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Application of Problem-Based Learning in Biotechnology Learning Contains Local Potential Jruek Drien Aceh to Improve Problem-Solving and Self-Directed Learning Skills of High School Students

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Abstract: Mastery of 21st-century skills by students is very dependent on the education and learning process. This research aims to measure the increase in students' problem-solving and self-directed learning skills. One of the biotechnology lessons that highlights the local potential of Aceh's Jrek Drien which can be a solution to overcome this problem. The research method used was quasi-experimental with a nonequivalent control group design. The population in this study was class X (Ten) students with a research sample of two classes, experimental and control classes, the research sample was determined based on convenience sampling. Data collection instruments used a problem-solving skills description test and a self-rating scale self-directed learning (SRSSDL) questionnaire. The results of the research showed that students' problem-solving skills increased with an average gain score for the experimental group of 22.44, while for the control group, it was 15.00 with the N-gain score for the experimental group being in the medium category and the control group being in the medium category of 0.320. Meanwhile, the students' self-directed learning ability obtained an average score of 81.61 for the experimental group and 79.12 for the control group. Students showed a positive response to the implementation of problem-based learning containing the local potential of Jrek Drien in the good category. Based on the research findings and results, it is stated that there is a significant difference in the increase in learning outcomes of students' problem-solving skills and self-directed learning between the experimental and control classes.

Keywords: Local potential; Problem-based learning; Problem-solving skills; Self-directed learning ability

Introduction

Education is an important aspect of the development of a country. Every human being has the right to receive a proper education so that he can develop into a better human being. Learning is not only limited to getting knowledge from the teacher but also how students can form and discover their knowledge independently. Learning will be meaningful if the delivery is easy for students to understand. If they can interpret learning, students will likely care more about what they have learned (Sezek, 2013).

Based on observations carried out in February 2023 at one of the high schools in Southwest Aceh Regency, it is known that there are several obstacles in learning, namely that students are less enthusiastic during the learning process, they tend to be passive in completing assignments and doubt their abilities when the teacher gives questions to students tend to be passive, they do not want to answer questions from the teacher, even though they know the answer. There are

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still students who are embarrassed to ask questions and are embarrassed to express opinions because students are not completely confident in their abilities. Other obstacles include limited learning resources such as textbooks which are still limited, learning is usually carried out is still centered on the teacher students also do not receive practical teaching materials that can enable students to learn anywhere and anytime and the learning process which is carried out does not yet direct the participants. Students to be actively involved in learning activities. These obstacles have an impact on low learning outcomes so there are still many students who have not reached the KKM set by the school.

As a result of interviews with high school biology teachers in Southwest Aceh Regency, information was obtained that biotechnology material is one of the materials that is difficult to understand because students do not have a good understanding of the material. Based on interviews with students at the Southwest Aceh Regency High School, they were informed that they experienced limitations in understanding the basic principles of biotechnology and its implications for science, the environment, technology, and society. This material requires in-depth understanding but limited time makes it difficult for students to understand the material. Solutions to existing problems require innovative learning processes that are relevant and supported by appropriate learning resources so that the material is easy for students to understand.

One effort to overcome the grades of students who have not met the KKM (Minimum Completeness Criteria) is by choosing the right learning method. Learning that can connect academic content with real-life contexts so that it can arouse students' enthusiasm to participate in learning activities is problem-based learning. Problem-based learning is expected to involve real life which is not far from students' daily lives and this learning uses problems as the first step in collecting and integrating new knowledge based on experiences felt by students in real life (Addiin, 2014). Problem-based learning is a learning method that can be used to improve problem-solving skills. This method involves students in solving real problems that are relevant to everyday life. In problem-based learning, students will be given a complex problem and they must work collaboratively to find the right solution. The challenge faced in problem-based learning is a change in the learning paradigm. This method requires an active role from students in the learning process, so teachers must change their roles to become facilitators and guides (Bakhri et al., 2017).

Problem-based learning containing local potential is very important and very necessary in the world of education. Education containing local potential provides knowledge, skills, and behavior to students. So that they have broad insight into environmental conditions and community needs by applicable values or rules. Situmorang (2016) states that the many local potentials that are internalized in biology learning affect educators' ability to develop biology as a tool in presenting biological material that is appropriate to everyday life. Learning in schools should be supported by various facilities aimed at making it easier for teachers and students to achieve learning goals, including biotechnology teaching (Fitriani et al., 2017). In reality, the biotechnology material found is still textual and emphasizes the completion of the subject matter, not the achievement of student competencies.

