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Implementation of project-based learning to the ability of scriptural literates on high school student IX grade

Implementation of project-based learning to the ability of scriptural literates on high school student IX grade

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Abstract. This research uses an experimental method which is aimed to know the difference of science literacy ability toward science-based model based learning project on hydrolysis material and buffer solution. This research was conducted in SMA Negeri 2 Salatiga. Design The research used is Pretest-Posttest Control Group Design. The sample used is two classes chosen by cluster random sampling technique. Methods of data collection in the form of documentation, observation, and test methods. The project work done by the students in the making of shampoo from rice husk. The data obtained were then analyzed using the N gain and t-test. The result of gain normality test obtained average science literacy ability of post-test result increased 0,77 and 0,69 with the high category in experiment class and while in control class. In addition, t-test analysis showed that the tcount of 3,660 is greater than ttable 2,002 with 5% significance level which means there is a significant improvement difference between experiment class and control class. In addition, the determination coefficient test obtained the value of 0.6 with the category of the influence of Project Based Learning Model is strong. Based on the results of the analysis can be concluded that the application of Model-Based Learning on the ability of science literacy is more significant than the Conventional Model.

1. Introduction

The education system must be able to print generations that have a broad and intellige[3] insight in understanding the phenomena in the natural environment. The purpose of the state on the national education system is contained in Law No. 20 of 2003, namely "Education is a conscious and planned effort to create an atmosphere of learning and learning process so that students actively develop their potential to have religious, spiritual power, self-control, personality, intelligence, noble character, as well as the skills needed himself, society, nation, and state [1]. The revelation shows that learning outcomes involve activeness and enthusiasm for students to achieve learning objectives.

Student Activity and enthusiasm can be improved through a scientific approach. This approach emphasizes the attitude of a scientist be actively involved in solving the problems faced. This effort encourages a student to be able to do more not only to follow the learning but to participate actively in teaching and learning activities. Students who have an active attitude will be curious to seek information either through referrals or teachers directly. This will assist students in finding the whole concept independently. Mastery of this student concept will assist students in completing the evaluation provided by the teacher. Sani (2014) states that quality education certainly involves students to actively learn and direct the formation of values that students need in life [2]. Students should be equipped with the ability to learn throughout life, learn from various sources, learn to work

together, adapt, and solve problems. The statement revealed that students' activeness could make learning more qualified and influence student learning outcomes.

Based on observations in SMA Negeri 2 Salatiga obtained that the percentage of students who have not reached the KKM in the middle semester repeat of 70.9%. This percentage data indicates that students' knowledgeability is not satisfactory, this can happen because the learning process has not been innovated. Learning innovation like the science process is necessary because it can enable students and create two-way communication. One of the most dominant issues in the education world is in the learning process has not prioritized the process of science as its foundation. According to Nurhadi & Senduk statement, the main problem faced by the education world is the quality of education, especially the quality of the scientific process that is still very low [3]. This shows the quality of national education, especially learning that prioritizes the process of science or called science literacy is still very far from expectations.

The data of literacy ability of science in Indonesia is still very low. According to PISA (Program for International Student Assessment) in 2012 shows the average science literacy of 382 students with an average of 501 and is ranked 64 of 65 participating countries [4]. While in 2009 the PISA survey results show the average science literacy of Indonesian students amounted to 383 with an average of 501 and ranked 59th out of the 65 participating countries [5]. The latest results in 2015 show the average science literacy of 403 students with an average of 493 and are ranked 62 out of the 70 participating countries [6]. These data indicate that there is a decrease in the rank or decrease in the level of science literacy in the learning that leads to learning only stops on theoretical. Whereas effective learning is done directly.

