THE INFLUENCE OF LEARNING MODEL AND LEARNING RELIANCE ON STUDENTS SCIENTIFIC LITERACY

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Abstract: This research aimed to identify the influence of two learning models and learning reliance on students' scientific literacy. The method used was the treatment by 2 x 2 level. The participants were 36 students from the Department of Biology Education who were grouped into two categories based on the reliance questionnaire score, i.e., categories of high and low. The data were collected through scientific literacy tests, data analysis using two-path ANOVA formula followed by the Tukey test. The results showed that there was an influence on the interactions between the learning models and learning reliance on students' scientific literacy seen from the ANOVA test results which obtained F = 29.88, α=0.05. The Tukey test analysis identified; (1) Scientific literacy of college students who used the Science, Technology, Society (STS) model was higher than those who adopted the Problem-Based Learning (PBL) Model with Q = 4,74 at α=0.05; (2) The scientific literacy of students having high learning reliance using the STS learning model was better than those applying the PBL with Q = 11,78 at α=0.05; (3) The scientific literacy of students having low learning reliance using the STS learning model was lower than those using the PBL with Q=5.07 at α=0.05. It concluded that the STS learning model could improve the students' scientific literacy. In other words, the STS learning was more useful for the high reliance students than those with low reliance.

Keywords: learning reliance, STS, scientific literacy

INTRODUCTION

The rapid development of science, technology, and society requires people to have necessary skills beyond reading, writing, and arithmetic skills to survive in life. The ability to read and write through the script, in the past several centuries generally interpreted as "literacy." Through education, it is expected to form science and technology-literate humans, as a bridge connecting to the environment to play a role as a human resource quality. The science referred to in this case is the "Science" concerning the object of nature (IPA), social, and technology. The various abilities of science mentioned above summarized in a concept called "Scientific Literacy." The purpose of scientific literacy education is to build a scientifical literacy society, that is, a social issue. Thus, the importance is not only the science concept mastery but also the thinking skills (Suwono et al., 2017; Holbrook & Rannikmae, 2009). Contended that scientific literacy extends beyond the mastery of foundational knowledge of scientific knowledge and apply it to relevant social contexts. Scientific literacy is a multi-literacy in which individuals must develop fluency in coordinating these multiple modalities of scientific representation at proper times in the curriculum, and when viewed from a critical standpoint, the science literature also includes the ability to question and appropriate scientific knowledge in personally relevant circumstances (Trauth-Nare, 2015; France, 2011; Toharudin et al., 2011).

Educational experts and practitioners continually strive to find the best solution to help students find the knowledge, skills, and attitudes needed in the life of society. Various learning models are built to get effective and efficient ways to achieve the goals of learning/education, such as learning model of Science, Technology, Society (STS). The STS learning model is a form of learning that combines understanding and utilization of science, technology, and society so that the concept of science can be applied through skills that benefit students and society (Klein et al., 2001; Owen et al., 2012). The STS learning model is developed to increase the literacy of individual scientists to understand how

2

science, technology, and society influence each other, and to improve the ability to use knowledge in making decisions (Putra, 2013). The curriculum of primary education has included a study on the basis of attitudes, personality, and knowledge development like sanitation, nutrition, and health. Therefore, environmental literacy is essential to be developed among students. Future teachers are very potential to create the right environment because they will be the agents of change in society. Moreover, future teachers have to pass on ethical values and characters in order to the sustainability of the environment (Farida et al., 2017).

Irregularities in healthy behaviors continue to occur in some communities, for example: adding hazardous ingredients in food management, consuming liquor or drugs, and letting waste pollute the environment. It alleged that such deviations occur because the learning system (especially science) conducted in schools that did not achieve the proper learning objectives of science. The learning model applied only to the development of cognitive ability (textual), while the real problem faced in life is contextual and it has not yet mastered. The further analysis results of the 2009 PISA data for Indonesian children are as follows:

1. The achievement of scientific literacy of students is low, with the average of 32% for the overall aspect consisting of 29% for content, 34% for the process, and 32% for the context.
2. The diversity of students' scientific literacy among provinces in Indonesia is relatively low.
3. The ability to solve the problem of children in Indonesia is as low as Malaysia, Thailand, or the Philippines.

The level of students' scientific literacy that is considerably low caused by several factors, including school infrastructure, human resources, and school organization and management also influenced students' literacy achievement (Ardianto & Rubini, 2016) significantly.

Field observations indicated that the discussion of chemicals in the classroom was limited to the content of the book/literature. There is no clear link between the material learned and the real problems that develop in the community. Derek Hodson Science Education is a form of indoctrination to a particular worldview so that young people do not question the underlying science. Derek Hodson Science education is incomplete if it does not involve students in preparing for and taking action on matters of social and political importance (Giordano, 2017; France, 2011; Sadler & Zeidler, 2009).