Problem-solving skills are a process of searching for and finding the best answers and solutions for something that is not yet known and is an obstacle in combining the knowledge and abilities you have to apply them to the problems faced (Juliyanto, 2017). There has been a lot of research on how to improve problem-solving skills. Based on research, learning using Wikipedia as a source of information can improve problem-solving skills (Hizqiyah et al., 2022). This ability invites students to think about what problems will be researched, and make temporary assumptions about the problems presented, students are also invited to analyze the data obtained and conclude the results of the experiments they have carried out so that through these skills students can solve problems that occur (Supiyati et al., 2019).

In the learning process, Self-directed learning is needed, which is a learning atmosphere approach that requires students to be responsible for constructing their knowledge of a concept (Kayacan et al., 2019). Independent learning (self-directed learning) can be interpreted as the characteristics and attitudes as well as the abilities that students have to carry out learning activities alone or with the help of others based on their motivation to master a certain competency so that they can use it to solve problems they encounter in the real world (Scott et al., 2018).

The problem-based learning model is very useful in designing effective learning and therefore it has the potential to address learning needs (Ayu et al., 2013). Problem-based learning with local potential is one type of learning that is considered to be able to improve problem-solving skills, because students are not only required to understand content but also to be skilled at solving problems, which are related to the knowledge gained such as finding solutions and producing a product that has value, thus enabling students to be more active in the learning process, working together to solve a problem, learning becomes more challenging and enjoyable because the problems taken are problems that students know or have experienced themselves in their surrounding environment (Mungmachon, 2012).

Apart from being able to improve problem-solving skills, problem-based learning can improve students' self-directed learning abilities which includes how a student can optimize an individual's ability to adapt and learn quickly to the environment or surrounding circumstances. Therefore, based on the description of the problem above, researchers are interested in conducting this research.

Method

The research method used was quasi-experimental with a nonequivalent control group design. This design is almost the same as the pretest-posttest control group design, only in this design the experimental group and control group are not chosen randomly. In the experimental class, treatment will be given using problem-based learning and in the control class using practicum. This design includes groups that are observed at the pre-test stage and then continue with treatment and post-test.

This research will be carried out in the 2022/2023 academic year, starting from February to March 2023. The population in this research is students of X (Ten) High Schools in Southwest Aceh Regency. The reason for choosing this sample was because the school was one of the closest high schools to the selected local potential area. Samples were taken based on convenience sampling (a willing sample). The research instrument used was the Problem Solving Skills Test which was developed based on David and Johson in Sanjaya (2011).

Table 1. Research Design (Creswell, 2010)

Group	Pre-Test	Treatment	Post-Test
Experiment class	O_1	X_1	O_2
Control class	O_1	-	O_2

Information

O_1 : Pretest problem-solving skills before learning activities

O_2 : Posttest problem-solving skills and Self-directed Learning after learning activities

X_1 : Learning using problem-based learning contains local potential in Aceh

This test consists of 5 indicators but only 4 indicators were tested in this study which include defining the problem, diagnosing the problem, formulating alternative strategies, determining and implementing the chosen strategy, and carrying out evaluations. The data collection technique in this research is by conducting a pretest and posttest to measure students' initial and final abilities. The data analysis technique in the research is quantitative data using SPSS-26 to determine the normality test, and homogeneity test on the gain and N-Gain of the data. Quantitative data in the form of problem-solving skills test results were analyzed using statistical tests using the SPSS 26 application. Before the test results were analyzed, the results were first calculated using Equation 1 (Arikunto, 2016).

$$Value = \frac{Total\ student\ answer\ score}{Total\ maximum\ anwer\ score} x\ 100 \quad (1)$$

Descriptive statistical analysis aims to determine the average gain of problem-solving skills, standard deviation, and minimum and maximum values of students' problem-solving skills in the experimental group and control group. To determine the increase in problem-solving skills, gain and N-Gain were calculated on the results of students' problem-solving skills. N-Gain is a normalized gain that aims to avoid errors in interpreting students' gain (the difference between pretest and posttest scores). Then the N-Gain results are categorized into three categories

Table 2. N-Gain Value Category (Hake, 2002)

N-Gain Value	Information
N-Gain > 0.70	High
0.30 ≤ N-Gain ≥ 0.70	Medium
N-Gain < 0.30	Low

The results of the gain calculation on the problem-solving skills of students in the experimental group and the control group were tested first. The prerequisite test in this research aims to find out what hypothesis test to use.

