The Influences of Problem Based Learning Accompanying Analyze Case Study Toward Scientific Literacy of Students

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Info Article	**Abstract**
	Biology learning process in SMA N 1 Slawi generally still oriented to the cognitive learning, yet oriented to develop students' scientific literacy skills in context aspects, competence, knowledge, and attitudes of science. This research aimed to describe the effect of the of Problem-Based Learning accompanying Analyze Case Study to develop scientific literacy of students of grade X SMA N 1 Slawi. The research was a quasy experimental research used non-equivalent control group design. Sampling techniques was purposive sampling method, which the grade of X MIA 3 as the control class and X MIA 6 as an experimental class. This data research is data scientific literacy test results, student activities, student respons, teacher feedback, and adherence to learning. scientific literacy test data were analyzed using t-test and test of N-gain. The results showed that learning to use the PBL to Analyze Case Study on experimental class significant to the control class scientific literacy test results analysis, t test showed t_{count} 4.28 > t_{table} 1.996 with significance level of 0.05 so it can be seen the difference in the increase the results of the second study classes. Test N-gain in the low category to high, the experimental class has a percentage of 94.12%, 65.71% while the control class. The t-test average score of N-gain with t_{count}5 > t_{table} 1.996. Analysis of experimental class student activity is higher than in the control class with the percentage of 84% for the experimental group and 71% of pupils to grade control included in the criteria fairly active and active learning activities. Based on the results of this study concluded that the application of the model of Problem Based Learning to Analyze Case Study positive effect on students' scientific literacy skills.

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INTRODUCTION

The specific objective of curriculum 2013 is that students have the necessary competence to people's lives in the present and in the future (Kemendikbud, 2016). Competence in education will serve as a bridge to keep pace with the development of science and technology, so as to create quality human resources. Qualified human resources can be achieved through sound scientific education based on the ability of scientific literacy (Preczewski, et.Al,2009). In fact, according to the Ministry of Education (2014) the current condition of education in Indonesia, which includes students' scientific literacy skills, are at a very low position. This is reflected in the results of mapping the Program for International Student Assessment (PISA) 2015 that shows the position of Indonesia ranks 62 out of 69 countries. The results of the mapping of TIMMS also showed that the literacy test results of students Indonesia in 2011 currently on preingkat 40 of the 42 countries participating.

The results of observations conducted in SMA Negeri 1 Slawi also showed that the learning process of biology in grade X is still emphasis on the knowledge and understanding of the material made by the method of lecture, discussion, and question and answer, not oriented to the development of students' scienctific literacy skills. In the learning process of students tend to listen, memorize and copy the contents of the learning material provided by the teacher without understanding the meaning and application. As a result, students scientific literacy skills in aspects of science and knowledge science attitude is still low. This is shown by the fact the lack of evaluation data showing the ability of students scientific literacy.

From the results of interviews conducted with the biology teacher in grade X SMA Negeri 1 Slawi, also obtained information that students have difficulty in understanding the concepts that exist in the material changes in the environment, as well as the lack of activity of students in the learning process. while students are required to be active in analyzing and solving problems through scientific work underlying principles in developing the literacy skills of science. This is a priceless of student learning success rate is still low at only 57.1% of students were able to exceed the minimum completeness criteria (KKM). Therefore, the strategy needs to involve students to work actively solve problems in groups and work scientifically in order to develop scientific literacy of students.

One of the models and learning strategies that provide opportunities for students to find their own knowledge and participation in learning so that they can understand the concept well and develop their scientific literacy skills is a learning model Problem Based Learning (PBL) with Analyze casestudy. PBL is a study initiated by the problems created by the students themselves (Bound & Feleti in (Barbara, 2001). The material changes in the environment is a material that has characteristics very close to everyday life, presenting the problem through the material changes in the environment is able to provoke students to develop analytical skills and problem solving of students included in the ability of scientific literacy. This is because the purpose of PBL is to provide opportunities for students to develop the skills to think, solve problems, learn independently and develop social skills (Arends, 2008). PBL also play a role it is important to train students to understand and master the concepts of learning so as to have the ability of scientic literacy (Rizqiana., etal,2015).

in addition to the model of learning, teaching and learning activities accompanied by learning strategies Analyze case study which is a support strategy in the viewer an issue that is more specific in PBL belonging to the active and case-based learning, in this strategy the teacher gives a case to students, then students were asked to discuss and analyze the cases filed (Hosnan, M., 20014). PBL as an effort to improve the scientific literacy of students corroborated by the research of Ardianto & Rubini (2016) who obtained the result that two of the three indicators of the ability of scientific literacy (identify issues of science, and the use of scientific evidence) percentage competence of science students with the application of PBL is superior with the application of Guided Discovery.