The results of interviews with students revealed that chemistry lessons are too abstract and elusive. Chemistry has been called the central science. Hence, the chemistry learning provides a unique context within which to consider the relationship between knowledge and social responsibility. This is what the public conscience of learners examined (Donald & Kovac, 2012). However, in the classroom, the lecturers presented several examples of problems in the community related to chemicals, but the students were not facilitated to investigate until they found a solution to problem-solving. The chemistry final examination results of the 2014/2015 academic year revealed that 113 students obtained the class average score of 50,5; the highest score was 77 and the lowest score was 28. Thus, it is considered necessary to optimize other learning models for enhancing the results of chemistry science learning.

In this study, the researchers believed that the STS learning model contributes to encouraging harmonious knowledge and skills through self-efficacy. Learners are parties who need to feel comfortable and fun in the learning process (Suparman, 2012; Akcay & Yager, 2010). Besides, teachers/lecturers are instrumental in conditioning facilities physically and mentally so that effective learning event is achieved. Learning reliance is

seen as a person's autonomous capacity in self-learning. Self-learning does not mean learning alone, yet the self-study or independent learning with or without a teacher (Rusman, 2011; Toyokawa et al., 2017).

METHODS

This research was conducted using the experimental method involving three kinds of variables, namely: scientific literacy as the dependent variable, learning model as the independent variable, and learning reliance as the attribute variable. There were two kinds of learning model applied; STS learning in the experiment class (A1) and Problem-Based Learning (PBL) in the control class (A2). Learning reliance (B) as the attribute variable covered two categories, namely high learning reliance (B1) and low learning reliance (B2). Thus, the design of this research was "Treatment Design by 2 x 2 Level".

The target population in this study was all 930 students majoring in Natural Sciences Education (Mathematics, Physics, and Biology Education), Faculty of Education Sciences, Muhammadiyah Metro University. The available populations were 64 Biology education program students in the second semester of academic year 2015/2016. These students were split into two parallel classes; 32 students in Class A, and 32 students in Class B.

The STS learning model scheme is shown in Figure 1 and the PBL model learning scheme is displayed in Figure 2.

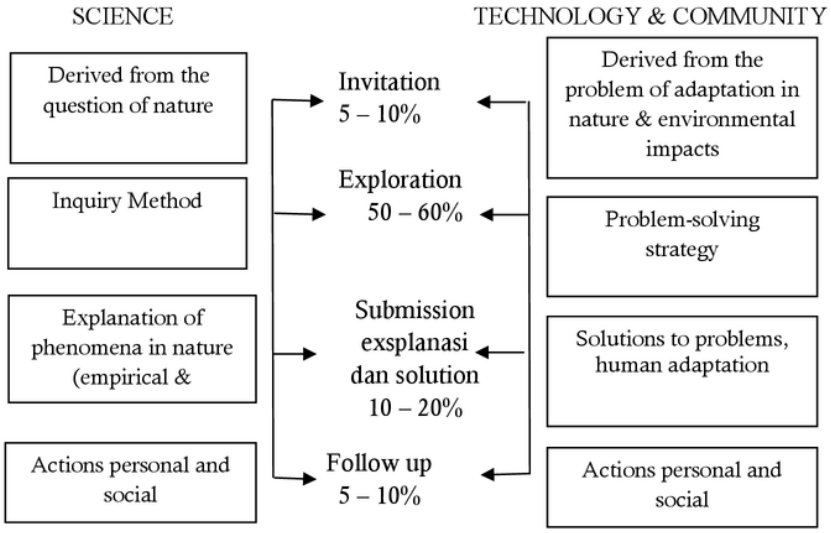

Figure 1. The Scheme of Science Learning Process with STS Model

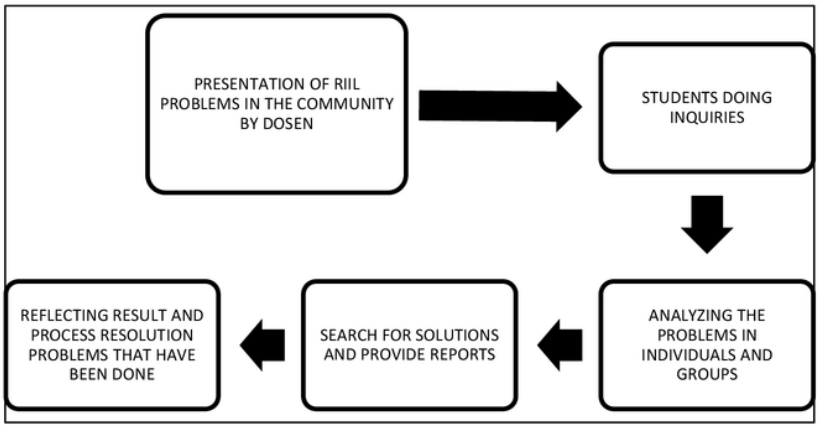

Figure 2. The Scheme of Science Learning Process with PBL Model

Types of data collection instruments: 1) test; to measure scientific literacy data in the form of multiple choice questions and description questions, 2) questionnaires; to measure data self-learning. Both external and internal validity aspects control the design of the experiment. The validity of data collection instruments determined through validity and reliability test techniques. Validation tests performed two stages, namely: (a) content validation (content) and (b) empirical validation. Content validation refers to an assessment of the extent to which the instrument represents the desired content.