Result and Discussion

Based on the data obtained from the pretest scores and post-test scores, it can be seen the comparison of problem-solving skills between students in the experimental group and the control group. The results of the descriptive analysis of the pretest and posttest data on the problem-solving skills of students in the experimental group and control group are presented in Table 3.

The results of the descriptive analysis of problem-solving skills show that the achievement of problem-solving skills of experimental group students is higher than that of the control group. This is due to differences in learning methods in the experimental group and the control group. The experimental group used Problem Based Learning containing the local potential of Aceh's local projects, while the control group used general practicum learning which is usually used in schools when learning Biotechnology.

Table 3. Descriptive Analysis of Problem-Solving Skill Scores

Descriptive Statistic	Pretest		Posttest	
	Control group	Experiment group	Control group	Experiment group
Total sample	30.00	30.00	30.00	30.00
Average	53.17	61.33	68.17	83.79
Standard deviation	7.89	10.24	8.56	7.90
Minimum value	32.00	48.00	38.00	58.00
Maximum value	72.00	83.00	80.00	97.00

Based on the results of students' problem-solving skills, the gain value was calculated to determine the increase in students' scores in the experimental group and control group. Then the gain value was statistically analyzed to determine the description of the N-Gain category for the experimental group and the control group. This aims to determine the differences in students' problem-solving skills from each indicator in the experimental group and control group students. The average gain in each indicator of problem-solving skills in the experimental group and control group is presented in the table.

Table 4. Recapitulation of Average Gain for Each Indicator of Problem-Solving Skills

Indicator of problem-solving skills	Control Group	Experimental Group
Defining the problem	19.40	18020
Diagnose the problem	15.60	24.40
Formulate alternative solutions	11.80	22.20
Conduct evaluation	13.40	24.90

Table 4 shows the results of differences in improving students' problem-solving skills in the experimental group and the control group. Based on the average gain on each indicator of problem-solving skills, the N-Gain value of problem-solving skills can be seen in Table 5.

Table 5. N-Gain of Experimental and Control Group Problem Solving Skills

Group	Criteria (%)		
	Low	Medium	High
Experiment	6.70	73.30	20.00
Control	50.00	50.00	0.00

Based on the data in Table 5, it can be seen that the N-Gain of the problem-solving skills of experimental group students in biology learning, students obtained a high category N-Gain of 6 students (20.0%) while students obtained a medium category N-Gain of 6 students. 22 students (73.3%) and 2 students (6.7%) obtained low category N-Gain. Meanwhile, in the N-Gain of the control group students' problem-solving skills in biology learning, students obtained a high category N-Gain of 0 students (0.0%) while 15 students obtained a medium category N-Gain (50.0%) %) and students obtained low category N-Gain as many as 15 students (50.0%). The following are details of the increase in each indicator of students' problem-solving skills in the experimental group and control group.

Defining the Problem

In the problem definition indicator, students are required to collect information about the problem being studied in the form of a problem formulation. This aims to make it easier for students to analyze the core of existing problems so that students will find it easier to solve specific problems. The results of the problem-solving skills test on the problem-defining indicators in the control and experimental groups are presented in Figure 1.

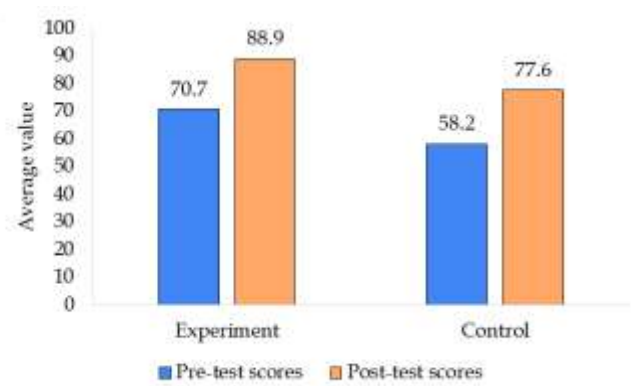

Figure 1. Average ability to define problems

The ability to define problems experimental group students got a pretest score of 70.0 and post-test 88.90, while control group students got a pretest score of 58.2 and post-test 77.6. Based on these values, the experimental group experienced an increase with a gain value of 18.20, while the control group experienced an increase with a gain value of 19.40. Based on the gain value, the increase in the indicator's ability to define problems in the control group was higher than in the experimental group.