Putri, A., et al (2014) also proved that there is influence of PBL local potential based on the ability of students' scientific literacy. Romlah, et al (2013) also proves that there is a significant increase in learning outcomes after SETS visionary case based learning.

Based on the background and the fact that shows that teachers have not been implementing PBL learning model with Analyze case study in learning, then conducted a study evaluating the students' scientific literacy skills through the PBL approach to Analyze casestudy.The title of this research is "The Effect ofLearning Model Problem Based Learning Accompanying Analyze a case study toward scientific literacy of students.

RESEARCH METHODS

This study was conducted in the second semester of the academic year 2016/2017. This type of research is quasi-experimental research with non-equivalent control group design. The sample used is X MIA 3 and X MIA 6 were determined by purposive sampling. Data collected in the form of prime data and the second data. The main data of the form-gap score of post-test and pre-test to measure students' scientific literacy through test questions in narrative form. The second data form of adherance of learning PBL with Analyze case study, student activities, student and teacher responses. Adherance of learning and student activities taken during the learning takes place by the observer, while the student and teacher responses taken after learning through student questionnaires and interviews to teachers. Learning is done in the experimental class in accordance with PBL syntax that is (1) to orient the students in case of problems (global and local environmental changes); (2) organize students to examine; (3) assist in the investigation of individuals or groups; (4) develop and present results; (5) analyze and evaluate the results of the troubleshooting process, while learning the control class with a lecture and discussion. Analysis of the data in this study quantitatively the results of students' scientific literacy test. The data used is the difference between scores of pre-test and post-test were then performed t test and N gain after fulfilling the prerequisite test is test of normality and homogenity.

RESULTS AND DISCUSSION

This study aimed to describe the influence of Problem Based Learning (PBL) with Analyze Case Study on students' scietific literacy skills gained from the data difference score of post-test and pre-test.The value of the post-test was used to determine the increase in outcomes after being treated, while the value of the pre-test aims to determine the level of prior knowledge of students before administration of learning activities. Scientific literacy test results are presented in Table 1.

According to Table 1, it is known that the average difference between scores the post-test and pre-test students' scientific literacy test results of the experimental class (13.5) is higher than the control class (9). Differences in average results of both classes due to the experimental class using learning Problem Based Learning to Analyze case study,while the control class discussions and lectures on the lessons. During the experimental class students learning directed to solve the problems of the given case through investigative activities in groups, aided by LKS and logbook to facilitate students in conducting the investigation. The problems that are presented in the form of contextual issues in the environment of students determined in accordance curriculum 2013 revision about changes in the environment. Indirectly students are taught to practice good scientific literacy skills on aspects of context, competence, knowledge and attitudes.

Table 1 Results of scientific literacy test

Source Variations	Class	
	Control(X Mia 3)	Experiment (X Mia 6)
Value *Pre-test*		
Rated	63	61
Lowest Rated	33	33
Average	47	49.4
Value *Post-test*		
Rated	77	88
Value lowest	40	60
Average	62.8	73.5
difference score *Post-test* and *pre-test* Rated	17	24
lowest Rated	1	3
Average	9	13.5

Issues presented from the environment around the students themselves can provoke interest and curiosity of students because it is contextual and in accordance with what happened to students directly, so that students can identify a wide range of questions as the formulation of the problem to be forwarded as a scientific study. Thus the students become more meaningful knowledge and scientific literacy skills can be developed. As a result, the difference in scores of post-test and pre-test experimental class is higher than the control class. This is consistent with the opinion Wulandari & Sholihin (2016) which states that learning is able to arouse the curiosity of students related to the topic of learning and encourage students to solve the problems presented teacher believed to be capable of building science process skills that are part of the aspect of the competence of scientific literacy. Then the data is tested prerequisite that normality and homogeneity test.