The data is then followed up by researchers with field observations. The researcher asked a few questions with Chemistry subject teacher, Nur Rohmah related to chemical science learning process on the subject of buffer and hydrolysis solution which has been applied in SMA Negeri 2 Salatiga not yet fully involving science literacy experience especially students' science process skill directly. This leads to aspects of science literacy which include aspects of conceptual knowledge, application of concepts in certain contexts, science process skills, and students' science attitudes have not been achieved optimally. In the case of concept applications in the context have not been seen during the learning process. Constraints faced by the teacher is in conducting practicum activities is time and also limited material available in the laboratory. Application of literacy in SMA Negeri 2 Salatiga already exist, but only limited literacy reading and not yet applied in the learning process. Selection of this material because it is a material that has a low daily test value, in addition this material has many examples of phenomena in everyday life.

Based on these problems needed a solution to provide learning with practice directly and associate the material learned with daily life so that students get involved actively and enthusiastically in the process of teaching which one of them is science-based literacy. Science literacy made students able to explain scientific phenomena using scientific evidence. Learning model that supports one of them is Project Based Learning Model.

The Selection of Project Based Learning Model is because the model of learning can improve the four aspects of science literacy, i.e. content, attitude, process, and context. Research on Model-Based Learning Project to improve students 'literacy ability of science is according to Mahanal on colloid material mentioned that the implementation of project-based learning in SMAN 2 Malang can improve students' attitude toward river ecosystem by 11.65% compared with conventional learning [7]. Other studies have demonstrated that project-based learning on colloid materials can improve student achievement and student creativity thereby improving the quality of learning [8]. In addition, the Project Based Learning Model is also implemented by Sutikno (2013) to improve students' understanding of daily life (context) that learning chemistry can be used for entrepreneurship and benefit society [9]. The products or the results of learning applied by Sutikno include nata de coco, handwash and goat's milk. This learning attracted entrepreneurship interest of 84.62% of the total A & B Industrial Chemistry class students. Similarly Winarti (2014) on project-based learning to improve the skills of the scientific process in this case skilled at doing laboratory work, the improvement

occurred in the first experimental class of 59.2% to 70.8% and second experiment class from 58.32% to 69.2% [10]. Based on the research, it is expected that the Project Based Learning Model is expected to be used to increase the students' science literacy.

The purpose of this research is to know the difference of literacy ability of science students between experiment class and control class with application of project-based learning model

2. Methods

This research was conducted at SMA N 2 Salatiga on hydrolysis material and buffer solution. This research is experimental research with Pretest-Posttest Control Group Design. Samples were selected by cluster random sampling technique, obtained by class XI IPA 1 as an experimental class and XI IPA 2 as control class. In the experimental class applied Project Based Learning Model based on science literacy, while in control class applied Conventional Model with practice method.

Research instruments that support data collection in the form of (1) a matter of pretest - post test description amounted to 11 questions with reliability of 0.75 and validity stated valid by the validator, (2) observation sheet aspects of science attitude with reliability of 0.75 and validity declared valid by validator, and (3) observation sheet of science process aspect with reliability equal to 0,75 and validity stated valid by validator.

The data obtained were then analyzed by using quantitative descriptive analysis technique in the form of t-test, N gain test and Coefficient Determination test on average literacy ability of student science.

3. Results and Discussion

The data obtained in this study is the ability of students' science literacy (attitude of science, content, process, and context).

The number of students involved in this study was 30 students from grade XI IPA 1 (as an experimental class) and 30 students of grade XI IPA 2 (as control class).

Based on the results of the analysis test, there are differences in the model-based learning science-based project-based learning that has been applied to the students' literacy skills. The following are details of each aspect of science literacy.

3.1. Aspects of Content

The results of the analysis have been done that the average value of the post-test experimental class is greater than the control class. It can also be seen from the result of t-test of the post-test grade of a control class and experiment class, with significance level 5% and dk = 58, hence obtained t_{count} = 3,660 and $t_{(0,95)(61)}$ = 2,002. The result of the calculation is obtained $t_{count} > t_{(0,95)}$, so it can be concluded that there is an improvement of literacy ability of science students between control class and experiment class which is significant that student value of experiment class is better than control class.

The N-gain test states that the science literacy ability of the experimental class is higher than the control class, where the experimental class is 0.77 with the high category while the control class is 0.69 in the medium category. In addition the test coefficient of determination obtained at 0.6 with strong influence category. Based on this it can be said that the application of Model-Based Learning Group in the experimental class affects the ability of science literacy is more significant than the control class. The results of students' literacy skills regarding content can be seen in Table 1.