The value of problem-solving skills in the indicator defining students' problems is categorized based on the average value and standard deviation in each class. This aims to determine the level of problem-solving skills of each student. Based on the results of the pretest categorization in the experimental class, it was found that 7 students were in the high category, 20 students were in the medium category and 3 students were in the low category. Meanwhile, in the posttest in the experimental class, it was found that 5 students were in the high category, 21 students were in the medium category and 4 students were in the low category. Furthermore, the results of the pretest categorization in the control class found that 3 students were in the high category, 22 students were in the medium category and 5 students were in the low category. Meanwhile, in the posttest in the control class, it was found that 5 students were in the high category, 19 students were in the medium category and 6 students were in the low category. Based on the results, although the improvement in the control class was higher than in the experimental class, the number of students in the medium category in the experimental class was greater than the number of students in the medium category in the control class.

Next, prerequisite tests are carried out, namely normality and homogeneity tests to determine the difference test between the two means used. Based on the pretest data, if the data is normally distributed and homogeneous, the post-test data will be tested using the paired sample t-test, while for pretest data that is not normally distributed and homogeneous, the posttest data will be tested using the Mann-Whitney test. The pretest results of the control and experimental groups showed that there were no significant differences, so continuing by using the Man-Whitney-test, the pretest and post-test results of the control and experimental groups were 0.000<0.05, meaning that H0 was rejected so it could be concluded that there was a significant difference between pretest and posttest in the experimental and control class indicators defining the problem.

The higher ability to define problems in the experimental group could be due to the learning method using Problem-Based Learning. This makes students more accustomed to analyzing the problems that exist in the surrounding environment so that students can understand the problems presented. Supiyati et al. (2019) said that problem-solving skills invite students to find various information to understand the problem given so that they can provide the best solution. Meanwhile, the control group was less able to find various information to understand the problem given.

Diagnose the Problem

The indicator for diagnosing problems is students' ability to analyze various supporting factors in solving problems. Students are required to analyze what causes the problems that occur so that this becomes a reference for students in finding solutions to existing problems. The results of the problem-solving skills test on indicators of diagnosing problems in the experimental group and control group are presented in Figure 2.

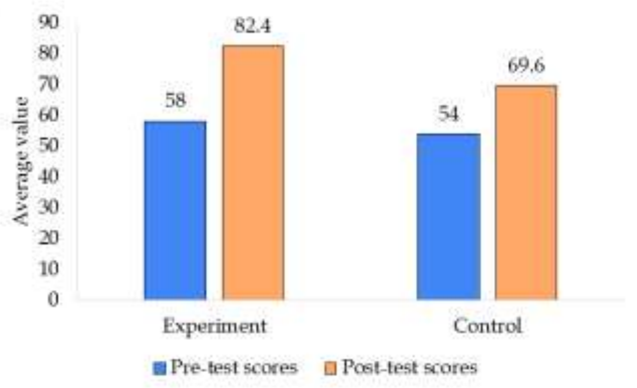

Figure 2. Average ability to diagnose problems

Through Figure 2 we can see that the ability to diagnose problems of experimental group students got a pretest score of 58.0 and posttest 82.4, while control group students got a pretest score of 54.0 and posttest 69.6. Based on this value, the experimental group experienced an increase with a gain value of 24.40, while the control group received a gain value of 15.60.

The value of problem-solving skills in the indicator for diagnosing students' problems is categorized based on the average value and standard deviation in each class. This aims to determine the level of problem-solving skills of each student. Based on the results of the pretest categorization in the experimental class, it was found that 5 students were in the high category, 21 students were in the medium category and 4 students were in the low category. Meanwhile, in the posttest in the experimental class, it was found that 7 students were in the high category, 21 students were in the medium category and 2 students were in the low category. Furthermore, the results of the pretest categorization in the control class showed that 4 students were in the high category, 21 students were in the medium category and 5 students were in the low category. Meanwhile, in the posttest in the control class, it was found that 6 students were in the high category, 17 students were in the medium category and 7 students were in the low category. Based on the results, there was an increase in the high category from pretest to posttest in the experimental class compared to the control class.