Based on the analysis of normality test results both experimental class and control class indicates that the significant level of 5%, obtained by $X^2_{count} < X^2_{table}$, meaning scientific literacy test results of students in experimental class and control class are normally distributed. In the calculation results of the homogeneity test students' scientific literacy test results of the experimental class and control class shows that the 5% significance level. Obtained F_{count} (1.31) $< F_{table}$ (3.841), it can be concluded that the experimental class and control class have the same variant or Homogeneous. This indicates that the data are normally distributed, so that further wear parametric statistical test.

Table 2 Test t the average difference in students' scientific literacy test resultsdifference scores *post-test* and *pre-test*

Class	Average	Dk	t count	t table	Description
Experiments	13.5	33			There is significant differences
Controls	9	34	4.28	1.996	

Test t do to further strengthen the assumption of differences in scientific literacy test results in which the better classes to determine which method is more influence on the improvement of students' scientific literacy test results. Based on Table 4, the results obtained by t test$_t$ (4.28) is greater than t$_{table}$(1.996). The t test results showed that there were significant differences in students' scientific literacy test results between the experimental class and control class. So it can be stated that learning with Problem Based Learning to Analyze case study berperngaruh against students' scientific literacy skills. This is in accordance with the statement Asyhari & Hartai (2015) that study of constructivism is

able to condition the learners to terlibata katif in the learning process through a series of scientific method, so that students can use the knowledge to solve specific problems in real life and can indirectly improve scientific literacy students. Learning through PBL that requires students to be able to solve problems(problemsolving)also canprovide opportunities for students to build their own knowledge, so that the knowledge acquired into more meaningful (Ristiasari, 2012).

Implementation of PBL with Analyze case study follows the learning steps PBL from Arends (2008), which consists of five stages or syntax learning is to orient students on the issue, organizing students to examine, assisting with the investigation independently and groups, develop and present the artifacts and the exhibit, as well as evaluating the problem-solving process. The research was carried out in accordance with the stages of PBL according Arends (2008), with the first stage students oriented to the issue or case studies on global environmental change and environmental changes in the district of Tegal, the provision of the existing problems stimulate students to bring a wide range of questions as the formulation of the problem, and serve as the basis for carry out scientific work, which is the first step to develop the literacy skills of science, especially in the aspect of competence. This is consistent with research Maurer & Neuhold (2012) which states that the issues presented can stimulate students to identify a wide range of questions that can be posed as a definition of the problem so that students can identify the questions that may be passed as a scientific study.

The second stage in the application of PBL models with Analyze casestudy,teachers organize students or grouping students into five groups according to the number of existing cases, this phase is still in progress at the first meeting. Teachers guide students to identify environmental problems received by each group by making a formulation of the problem, hypothesis, the purpose of the investigation, and how they get the data. Student worksheets that comes equipped with sheets of "Need to Know Sheet" to develop scientific work sheet to write a draft investigation plan investigations to be carried out, and the logbook must be filled every student perform exploratory activities. In the organizing phase, students are required to create a draft of the investigation, when drafting the investigation, students should know what students will do the investigation, how do they get the data, as well as any information that students need in advance to get the data. Through the drafting of these investigations, students can build the appropriate science concepts to solve problems, and to develop the ability to evaluate and design a scientific discovery which is the point of aspects of competence in scientific literacy is the ability to explain the phenomenon scientifically. This is consistent with research Yew et al (2010) which states that through the drafting of the inquiry will help the students to recall concepts they already have, so that students will choose the appropriate science concepts and in accordance with these problems.

The drafting of the investigation were made through worksheets that have been shared that it will also include sheets*"neeedto Know Sheet"* contains *"What do you already know*" that must be addressed students on the concepts that have been known in advance about the existing problems in the discourse, *"What do you want know* "isthe purpose of the investigation to be conducted, as well as*"What do you do* "ishow the students to find solutions to the problems, how to get the data, the things they need for research. Based on the*"Needto Know Sheet"* made by students during study shows that the initial knowledge of students was limited to metal waste, garbage, sewage know, mining, air pollution can harm the environment, but they have not been able to explain the extent of the damage, and why can happen. Thus the student wants to know the impact of waste, mining and air pollution to the environment as well as solutions that can be used to overcome these problems by interviewing local residents to place their environmental pollution.