Based on Table 2, it shows that the Project Based Learning Model based on Science Literacy can have a good effect on students' knowledge (content). From the analysis that has been done, the results obtained that seven of the eight indicators show the percentage of the experiment class number is greater than the control class. Model of Project Based Learning is constructed or build its knowledge independently, in this research the students try to find or explore information about making shampoo husk rice project from the internet and then discuss to the group before finally in asking truth to the teacher. This process will train students to find their initial concepts of students in studying hydrolysis materials and buffer solutions. Making shampoo project assignments from their rice husks do yourself with a group of friends so they can argue each other to solve or complete the project in cooperation.

The direct experience made by the students in making the shampoo will make the students' concept of the buffer material stronger so that the students better understand the material they are learning. Therefore, the application of Project Based Learning Model based on Science Literacy in experimental class shows seven out of eight indicators higher than control class with Conventional Model assisted project task.

Table 1. Percentage data of student content capability

Indicator	Percentage	
	Control Class	Experiment Class
Analyzing buffer and not buffer solution through experiment	76%	81%
Calculates the pH or pOH of the buffer solution	71%	80%
Calculates the pH of the buffer solution with the addition of slightly acid or slightly alkaline or by dilution	76%	92%
Describe the function of buffer solution in the product they are working on	63%	67%
Describe the phenomena associated with buffer solutions present in everyday life	63%	67%
Determine some types of salts that can be hydrolyzed in water through experiments	98%	94%
Determine the hydrolyzed salt properties of the ionization reaction equation	84%	91%
Describe the phenomena associated with salt hydrolysis in daily life	80%	88%

The study is in line with Yance (2013) Students with Model-Based Learning Project to familiarize themselves with the concept of physics through a given project; they are given the freedom to find sources that can help the project either through a literature study [11]. Therefore, it is clear why PjBL can improve students' physics learning outcomes. Another opinion by Insyasiska (2015) Project learning can showcase better conceptual mastery than students who are facilitated by conventional learning [12]. Students will easily master the conventional concept. Students who have mastered the concept of an object will be easier to apply in solving the problem. A concept can be formed through direct experience with objects or events in life, through visual images, and meaningful words and the process is all visible on project learning. In addition, project-based learning encourages students to learn to solve problems. Students are required to seek and obtain relevant information related to project tasks. This will enhance students' understanding and skills [13].

3.2. Aspect of Attitude

Based on the analysis result obtained the average attitude of science students of experimental class students by 74% with good criteria. Detailed results can be seen in Table 2.

Tabel 2. Percentage data of students' attitudes on science

Indicator	Percentage **Experiment Class**	Criteria
Difficulties in chemical matter	70%	Decent
Interest in chemistry	78%	Decent
Other benefits for the future of students	73%	Decent
The importance of chemistry for student life	76%	Decent

Based on Table 2, it shows that the application of Project Based Learning Model based on Science Literacy can affect students' science attitude. The analysis was conducted on four science literacy

indicator of science attitude aspect namely chemical difficulty, interest in chemistry, other benefits gained for student's future and chemical importance for student's life. Based on the results of the analysis obtained the result that students' interest in chemistry reaches 78% and difficulties in the chemistry of 70% in following the lesson. The model of project learning by making shampoo from rice husks is new for students and make students curious in following the learning process. Students will be more interested in studying chemistry and automatically eliminating difficult mindsets in studying chemistry.

In addition, other attitudes that researchers see are the benefits and the importance of chemistry for students in a row is 73% and 76% of the good category. The Project Based Learning model helps students to discover the benefits of the items around them to make them more useful for example shampoos from rice husk they have been working on. Students are taught to use what is around well through this learning model and is expected to be able to be transmitted at home to educate the environment. In addition, with the practice of making this shampoo, students will better understand the importance of chemical roles to students in particular and society in general.

