Profile of Students' Problem Solving Ability Through the Application of Problem Based Learning Model on Environmental Change Material

Fitriah Rahmayanti Ismail[1,] Nurhayati, B [2,] St Fatmah Hiola [3]
[123]Biology Department, Universitas Negeri Makassar
Fitriahrhmayanti18@gmail.com

Abstract. This research aims to determine the problem solving ability of students through the application of the Problem Based Learning Model on the material of environmental change at the Semen Tonasa Senior High School. This type of research is descriptive quantitative. The subjects in this research were all students of class X SMA Semen Tonasa with a research sample consisting of one study group. The data collection technique used the test method with the type of essay questions. The data analysis technique used is descriptive statistical analysis by categorizing the value of each sample. The results showed that the student's problem solving ability on environmental change material at the SMA Semen Tonasa by applying the PBL model obtained an average score of 82.7 with a good category.
Keywords: Problem Solving Ability, Environmental Change Material

INTRODUCTION

National education functions to develop abilities and shape the character and civilization of a dignified nation in order to educate the nation's life, develop the potential of students to become human beings who are faithful and devoted to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens (National Education System No. 20 of 2003). The government also issued Minister of National Education Regulation No. 16/2007 on teacher qualification standards. In realizing good learning, teachers are required to be able to develop learning that is in line and in accordance with the times in order to achieve the expected learning objectives.

In accordance with Permendiknas Number 22 of 2006, in high school education units in learning biology has several objectives, among others: (1) fostering the scientific attitude of students; (2) students are able to develop experience in proposing and testing hypotheses through experiments; (3) students are able to develop the ability to think analytically, inductively, deductively and use biological concepts and principles; (4) students are able to develop the ability to master concepts and knowledge; (5) students are able to produce simple technological works; and (6) students play a role in preserving the environment. Based on some of these biology learning objectives, it can be interpreted that each

learner must be able to improve the ability in the knowledge aspect to develop the ability in the skills aspect including problem solving skills.

The problem-solving ability of students is influenced by an ineffective learning process that makes students passive. Students' learning behavior is strongly influenced by their learning motivation which also comes from the learning process built by the teacher in the classroom. Therefore, teachers are expected to be able to build an effective and conducive learning atmosphere by applying learning models and methods that are appropriate to the learning material. In addition to the use of inappropriate learning models and methods, teachers who have not been able to apply models and methods properly are also the cause of students' inactivity in learning. This is in accordance with the statement of Endang, Sari & Pratiwi (2021) that increasing the role and activeness of students and the ability to solve problems in teaching and learning activities is also influenced by the role of the teacher in applying the right learning model.

Problem Based learning (PBL) Model is a learning model that uses problems and issues in the form of facts which then students are directed to solve these problems and issues with the principle of cooperation (Rusman, 2014). Furthermore, Trianto (2014) explains that the PBL model facilitates the ability of students in various skills including problem solving, communication, cooperation and interpersonal skills. According to Maspupah, Alwahdah & Sa'adah (2020), the implementation of learning with the principle of daily life problem solving which emphasizes the ability of students to solve problems related to everyday life is needed. Furthermore, Afifah & Putra in Maspupah, Alwahdah & Sa'adah (2020), explained that the application of the PBL Model in biology learning makes students more active in teaching and learning activities

RESEARCH METHOD

This type of research is quantitative descriptive research. The subjects in this study were students of class X IPA SMA Swasta Semen Tonasa and the sample used was Class X IPA 2 obtained from random sampling. Collecting research data is done by giving written tests containing questions that have been prepared based on problem solving indicators. The question items used were 16 questions with essay type questions as shown in Table 1.

Table 1. Indicators of Students' Problem Solving Ability

No	Problem Solving Aspects	Indicator
1.	Defining the Problem	Finding facts related to the problem
		Determine the details of the problem including place, time and actors
2.	Examining the Problem	Identifying the problem
		Examine the causal relationship of the problem
3.	Plan Solution	Develop a problem-solving plan based on the problem
		Mapping sub-problems and sub-solutions
		Determine strategies to solve related problems
4.	Implementing the Plan	Making a list of problems to be solved
		Sequencing work steps related to the solution that has been made
5.	Evaluate	Estimating the results that will be obtained through the solution that has been made

The data that has been collected in the form of answers of each sample, then assessed by referring to the assessment guidelines, as presented in Table 2.

Tabel 2. Guidelines for Assessing Problem Solving Ability Using the PBL Model

No	Problem Solving Aspects	Indicator	Score	Description
1.	Defining the Problem	Mentioning facts related to the problem	3	If you write more than 1 fact correctly
			2	If you write 1 fact correctly
			1	If you write inaccurate facts
		Determining problem details including place, time and actors	3	If you write the right problem details
			2	f you write the details of the problem that are less precise
			1	If writing inaccurate problem details
2.	Examining the Problem	Identifying the problem	3	If you write the right subject matter
			2	If writing the main problem that is less precise
			1	If writing the main problem that is not correct
		Checking the causal	3	If you write the right causal relationship

No	Problem Solving Aspects	Indicator	Score	Description
		relationship of the problem	2	If you write the causal relationship that is less precise
			1	If writing the causal relationship that is not correct
3.	Planning the Solution	Developing a problem solving plan based on the problem	3	If you elaborate the problem solving plan coherently and correctly
			2	If describing the problem solving plan coherently and less precise
			1	If describing the problem solving plan coherently and incorrectly
		Mapping sub-problems	3	If you write the right sub-problems
			2	If writing sub-problems that are less precise
			1	If writing sub-problems that are not appropriate
4.	Implementing the Plan	Sequencing work steps related to the solution that has been made	3	If you make the steps correctly and coherently
			2	If you make the steps less precise and coherent
			1	If you make the steps incorrectly and incoherently
5.	Evaluate	Estimating the results that will be obtained through the solution that has been made	3	If you can estimate the results obtained logically based on the actions of the perpetrators
			2	If you can estimate the results obtained less logically based on the actions of the perpetrator
			1	If you can estimate the results obtained illogically based on the actions of the perpetrator

After the assessment, the data was then analyzed using descriptive analysis techniques. The analysis was carried out in the form of categorizing the data found based on the Wankat and Oreovocz Theory cited by Sari, 'Adna & Mardhiyana (2020) which is presented in Table 3.