Sheet *"Need to Know Sheet"* This helps students to connect the initial scientific concepts that they have learned previously with things they need to do so that it can collect new information. This is consistent with the statement in dahar Ausubel (2011) that the adjustment between the old concepts and new information make student learning more meaningful. Through sheets of *"Need to Know Sheet"*

students can also develop aspects of knowledge, because through the sheet *"Need to Know Sheet"* is, students are required to capture a science concepts early known students, and connected with things to do in order to obtain new information , This is in accordance with Rustaman statement (2004) that the aspect of scientific knowledge, students need to capture a number of key concepts or esensisal to be able to understand certain natural phenomena and changes that occur as a result of human activity.

The third stage model of PBL is helping independent investigative and groups. This stage takes place at a second meeting for two hours and continued lessons outside school hours. at this stage the students reported some of the things that they have learned after the preliminary observations made by one of the students who lived close to where the pollution, then the teacher helps the student to be able to conduct an investigation in greater depth, based on the results of preliminary observations of the teachers and students know that there is a point of investigation of pollution that has been carried out action response activities by communities around the government and the group of waste pollution in the village knew Pesarean, therefore in this group of teachers asking members of groups has to be able to investigate more deeply how management activity waste pollution knows conducted by community around, and if they have a negative effect on the surrounding community. The investigation and the division of labor each group varies, depending on the plan that has been made by each group eg interviews, literature, and direct observation. Each group is equipped with *a logbook* that they have to complete in accordance with the activities carried out by each group,function *logbook* is to facilitate the monitoring of investigations carried teacher student, especially if the investigation takes place outside of school hours.

Investigation activities undertaken by students at this stage can train students to increase their scientific literacy skills in aspects of competence, because at this stage the information and evidence available from the students used as a basis for making conclusions in the form of a solution of the problem. This is in accordance with the statement Toharudin *et al* (2011) which states that the aspects of science competency refers to the mental processes involved when answering a question or solve a problem. Investigation activities can also help students to find their own knowledge, so that learning becomes more meaningful. This is in accordance with the statement Susilowati (2013) that the investigation activities provide direct experience and an opportunity for students to be able to construct his own knowledge to give students the opportunity to pour the ideas on the project is done so that the knowledge obtained by the students more meaningful because students are directly involved in learning.

At this stage students also can develop the literacy skills of science in terms of attitude aspects of the science, evidenced by the idea of solving the problem of students through the collection of evidence and information, the idea of solving the problem is evidence that students are able to apply the knowledge of science and technology for the benefit together. This is in accordance with OECD (2006), which states that one purpose of science education is to develop the student's attitude that makes them interested in scientific issues and then acquire and apply knowledge of science and technology for the benefit of the personal, social, and global. Involvement of students in learning is through investigative activities have also been able to prove that students can develop literacy skills in terms of attitude aspect of science, it is in line with the statement of Huang *et al* (2012) that one of the factors that affect the results of the study scientific literacy is the attitude aspect of science related to emotional factors that include interest and the convenience of studying science and the involvement of students in learning science. The existence of a direct involvement of students in learning activities also can provide meaningful experiences for students so as to improve students' understanding of the material being studied, and the learning outcomes for the better. investigation and presentation activities can provide meaningful experiences for students so that students' learning gained more beneficial for the students involved in learning activities.

The fourth stage of PBL is to develop and present the artifacts and the exhibit.This stage takes place at the third meeting. At this stage the teacher helps the student to display the results of their investigations in the form of reports, photographs, videotapes, and presentation to others. Each group received 10 minutes for presentation and 5 minutes for discussion. At this stage, students are trained to communicate the conclusions of the solutions they find and reflect the impact of the development of science and technology to the general public, it is because at this stage the students were asked to explain the solutions they chose to address environmental problems, based on data and evidence has been students gain from investigative activities. At this stage, students are also given the assignment to create a poster which is then disseminated through social media instagram regarding environmental areas that have their investigation in the form of an appeal to preserve the environment, through these activities students are able to develop the ability of scientific literacy in this aspect of the attitude of science is the attitude of concern for the environment.