Next, a prerequisite test was carried out based on the pretest results of the control and experimental groups, showing that the data was normally distributed and there were significant differences, so it was continued by using the paired sample t-test, so the results in the experimental class were 0.000<0.05, meaning that H0 was rejected so it could be concluded that there were significant differences between the pretest and posttest in the experimental class and control class on indicators of diagnosing problems.

Based on this, it proves that students link the problems presented with problems that are occurring in the surrounding environment, namely the large number of losses caused by waste. This is in line with Anwar et al. (2013) that problem-solving teaches students to relate problems to real situations they have experienced. Based on this, students will easily remember the activities of the surrounding community which can influence environmental changes that occur. This is supported by research on problem-solving skills which reflect how far students have mastered the material because students are required to be able to analyze the causes of a problem and find ways to solve it (Guritno et al., 2016). The ability to diagnose problems is important because it affects the participants' abilities at a higher level. The ability to diagnose problems can help students apply concepts they have understood to familiar contexts in everyday life as well as help students determine new problems. Problem diagnosis is intended as a research activity, examining in depth the factors that cause problems to arise, and it is not enough to just look at the causal factors. For accurate problem-solving, various factors related to the problem can also be researched, including the consequences caused by the problem (Amirin, 1988).

Formulate Alternative Solutions

In the indicator of formulating alternative solutions, students must be able to express their opinions and argue about the actions in the form of solutions they provide to solve the problems provided. In this indicator, we can see how students' abilities are in analyzing problems based on the causes of the problem. Following are the results of the ability to formulate alternative solutions for the experimental group and control group students, presented in Figure 3.

Figure 3 above, shows the results of the problem-solving skills test on the indicator of formulating alternative solutions, experimental group students got a pretest score of 59.8 and post-test 82.0, while control group students got a pretest score of 52.0 and post-test 63.8. Based on this value, the problem-solving skills in the indicator of formulating alternative solutions for experimental group students have increased with a gain value of 22.20 and is the indicator that has experienced the highest increase, while for control group students it has increased with a gain value of 11.80 and is the lowest increase. This could be because students in the experimental group are more accustomed to analyzing problems compared to the control group so students in the experimental group are better able to provide alternative solutions to problem-solving problems.

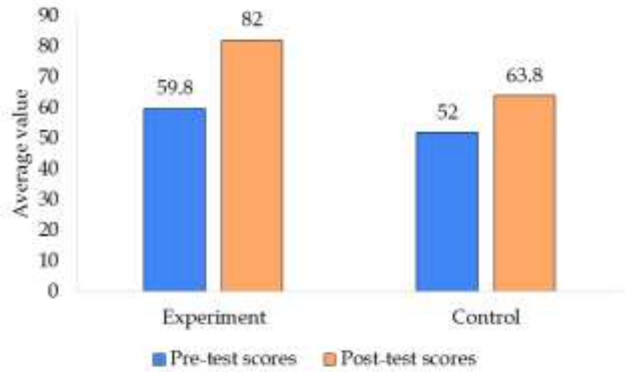

Figure 3. Average ability to formulate alternative solutions

Next, categorizing indicators formulate alternative solutions. Based on the results of the pretest categorization in the experimental class, it was found that 5 students were in the high category, 23 students were in the medium category and 2 students were in the low category. Meanwhile, in the post-test in the experimental class, it was found that 2 students were in the high category, 24 students were in the medium category and 4 students were in the low category. Furthermore, the results of the pretest categorization in the control class found that 4 students were in the high category, 23 students were in the medium category and 3 students were in the low category. Meanwhile, in the posttest in the control class, it was found that 7 students were in the high category, 18 students were in the medium category and 5 students were in the low category. Based on the results, although the improvement in the control class was higher than in the experimental class, the number of students in the medium category in the experimental class was greater than the number of students in the medium category in the control class.

