Scientific Learning Materials of Measurement Liquid Density In Junior School Students, Bogor Regency, Indonesia

Nur Rizkiyah
University of Indraprasta PGRI Jakarta Indonesia
Email : qyetaman@yahoo.com

ABSTRACT

The purpose this study was to describe the scientific learning process for Biology lessons with material for measuring the density of liquids in 7th grade students of Yapa Middle School in Bogor Regency, West Java for the 2019/2020 academic year, secondly to find out whether there was an increase in learning outcomes in the use of discovery learning, the third was to find out whether there was an increase in learning outcomes in the use of Problem Base Learning learning. In this study, the experimental method of the type of One – Group Pretest-Posttest Design (One Group Pretest-Posttest) was used. It were processed using assumption, normality, homogeneity and t-test tests.The respondents were 45 at 7th grade students. The Scientific learning process at Yapa Middle School is quite good, especially Biology learning for 7th grade students. The teacher had invited students to think critically and learn to be independent and dare to be responsible for their own results. Students looked enthusiastic and eager to learn to find a solution and task.Discovery and Problem Base learning had their respective strengths and weaknesses. The results achieved in the use of Discovery Learning got an increase in value of 4.9624, while for Problem Base learning it was 1,243. So it could be said that discovery learning has a higher value than Problem base learning of 3.7194

Keywords
Scientific Learning; Discovery , Prolem Base, Learning

Introduction

The development of natural science education still needs to be encouraged and developed in Indonesia. Currently, natural science learning still needs to be improved. Learning is not only theory, it is still necessary to give students exploration space. A critical generation that does not necessarily accept the knowledge given but also understands the process of obtaining it (Sadiqin, I. K., et al., 2017). Learning to organize multiple sources of information, learning to learn from experience(experiential knowledge), dealing with the social dimensions of knowledge formation, learning to self-regulate the effort to learn, Carneiro, R. (2011). Excavation of material that is realized into practical learning is still lacking. The development of science, especially the subject of Biology still needs to be addressed. Biology subjects are products of natural knowledge in the form of facts, theories, principles and laws from the scientific work process Students often have difficulty in understanding biological material (Zulyusri, & Dana, N. R., 2019).
Furthermore, technology applications are still imitating knowledge from other countries. Implementation is still minimal, so learning outcomes are not optimal. Learning outcomes that are not optimal make students learn not optimally, both at school and at home. The teacher as a center for learning and learning as well as a motivator for students, must be creative and make effective learning breakthroughs for students. Professional teacher is able to manage learning well, has implications for increasing students' abilities in constructing their knowledgeand its application in everyday life. Winarsih, A., & Mulyani, S. (2012). However, obstacles are still encountered, some teachers are less updated to technology hence find difficulty in conducting the on-line classes (Kumar, R., 2021).
Various studies have shown that globalization era with the tight competition is really determined by the human resources(Yani, M. T., Setiawan, S., & Subagyo, A. A., 2021). The pattern of learning natural sciences should not only focus on aspects of knowledge (cognitive), but should emphasize the scientific aspect. There is a series of processes that can be done by students, and it is hoped that they can find a product of science. The pattern of learning in schools is encouraged to improve science, and apply it in solving a problem in everyday life. Students' ability in learning science (Biology, Physics and Chemistry) is influenced by the students' learning process in class. Good and qualified teachers are required to have pedagogical competence, have in-depth knowledge of science lessons and can package scenarioslearning

with various approaches and learning methods. Active, innovative, creative and fun learning methods (Prihatni, 2017)

A good learning process is to always invite students to explore and experiment in understanding science concepts. Creative teachers transfer knowledge without patronizing and saying at length. Students are more active and take advantage of existing learning resources. One approach that emphasizes the process of students is a scientific learning approach. In ministerial regulation number 103 2014 year, it is stated that scientific learning is practiced in the form of learning activities in which it states learning experiences in the form of observing, asking questions, gathering information, reasoning and communicating. To complement the scientific approach, it is recommended to apply discovery learning and project-based learning (Problem Base Learning), as part of a scientific learning approach, (Permendikbud No 22 of 2016).