The fifth stage of the model PBL is to evaluate the problem solving process. Students together with teachers perform analyzes reflect on the processes that have been used to find solutions to environmental problems that exist around their lives. Teachers also clarifying student questions unanswered and the answers of students who are less precise. At this stage it will form a concept in the minds of students on the knowledge they learn, understanding the concept will also be embedded with a well when students actively participate in learning activities. it is in line with the statement Setyaningrum (2015) which states that the understanding of the concept of the student will be embedded more strongly when students undertake project activities that involve students actively in learning.

N-gain test is performed to determine the increase in students' scientific literacy test results before and after being treated. Based on Figure 1, the test results of N gain shows that most ssiwa the experimental class in the category ofenhancement N gain high(88.24%), while the control class most students fall into the category of an increase inN the gain medium(65.71%) , The high increase scientific literacy test results because the experimental class students learning model. PBL learning to Analyze Case Study helps students to find their own concept to be learned. The role of teachers as facilitators who megarahkan and guide students during the learning process, so that the learning outcomes of students scientific literacy test experimental class is better than the control class. In line with research conducted by Rizqiana, et al (2015), that PBL able to train students to understand and master the concepts in learning so that learning becomes more meaningful and student discount scientific literacy. The test results of N gain can be seen in Figure 1 below.
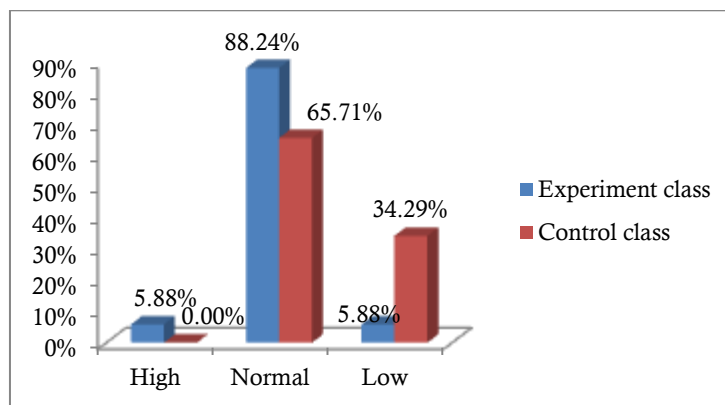

Figure 1 The result of N-gain test experiment class and control class by PBL with
Analyze case study

It is also comparable to many of the activities of students during the learning process such as discussions, presentations, investigative activities and assignments that make learning more meaningful. In line with the opinions Wahyuni etal.,(2013) that students with high learning activity have better learning outcomes than students with low learning activity. Thus the students' scientific literacy skills can be developed through the investigation by identifying the problem and then be able to explain the phenomena of science, as well as finding the facts that are then used to determine the attitude to be taken in dealing with a problem.

Measurement of adherence to PBL with Analyze case study was conducted to determine how high the level of adherence to lesson plans have been prepared and know how big an impact on the scientific literacy test two mean difference in this study. The enforceability of the level can be seen in Table 3.

Table 3 Results adherance of learning level categorization PBL with Analyze case study about environmental changes in SMA Negeri 1 Slawi

Meeting	Adherence Value of Learning	Criteria
1	90%	Very high
2	95%	Very High
An average	of 92.5%	Very high

Based on the results of this research is that adherance of PBL to Analyze Case Study included in the category of a very high 92.5%. The adherance of learning can be seen from (1) the teacher gives contextual questions, (2) guide the students on the issue, (3) grouping students, and (4) guide students to investigate. In addition, visible also from (5) students who stand to answer questions, (6) the students discuss, (7) the students planned investigative activities, (8) students presented the results of discussions and investigations, and (9) the extent to which students understand the material already taught.

A series of learning activities in the learning PBL to Analyze case study make students more motivated and eager to learn, so the spur students in learning activities. The higher activity of students, making the knowledge becomes more meaningful so that student learning outcomes can be improved. This is one cause of the high average value of the posttest and the average gapscores posttest and pretest in both classes. It fits the opinion of Moraes and Castellar (2010) which states that the presentation of the problem through learning PBL able to make learning more interesting and significant for students and teachers, which is directed at improving student learning outcomes.