Next, prerequisite tests are carried out, namely normality and homogeneity tests to determine the difference test between the two means used. Based on the pretest data, if the data is normally distributed and homogeneous, the posttest data will be tested using the paired sample t-test, while for pretest data that is not normally distributed and homogeneous, the posttest data will be tested using the Mann-Whitney test. The pretest results of the control and experimental groups showed that there were no significant differences, so continuing by using the Man-Whitney-test, the pretest and post-test results of the control and experimental groups were 0.000<0.05, meaning that H0 was rejected so it could be concluded that there was a significant difference between pretest and posttest in the experimental and control class indicators to formulate alternative solutions.

In this indicator of formulating alternative solutions, students will find alternative solutions themselves that will be given based on their thoughts using the abilities and information they have, according to Sujarwanto et al. (2014) who say that problem-solving skills are students' efforts to find various information by Use your abilities to provide the best solution to a problem. So that when students are faced with an environmental problem, students will be able to solve problems that occur in everyday life easily. As Rahman (2019) said, problem-solving is one of the skills that is needed in society. So through this, the integration of learning and problem-solving skills which are 21st century skills are very necessary. The 21st century does not only emphasize mastery of concepts but also certain skills such as high-level thinking which enables students to use their experience in solving problems (Setiawan et al., 2019). This is in line with Paidi (2010) that one part of the problem-solving process is decision-making, namely choosing the best solution from several available alternatives. In developing alternative problem-solving, a high mental process (thinking) is required and this mental process must be trained so that students can face the problems around them (Bakhri et al., 2017).

Conduct Evaluation

The indicator for conducting evaluation is the ability of students to evaluate the process and results of alternative solutions provided in overcoming a problem. In this indicator, students must be able to evaluate the best solution that can be provided and explain the reasons for choosing this strategy. The results of problem-solving skills on the indicators for evaluating experimental group students and control group students are presented in Figure 4.

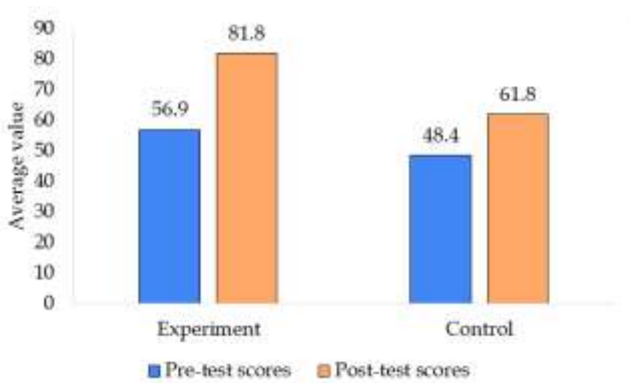

Figure 4. Average ability to carry out evaluations

Figure 4 above shows that the results of the ability to evaluate experimental group students got a pretest score of 56.9 and post-test 81.8, while control group students got a pretest score of 48.4 and post-test 61.8. Based on this value, the problem-solving skills in the indicator for evaluating experimental group students have increased with a gain value of 24.90, while for the control group, they have increased with a gain value of 13.40. Based on these values, the value of the ability to carry out evaluations in the experimental group experienced a higher increase compared to the control group. This could be due to the students in the experimental group understanding more than the control group about alternative solutions in overcoming problems as seen from the results on the evaluation indicators so that students in the experimental group better understand what constitutes a given solution.

Next, the indicator categorization carries out evaluation. Based on the results of the pretest categorization in the experimental class, it was found that 4 students were in the high category, 21 students were in the medium category and 5 students were in the low category. Meanwhile, in the posttest in the experimental class, it was found that 3 students were in the high category, 20 students were in the medium category and 7 students were in the low category. Furthermore, from the results of the pretest categorization in the control class, it was found that 5 students were in the high category, 18 students were in the medium category and 7 students were in the low category. Meanwhile, in the posttest in the control class, it was found that 6 students were in the high category, 21 students were in the medium category and 3 students were in the low category. Based on the results, although the improvement in the control class was higher than in the experimental class, the number of students in the medium category in the experimental class was greater than the number of students in the medium category in the control class.

Next, a prerequisite test was carried out based on the pretest results of the control and experimental groups, showing that the data was normally distributed and there were significant differences, so it was continued by using the paired sample t-test, so the results in the experimental and control groups were 0.000<0.05, meaning H0 was rejected so it could be concluded that there is a significant difference between the pretest and posttest in the experimental class and control class on the indicators of conducting evaluation.