Based on the description above, the researchers are interested in conducting research, the scientific learning process for junior high school students, especially grade 7 students at Dreiwanti Middle School, Bekasi, West Java, Indonesia. From the research discussion, several problems can be proposed, namely first, how is the scientific learning process in Biology lessons with material for measuring the density of liquids in 7th grade students of high school in Bekasi Regency, West Java for the 2020/2021 academic year?, second, is there an increase in learning outcomes in the use of learning? discovery learning?, second third, is there an increase in learning outcomes in the use of Problem Base Learning? The purpose of this study is to describe the scientific learning process for Biology lessons with material for measuring the density of liquids in 7th grade students of Yapa Middle School in Bogor Regency, West Java for the 2019/2020 academic year, secondly to find out whether there is an increase in learning outcomes in the use of discovery learning, the third is to find out whether there is an increase in learning outcomes in the use of Problem Base Learning learning

Literature Review

Scientific Learning

Scientific learning is a learning approach which means that ideas are used to achieve a goal, scientific means something that can be repeated openly by actors, within a certain spatial scale. Scientific learning can be done by the teacher by making a learning goal in the classroom. According to the instructions in the 2012 curriculum, it is said that learning objectives can be formulated in the form of competencies, which consist of core competencies and basic competencies. Scientific learning is an integral part of a pedagogical approach that follows scientific principles in classroom learning. This approach does not focus on competency development but can develop students' knowledge and thinking skills. Students are expected to be able to innovate and be creative optimally. The scientific approach can help teachers to identify differences in student abilities.

experiment, but also develop students' critical and creative thinking skills in innovating or creating. The scientific approach can develop students' attitudes, knowledge and skills. The scientific approach includes two patterns of reasoning, namely inductive reasoning and deductive reasoning. Inductive reasoningstarting from something particular (special) to something general, on the contrary deductive reasoning starts from statements that are general.

Learning Discovery Learning

Discovery learning is a learning model to expand students' active learning by finding their own, investigating, until the results obtained are long-lasting and not easily forgotten by students (Hosnan, 2014).

The stages of implementing Discovery Learning learning can be seen in the following chart:

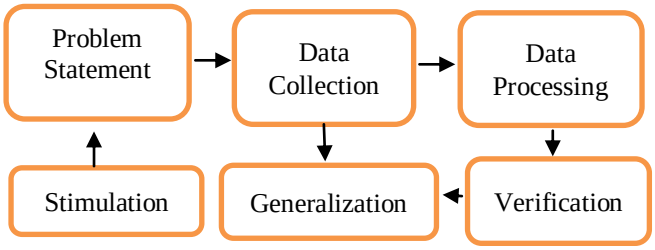

Figure 1. The stage of Discovey Learning

At the stimulation stage, students are given several questions and some things that will cause confusion. Then they will think, by looking for answers to these questions. Students are given the opportunity to find their own answers. At the data collection stage, students are given data by the teacher or students look for data on their own, or in groups. At the data processing stage, students are trained to do exercises on problems that have been given from the teacher, students can be assisted by the teacher in data processing. After the data is processed, students can check the data or results that have been processed, whether it is true or false.

In the generalization stage, each group reports their respective answers. Answers can be checked and discussed together with the help of the teacher. Conclusions are drawn after all groups give their respective answers

The Discovery learning model has several advantages, including, firstly, it can add to the student's learning experience, secondly, it gives students the opportunity to be closer to learning resources other than books, thirdly, exploring student creativity, fourthly increasing student confidence and fifthly increasing collaboration between students. Besides that, this method has several weaknesses, including students with low abilities, requiring extra attention. Teachers need more time to prepare for this method.

This method has the following objectives: Students are given the opportunity to be actively involved in learning:

a. Students can find abstract and concrete patterns
b. Students can formulate questions and answers, to obtain useful information
c. Students can help other students find answers, share information and hear other people's ideas
d. Some skills and concepts and principles that can be learned, so that it can help find something new and meaningful.
e. Skills that are built through case-finding learning situations, are easily transferred to new activities and the application of new learning situations.

Problem Based Learning (Problem Base Learning / PBL)

This learning is a learning model that presents problems that arise in everyday life. This method gives students the opportunity to work in groups to find solutions to problems. Problems are given to arouse students' curiosity. Cooperative learning is a teaching and learning strategy that emphasizes shared attitudes or behavior in working or helping each other in a regular cooperative structure in groups, consisting of two or more people (Juita, H. R., & Widiyarto, S.2, 2019)

This method has several characteristics and students are trained to think critically and find solutions.