This is supported by Susanti's (2013) opinion that project-based learning is effective for improving students' scientific attitudes [13]. Students gain new experiences from project activities on how to process food, and from that experience, students can shape their attitude, according to what Azwar stated as quoted by Susanti (2013) that attitudes can be formed one of them by experience and learning activities in educational institutions [13].

3.3. Aspects of Process

Based on the results of the analysis that has been done, the average value of science process skill of experiment class students is 80% with Very Good criteria while control class is 60% with Good criteria. It shows that science process skill of the experimental class with Project Based Learning Model based on Science Literacy is better than control class with Conventional Model. Details of students' literacy skills regarding process can be seen in Table 3.

Tabel 3. Percentage Data of Science Process Skills

Indicator	Percentage	
	Control Class	Experiment Class
Scientific questions identification	67%	79%
Explain Phenomenon scientifically	63%	80%
Use of scientific proofs	62%	85%

Based on table 3, shows that the Project Based Learning Model based on Science Literacy influence the students' science process skills. There are three indicators of science process skill studied that is the identification of student scientific question, explain phenomenon scientifically, and use scientific evidence. Here is an explanation of each indicator.

First, identify students' scientific questions. The PjBL model helps students to explore or search for information related to making shampoos from rice husks from the internet and with their groups discussed to identify problems and find solutions for project work. Second, the ability to explain the phenomenon scientifically. Once students can find the information correctly, they do the project correctly and the results obtained are communicated in the form of a preliminary presentation or preliminary report. This process will help the students to finalize the initial concept when identifying a problem from the project. Third, using scientific evidence. The making of the final report as a result of the practicum activity is discussed to a group of friends based on references to existing research. In addition to helping students better understand the material done can also be a reference that can be accounted for.

These three indicators indicate that the Literacy Science Based Project Based Learning Model can improve students' science process skills. The results of this study are in accordance with research by Falahudin (2016) that project-based learning makes students more active in following the learning process and able to learn independently in completing project tasks resulting in increased skills of students' science processes [15]. in line with that opinion Project-based, laboratory-centered, student-centered learning by direct practice plays an important role in creating relationships with everyday life, enabling students to understand lessons, realizing learning knowledge, and developing students' psychomotor (process) skills [16].

3.4. Aspect of Context

The most prominent aspect of science literacy is the aspect of context or the link between matter and everyday life. Based on the results of the analysis presented in Table 3 above, it can be seen that the experimental class students in explaining the phenomenon use scientific evidence better than the control class. This is because the Project Based Model Learning based on Science Literacy put forward in the explanation of the material and its relation in daily life, students during the learning process given insight by the teacher related to the material of hydrolysis and buffer solution in everyday life as well as the relation of shampoo project from rice husk they work with the buffer material they learn. This process will make students feel chemically important to live and interested in studying chemistry extensively. In line with research conducted by researchers, according to Hayati (2013) Project-based contextual learning is a learning concept that links between material taught to real-world situation so that learning will be more meaningful [17].

In addition, the experimental class has a better contextual attitude than the control class. Contextual attitude data of students based on observation sheet of experiment class student is 78% while control class is 55%. It shows that the application of Project Based Learning Model based on Science Literacy can create a contextual attitude in which students are also given additional insight. So that, students are more sensitive to the environment and the benefits of the project that has been done. The task of shampoo making project from rice husks can be made as wrong one application of what is learned in the school in the environment around the house and the container of creativity for students to use it in the field of entrepreneurship. This research is appropriate and supported by previous research that is a model of Project Based Learning on chemistry learning can be used for entrepreneurship and benefit to society in general [9].

4. Conclusion

Based on the results of the analysis that has been done, it is found that there are differences in the ability of science literacy in the experimental class and control class. The result of test Result of t-test of post-test value, t_{count} show value equal to 3,660 were higher than t_{table} 2,002. N-gain, experimental class test, is 0.77 with the High category, while control class is 0,69 with Medium category. This indicates that the Project Based Learning Model based on Science Literacy influences both the ability of science literacy which is more significant than the Conventional Model.

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