implementation of the syntax of the problem-based learning model which can improve students' problem-solving skills. The first phase is the orientation of students to problems. Students are introduced to local potential problems that will be discussed. The second phase is student organization in learning. Students form several groups and begin to pay attention to information on local potential problems. This first and second phase trains students so as to improve skills on indicators of understanding problems (Helmi & Selaras, 2024). The increase occurred because the attractive and easy-to-find local potential stimulated students' curiosity so that they were willing and focused on participating in learning (Kuswari, 2021).

The third phase is individual and group investigation. Students explore information from various relevant sources so as to gain new knowledge. The fourth phase is the development and presentation of problem-solving results. Students create solutions based on information or knowledge that has been obtained and understood. The solution was prepared by discussing between group members. The third and fourth phases train students so that they improve their skills in the indicators of compiling and implementing problem-solving plans (Elvianasti *et al*., 2022). The improvement is due to the experience gained during learning with local potential making students accustomed to solving problems. Local potential also adds creativity in devising solutions because students already have knowledge about their environment (Arbiana *et al*., 2024).

The fifth phase is the analysis and evaluation of the problem-solving process. Students examine the solutions that have been prepared. The teacher also provided additional responses and explanations regarding the right solution to solve the problem of local potential. This fifth phase trains students so that they improve their

skills in the indicators of checking and explaining the results of problem-solving (Rahmadhani & Fauziah, 2024). The increase in skills in this indicator occurs because students have been able to consider the success of the solution with the right argument (Karmila *et al*., 2023).

The implementation of PBL syntax integrated with local potential is carried out with LKPD media and material modules that support the improvement of students' problem-solving skills. LKPD integrated with local potential can develop a number of thinking skills needed to solve problems. Skills such as critical, analytical, creative, and reflective thinking develop through the provision of materials and problems (Hayon *et al*., 2023). The development of these thinking skills improves students' problem-solving skills. Meanwhile, the material module integrates local potential, making the understanding obtained by students more in-depth because it is related to the surrounding natural resources (Dini & Rini, 2024). This understanding of material is then used by students to solve problems more easily.

The problem-based learning model used in the study has improved students' problem-solving skills through processes and activities during learning. The learning process is carried out by students by exploring information and developing solutions to the problems discussed. Students can solve problems by relating knowledge to the real situation they are facing (Kurniawati *et al*., 2019). The learning process also involves group discussion activities. During the discussion process, students can solve problems together thereby improving their skills (Riyani & Hadi, 2023).

4.2 Influence of Local Potential Integration in Problem Based Learning Model on Biology Learning Outcomes of Senior High School Students in Industrial Agricultural Area

The research conducted has proven that there is an influence of the integration of local potential in the problem-based learning model on the problem-solving skills of high school students in industrial agricultural areas. This is known from the results of the covariance analysis hypothesis test (ANCOVA) and descriptive analysis of the scores obtained by students. The hypothesis test of covariance analysis (ANCOVA) produced a significance of $0.009 < 0.05$. Descriptive analysis also showed that the average result of the class score given the treatment (experiment) increased higher than that of the control class.

The results in this study are in accordance with a number of studies on the integration of local potential in the problem-based learning model. Research by Muldayanti et al. (2020) obtained results in increasing student learning outcomes after learning with local potential. This increase occurred because students actively searched for local potential information so that they could understand the concept and meaning of learning. Nurhidayati's research (2019) also found results in increasing student learning outcomes. Familiar local potential adds interest in learning so as to improve students' skills in solving problems.

The integration of local potential in the problem-based learning model makes learning more interesting and adds to the learning experience of students so that learning outcomes increase. The problem of local potential from the environment makes students interested in participating in learning. Then students can become motivated to follow learning attentively or focused (Murti *et al*., 2024). During learning, students carry out local potential problem-solving activities presented in LKPD in groups. This activity increases student engagement so that they get a more meaningful learning experience (Firda *et al*., 2023). The experience gained improves student learning outcomes.

The problem-based learning model improves learning outcomes with a number of activities and material delivery through problem-solving. Problem-solving activities are carried out through analyzing, investigating, compiling, implementing, and evaluating problem-solving solutions. This activity makes the understanding obtained more meaningful so that it can be stored longer in memory (Saleh *et al*., 2023). Delivering material through the problems raised also helps students understand complex concepts. This is because the problems discussed can be witnessed in real life, making it easier for students to achieve an understanding of complex concepts (Putri *et al*., 2024).

The syntax in the problem-based learning model allows students' thinking levels to be higher so as to improve results after learning. The activity was carried out in groups. At the beginning of the discussion, students' critical and analytical thinking skills improve to understand the problem (Chen, 2024). Then the discussion continued to compile and determine solutions to the problem so that the improvement of students' creative thinking skills increased (Simanjuntak *et al*., 2021). At the end of the discussion, students conduct an evaluation so that their evaluative thinking skills improve. This improvement in various thinking skills improves student learning outcomes (Choerunnisa & Yani, 2024).

5 CONCLUSION

Based on the results of the research that has been obtained, it can be concluded that there is an influence of local potential integration in the problem-based learning model on problem-solving skills and biology learning outcomes of senior high school students in industrial agricultural area. This is proven by the ANCOVA test results with a significance (sig.) of < 0.05. This research is expected to be one of the references so that teachers integrate local potential in learning in order to improve students' problem-solving skills and learning outcomes.

Declaration by Authors

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