This method is a learning approach that tries to apply problems that occur in the real world. With this, students will be trained to think critically and find solutions. There are six characteristics, including:

a. Early learning begins with giving a problem.
b.There is organization and discussion of problems.
c. Students are given a big responsibility to carry
out the learning process
d. Learning activities begin with giving a problem.
e. Students are required to demonstrate the performance that has been learned

The learning process of discovery learning can be summarized in a chart below:

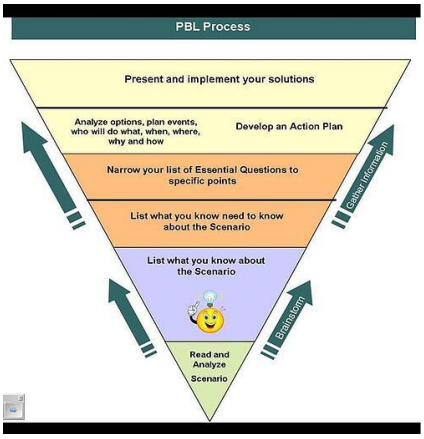

Figure 2. The learning process of discovery
Source :pinterest.com

In the early stages students read and analyze a scenario. The scenario in question is the student material, or the learning sequence process based on the material. In the second year students make a list of what is known about the material or scenario that has been read or studied. The third step is still the same, students are given a second time to make a list of known scenario material and then students filter the material, into something more special and important than the material. At the final stage the students are expected to analyze, develop and carry out problem solving steps, at this stage the students implement all plans and solutions. Steps to Use the Problem Base Learning Model The operational steps in the learning process of the Problem Base Learning learning method conceptualized by the Ministry of Education and Culture of the Republic of Indonesia are as follows:

1. Basic Concept
2. Defining The Problem
3. Self Learning
4. Exchange Knowledge
5. Assessment

In this chart, it explains, giving the problem to the solution that must be done by students.

Figure 3. The learning process of Problem Base
Source : pinterest.com

Methodology

In this study, the experimental method of the type of One – Group Pretest-Posttest Design (One Group Pretest-Posttest) was used. There is no comparison group in this study. The treatment that will be taken there are 2 learning methods, namely problem-based learning methods and discovery learning methods. The

results of the two methods are compared which one is lower and which one is higher between the two methods. The respondents were 45 7th grade students of SMP Yapa Bogor, West Java, Indonesia.

Table 1. *One – Group Pretest-Posttest Design*

Group	Pretest	Treatment	Postest
Experiment Class	O1	X	O2

Information:
O1 : Pretest score
O2 : Posttest score
X : Treatment
The instrument used in this study was 50 multiple-choice test questions about the material for measuring the density of liquids, both in the pretest and posttest. The second instrument is the result of observation. The results of observations want to see student responses when using problem-based learning methods and discovery learning`
The data collection method used is the method of observation, interview, pretest and post test. Observations were made when the researcher first came to Dreiwanti Middle School. Data collection techniques are observations, interviews, documentation, and field notes (S Widiyarto, et al., 2021). Interviews were conducted before and after learning to teachers and students. The test was carried out before and after the use of Discovery and Problem base learning. The data was processed using the SPSS 20 program. Before the data was processed, the data were processed using assumption, normality, homogeneity and t-test tests.

The researcher made notes and documentation when the Biology subject teacher gave material in the classroom. The method used in the class is the Scientific approach method. The researcher gave several questions regarding the preparation made by the teacher. The researcher observed directly the teaching and learning process in the classroom. The teacher uses several props such as measuring cups and controller tools. Both tools are used to see the process of measuring the density of liquids. The process can be described in the following chart:

Result and Discussions
The researcher made notes and documentation when the Biology subject teacher gave material in the classroom. The method used in the class is the Scientific approach method. The researcher gave several questions regarding the preparation made by the teacher. The researcher observed directly the teaching and learning process in the classroom. The teacher uses several props such as measuring cups and controller tools. Both tools are used to see the process of measuring the density of liquids. The process can be described in the following chart:

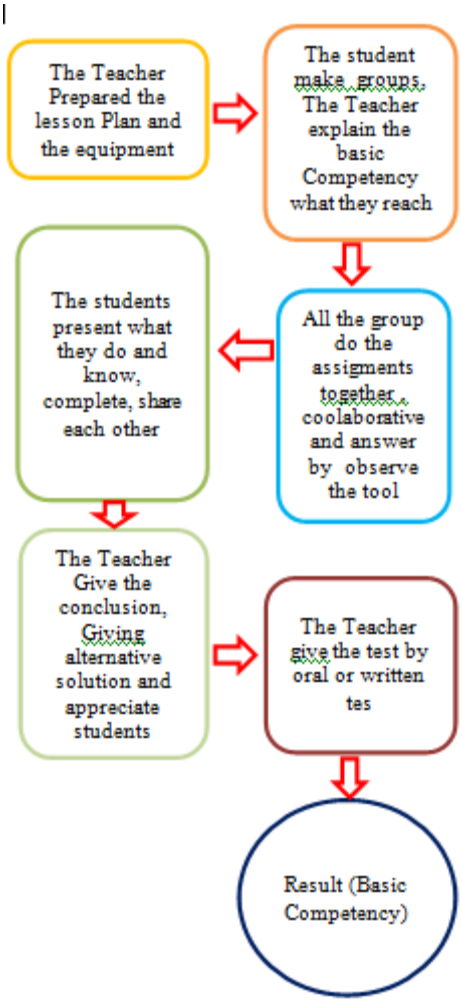

Figure 4. The learning process of Scientific
Source : pinterest.com

In the figure 4, above is the process of teachers teaching in the classroom. One of the characteristics of synthetic learning is that learning relies on students. The teacher is only a motivator and facilitator. The process of collaboration between students appears and does not appear to be the smartest students, they work together for a goal, either looking for solutions or finding answers to a competency to be achieved. The teacher during the learning process prepares several learning tools such as a controller equipped with a liquid density measuring sensor:

Figure 4. The Props Design(Microcotroller)
Source : Private Document

Figure 4. Mass Meter
Source : Private Document

The researcher processed the pretest and posttest data of the 45 students. The results of the normality assumption test, both using discovery learning and problem base learning, are summarized as follows:

Table 2. Normality Test Results on Discovery Learning and Problem Base Learning

No	Problem Base Learning	Discovery Learning
1	Pretest Sig. 0.651	Pretest Sig. 0.565
2	Postet Sig. 0.320	Postetst Sig. 0.474

The table above shows the value of Sig. on the learning value of Problem Base Learning (PBL) and Discovery Learning above 0.005. Each PBL value, Sig. 0.65 > 0.005. for the value of Sig. learning Discovery Learning, Sig. 0.565 > 0.005, Based on the above value, it can be said that the data is normally distributed.
After completing the normality data assumption test, it continues to the homogeneity test. The results of the homogeneity table of Problem-Based Learning (PBL) data are:

Table 3. Test of Homogeneity Variences of Problem Base Learning

	Levene Stastic	df1	df2	Sig.
Pretest Score	2.382	1	28	0.071
Postest score	2.231	1	28	0.052

In the table of output results of the test of homogeneity of variances, it can be seen that the value of sig. 0.211 > 0.05 at pretest and Sig. 0.142 > 0.05 so Ha is accepted, meaning that the variance of the two groups of data is homogeneous

Table 4. Paired Sample Test of Problem Base Learning

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Score_before_PBL	70.9131	45	6.34126	1.68211
	Score_after_PBL	72.1561	45	6.51937	1.73372

.The table above shows the values before problem-based learning (PBL) and learning after Problem-Based Learning. Value before
used Problem Base Learning of 70,9131, while after the use of Problem Base Learning of 72,1561. This means that there is an increase of 1,243. Problem Base Learning contributes and increases learning outcomes in the liquid mass measurement material in the 7th grade Biology lesson at Dreiwanti Middle School, Bekasi City, Indonesia. These results are in line with the results of research conducted by Udiyah, I. N. M., & Pujiastutik, H. in 2017, stating that Problem Solving learning can improve the problem solving ability and activeness of students through the stages contained in the learning process. This learning model can be more optimal in improving learning outcomes and student activeness when followed by good classroom management by teachers and planning of mature learning. Likewise, the results of Prakoso, B. A. K. (2015) research entitled Improving Problem Solving Skills and Biology Science Learning Outcomes Through the Application of Problem Based Learning (PBL), this method can improve problem solving skills and students' biology science learning outcomes.

Conclusion

From the discussion above, it can be concluded that scientific learning is one of the effective learning approaches and includes modern learning in this century. Learning focuses on humanistic, collaborative and innovative aspects. The Scientific learning process at Yapa Middle School is quite good, especially Biology learning for 7th grade students. The teacher has invited students to think critically and learn to be independent and dare to be responsible for their own results. Students look enthusiastic and eager to learn to find a solution and task.

Discovery and Problem Base learning have their respective strengths and weaknesses. The results achieved in the use of Discovery Learning got an increase in value of 4.9624, while for Problem Base learning it was 1,243. So it can be said that discovery learning has a higher value than Problem base learning of 3.7194

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