Based on the description of the discussion of the cognitive learning can be obtained the characteristics of PBL learning namely, (1) contextual learning that promote student independence to be able to build his own knowledge, and directs the learning centered on student or student centered learning, (2) is active to trigger the involvement of students deeper in terms of process beajar, (3) training cooperation both among students, (4) train the sense of responsibility with the ideas expressed during the learning process and the tasks assigned, (5) increase the interest and curiosity of students during the learning process. Assessment of student activity aims to determine the level of activity of students during the learning process. Activities of students in research that have been implemented include activity in the attention of teachers, skills answered questions, observe presentations, discussions, presentations, and making inferences. Recapitulation of activity analysis control class and experimental class are presented in Table 4 as follows.

Table 4 observations every aspect of student activity during two meetings

No.	Indicator	Percentage (%)	
		Control	Experiment
1.	Taking into teacher	80	96
2.	Answering questions	62	82
3.	Noting presentation	72	83
4.	Delivering opinions and ask	76	85
5.	activeness of students in the discussion	76	83
6.	activeness of students in the presentation	64	82
7.	Making conclusion	62	80
	Average (%)	70	84
	Criteria	Enough Active	Active

Based on the results of the activity of research data on the active criteria experiment grade students had an average higher than 84% in the control classes (experimental class) and 70% (control group). Learning is said to be influential if the results of the experimental class student activity is better than the control class, so it can be concluded that learning with PBL to Analyze Case Study material changes in the environment affect the students' science literacy skills. This is because learning to use the PBL to analyze case study invites students to active learning. During the learning process of students seemingly enthusiastic following study, for PBL with Analyze case study is student centered learning and has several advantages including increased student activity, forming the right concept, working in small groups, and attract the attention of students. The enthusiasm of the students because students have never implement PBL to analyze case study previousas well as students are challenged to be the best group at the time of presentation. Activities that are effective in learning and guidance in accordance with the scientific method to train the ability of the process of science. Agree with Wulandari (2015) that the learning activities to encourage the students to enhance their curiosity so high that motivate students to improve ketertarikannnya on scientific issues that allow it to be investigated through the steps of the scientific method and increase the sense of responsibility of students to the surrounding environment with applying science concepts they have learned.

The results of student responses obtained through the administration of a questionnaire distributed to students at the end of the experimental class learning at the last meeting only in the experimental class. The analysis showed that the average percentage of students achieving 92% with the criteria very well. Based on the reason the questionnaire, an outline of the students better understand the material because they have to actively build their own information, make hypotheses and connect one concept and the concept of the other, communication patterns established during the learning process between teacher and students and between students getting help students to understand the material as a whole and form a concept based on the examples presented. It is influential to develop students' science literacy skills, evidenced by the analysis of posttest the averagewith experimental class is higher than the control class. As for the response of teachers, in general, teachers give positive feedback to the learning PBL with Analyze casestudy.Teachers responded that applied learning activities are able to optimize the activity of students in learning activities. During the learning activities of students play an active role both in discussions and presentations. The results of students in applied learning also showed optimal results. Application of instructional design is able to create more learning activities are well organized and make student learning more meaningful to students construct their own knowledge. Students' science literacy skills can be developed through investigative activities provided.

In addition to providing feedback, the teacher also gave advice on the design of applied learning. For the implementation of the design in future learning teacher gives advice to the division of investigative groups divided according to the area of location of residence of students, so that students can investigate not far from where she lived.

CONCLUSION

The conclusions of this research is learning by using Problem Based Learning to Analyze Case Study showed significant differences compared with the group using the teaching methods lecture and discussion on the scientific literacy of students on material changes in the environment. In particular, the conclusion of this study is the application of the model of Problem Based Learning to Analyze Case Study to develop the ability of scientific literacy in students of SMA Negeri 1 Slawi showed significant differences compared with the control class that implements learning with lectures on material changes in the environment, so learning to use the model of Problem Based Learning to Analyze Case Study to contribute better to the scientific literacy test results on the students of SMA Negeri 1 Slawi.

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