In the evaluation indicator, students are invited to try to evaluate ideas, namely solutions formulated to a problem. This aims to build an attitude of responsibility and students' understanding of the solution given to a problem. Carrying out an evaluation means checking the answers again to see if they can be carried out well (Supiyati et al., 2019).

The research results found in this study have also been widely supported by other research findings. Research conducted by Simatupang et al. (2020) shows that the application of the Problem-Based Learning model has been proven to be able to improve students' problem-solving abilities, based on the results of hypothesis testing, it was concluded that the Problem-Based Learning model had a positive and significant effect on students' biological problem-solving abilities on pollution material environment. Meanwhile, Safithri et al. (2021) conducted research related to the influence of the application of problem-based learning (PBL) and project-based learning (PjBL) on problem-solving abilities based on students' self-efficacy. The results showed that there was an influence of the application of PBL and PjBL learning on solving abilities. Student problems. Problem-solving skills are one of the skills that participants must master. Students Greiff et al. (2013) states that problem-solving skills are part of the abilities and competencies that are very important and should be mastered by every student. Lismayani et al. (2017) added that the importance of mastering problem-solving skills in students can encourage the acquisition of new experiences through finding solutions in the problem-solving process. Furthermore, mastering problem-solving skills students will have a positive impact on various other skills (Yulianti et al., 2012). Based on the findings previously described, it can be concluded that activities in problem-based learning can improve problem-solving skills during learning. This can be seen from the increase in value at each phase of each meeting.

The importance of mastering problem-solving skills is students can compete globally and survive in the current era (Dewi et al., 2017). Therefore, students need to master problem-solving skills and abilities because these abilities can guide and encourage students to develop their theories, test their theories, test the theories of their friends, as well as evaluate and even discard if the theory they have prepared is inconsistent and continue by trying other things. Problem-solving skills are also explained as students' ability to use all the knowledge they have to carry out the problem-solving process, especially those related to everyday life (Hidayat et al., 2017). However, in reality, many studies have revealed that students' problem-solving skills in Indonesia are still relatively low. As research results revealed by Mustofa et al. (2016) show that the problem-solving skills possessed by students currently are not very satisfactory. This lack of problem-solving skills possessed by students must, of course, be overcome through various methods, including training students so they can improve their problem-solving skills, especially by getting used to the learning process of solving problems.

Indahsari et al. (2019) also found that students' problem-solving skills were still relatively low. In other research, it was found that the reality that is often found in schools is that students' problem-solving skills are still categorized as low (Nasution et al., 2022). Meanwhile, according to Nursyifaa et al. (2018), one of the causes of students' low problem-solving skills is the lack of innovation by teachers in classroom learning. Suryani et al. (2020) added that in the learning process, teachers rarely or never direct students to everyday problems related to students' lives and do not guide students to carry out problem-solving activities. Regarding this, Abdullah et al. (2022) also explained that the low problem-solving abilities of students are also caused by conditions where students are not yet routine and accustomed to working on questions related to problem-solving. The same thing was also explained by Sopian et al. (2017) that students were less able to solve problem-solving questions.

Various methods and models that are student-centered can be alternative meaningful learning options that can be applied by teachers. Especially in biology learning, as previously known, there are 3 essences of learning, namely product, process, and attitude. So learning cannot be separated from carrying out practicums experiments or project activities. So, during the implementation of the learning process, teachers are required to be able to find a solution for implementing practical and experimental activities. There are many models suggested in the independent curriculum to be applied in learning, such as problem-based learning and project-based learning. The models recommended above are learning models that can require student activity.

The Problem-Based Learning that students do is making the traditional Jruek drien food which is currently being abandoned by society. The basic ingredient for making Jruek drien is Durian fruit. In the process of making Jruek drien, students are given the freedom to design their procedures for making Jruek drien based on sources of information obtained by students.

Conclusion

Based on the results of the research, shows that students' problem-solving skills increased after implementing problem-based learning containing local Acehnese potential in Biotechnology material. The increase in students' problem-solving skills is shown based on the data results and the average gain and N-Gain for experimental group students who use the application of problem-based learning in learning which is higher compared to the control group.

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