Table 3. Categories of Problem Solving Ability

Score Range	Category
$N \geq 86,3$	Very Good
$72,6 < N < 85,3$	Good
$59 < N < 71,6$	Enough
$45,3 < N < 5\,8$	Deficient
$N \leq 44,3$	Very Deficient

RESULTS AND DESCRIPTION

Based on the research that has been done, the data is found as in Table 4 below

Table 4. Problem Solving Ability of Learners

No.	Statistics	Sample	
		Pretest	Posttest
1.	Number of Samples	21	21
2.	Highest Score	67	89
3.	Lowest Score	25	75
4.	Mean	45,8	82,7
5.	Mode	44	83
6.	Standard Deviation	11,6	3,7

Based on this table, it can be seen that the pretest mean score of 45.8 is in the very poor category while the posttest mean score of 82.7 is in the good category. The highest achievement on the prestest was 67 in the moderate category while on the posttest it was 89 in the very good category, then the lowest achievement on the prestest was 25 in the very poor category while on the posttest it was 75 in the good category.

The frequency distribution and percentage of problem solving skills on the pretest and posttest are presented in Table 5.

Table 5. Frequency and Percentage Distribution of Problem Solving Ability

Score	Category	Pretest		Posttest	
		F	%	F	%
85-100	Very Good	0	0%	8	38,09%
75-84	Good	0	0%	13	61,90%

Score	Category	Pretest		Posttest	
		F	%	F	%
65-74	Enough	2	9,52%	0	0%
55-64	Deficient	2	9,52%	0	0%
0-54	Very Deficient	17	80,95%	0	0%
	Total	21	100%	21	100%

Based on this table, it can be seen that the acquisition of students' problem solving skills on the pretest, the highest category achieved was the good enough category as many as 2 people, while the acquisition of students' problem solving skills on the posttest, as many as 8 people occupied the highest category, namely the very good category. It can also be seen that in the pretest students dominate the very poor category while in the posttest students dominate the good category as many as 13 people.

Based on the frequency distribution and percentage of students' problem solving ability, it can be seen that there is a difference in acquisition between pretest and posttest. The distribution of the acquisition of students' scores on the pretest is in the good enough to very bad category, while on the posttest the acquisition has increased to be in the good and very good categories.

The acquisition of pretest and posttest scores shows the difference in problem solving skills after and before learning using the PBL Model. The stage in PBL Model learning that most affects students' problem solving skills is the first stage, namely orienting students to the problem. At this stage the teacher orientates learning to students by proposing a problem or environmental phenomenon that is closely related to the lives of students, so as to increase the enthusiasm of students in participating in learning and stimulate students to think about the problems or phenomena proposed. In addition, another stage that affects the problem solving ability of students is group investigation. In small group discussions, students will more easily express their respective opinions to find solutions to the problems discussed, in this case students become more active in thinking and processing and analyzing information from group colleagues. In line with research conducted by Maspupah, Alwahdah & Sa'adah (2020) it was found that the PBL Model can help improve students' problem solving skills, due to the enthusiasm of students to take an active part in the learning process.

To find out the percentage of students' abilities based on each aspect of problem solving, it can be seen in table 6 below

Table 6. Problem Solving Ability of Learners Based on Problem Solving Aspects

No.	Aspects of Problem Solving	Percentage
1.	Identifying the problem	80%
2.	Checking the problem	96%
3.	Planning the solution	70%
4.	Implementing the plan	72%
5.	Evaluate	60%

Based on this table, it can be seen the largest percentage of students answering questions correctly is in the aspect of examining the problem of 96%. In this aspect there are 5 question items. While the lowest percentage is in the aspect of evaluating at 60%, with 2 questions. When averaged, the percentage of students' problem solving ability in all aspects is 76%.

The application of the PBL Model, involves students actively in understanding the concepts and principles of a material. This has an impact on the participation of students in learning so as to increase thinking activities. Learners are encouraged to understand a problem and find solutions by looking for additional information that can be obtained through reading activities, group discussions and also questions and answers that occur between teachers and students. The same thing was stated in the research of Supiandi & Julung (2016), that learning with the PBL Model provides flexibility for students to interact with teachers and fellow students. This has an impact on a better learning atmosphere because learning in the classroom is not fully controlled by the teacher so that students feel they have the responsibility to learn.

CONCLUSIONS AND SUGGESTIONS

Based on the research that has been done, it can be concluded that the problem solving ability of students before learning dominates the very poor category, but after learning has increased by dominating the good category.

Students' problem solving skills can develop with the help of the teacher's role in the teaching and learning process. Selection of the right learning model that is in accordance with the teaching material significantly affects the ability of students to think, especially in solving problems. Teachers are expected to be able to apply learning models and methods that can increase students' activeness in learning, so that students get a memorable learning experience and increase learning motivation.

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