Empirical validation conducted through a test of test on 33 students of biology education program of the 3rd semester who have studied carbon compound material. The validity of the multiple choice test (dichotomized grains) was calculated using the correlation formula Biserial Point, and the reliability coefficient was calculated using the formula Kuder-Richardson formula 20 (KR-20). The validity of essay test (item polytomy have no discrete score) is calculated using correlation formula Product Moment, reliability analysis using formula Alpha CronbachThrough validation of test instrument to measure scientific literacy, there are 40 items of valid and reliable multiple choice with reliability coefficient (0.8961), and 4 items essay is also valid with the reliability coefficient Alpha Cronbach 0.4181. List of valid learning validity questionnaires of 33 items with the value of reliability coefficient (0.8947. The learning treatments were held eight times, both in the experimental class and control class.

The operational differences in the learning between the two presented in table 2. Some of the elements of learning activities carried out in the experimental class and control classes are made similarly, namely: The subject matter of the discussion, including 1) Material principal, Namely Hydro Carbonyl, Carbonyl, Amine, Benzene and its derivatives as well as natural and artificial polymer compounds (plastics), Napza, Petroleum and Food Additives. Setting class made into eight groups, frequency, and duration of time learning is 8 x 100 minutes.

Table 2. Differences in learning operations in experiment class and control class

Elements of Learning	Activities	
	Classroom Experiment	Classroom Control
Learning model	Science Technology Community (STS)	Problem Based Learning (PBL)
Core activities of learning (group)	1. Lecturer facilitate the process of formulation of the real problems in the society based on the identification of investigation activities students 2. Look for alternative troubleshooting solutions using methods brainstorming.	1. lecturer presents the problem of real in the community as a stimulus to be conducted by the student investigation. 2. Look for alternative troubleshooting solutions using discussion methods.

The scientific literacy data of the test results were analyzed by descriptive statistics to obtain mean/standard values, standard deviations, minimum values and maximum values. Data analysis with inferential statistics was conducted to test the research hypothesis. Model of data analysis in this research is ANOVA 2 way (Two Way Analysis of Variance). Before the statistical data test, then test prerequisite analysis is tested Normality using test Liliefors while Homogeneity Test using Chi-square formula; as a result, each group of data is normally distributed, and the intergroup comparing has a homogeneous variant.

Table 4. Score literacy science

Self-Reliance Learning (B)	Data	Score Literacy Science (Y) Based on Learning Model		Total Line
		STS (A_1) (Class Experiments)	PBL (A_2) (Class Control)	3
		A_1B_1	A_2B_1	B_1
Height (B_1)	n	9	9	18
	Mean	72.00	49.83	60.83
	SD	4.74	8.89	12.35
	Max	79	69	79
	Min	65	40	40
		A_1B_2	A_2B_2	B_2
Low (B_2)	n	9	9	18
	Mean	36.89	46.28	41.94
	SD	6.51	10.41	9.98
	Max	48	62	62
	Min	26	25	25
		A_1	A_2	
Total column	n	18	18	
	Mean	54, 83	47.50	
	SD	16.98	11.08	
	Max	79	69	
	Min	26	25	

6

RESULTS AND DISCUSSION

Based on the results of data analysis, can be presented research results as follows:

Test of hypothesis 1

Student Scientific literacy Using the A_1 Community Science Learning Model (STS) is Higher if Compared to the Using the Problem Based Learning (PBL) Learning Model A_2.

A_1 : A_2

Hypothesis Statistic:

$H_0 : \mu_{A_1} = \mu_{A_2}$

$H_1 : \mu_{A_1} > \mu_{A_2}$

Test Criteria: Reject H_0 if Sig < 0.05

Obtain F=4,75 at significance level 5% and F=4,07 at significance level 1%. Based on the test criteria, then H0 is rejected at 5% and 1% significance level, that is; "The average scientific literacy score of students who are learning to use learning model of Community Technology Science (STS; A_1) 53,83 is significantly greater than those using Model Problem-Based Learning (PBL: A_2) 47,50".

Test of hypothesis 2

There is Influence of Interaction between Learning Model and Learning Reliance to Literacy Science; ANOVA result obtained (p 0,05); meaning there is an interaction between learning model and learning reliance to scientific literacy value. It can argue that medallion learning has a significant effect on the value of students' scientific literacy or vice versa and depends on its learning reliance.

After it proved that there was an interaction between learning model and learning reliance toward scientific literature, the analysis continued with Tukey test to test the simple effect, model A study indicated by the mean difference between A in each group B; (A_1B_1 : A_2B_1 and A_1B_2 : A_2B_2).

Test of hypothesis 3

Scientific literacy of Students Who Have Higher Learning Reliance Using the Community Technology Science (STS) Learning Model A_1B_1 is Higher when Compared to Those Using Problem Based Learning (PBL) A_2B_1 Learning Models.

A_1B_1 : A_2B_1

Hypothesis Statistic:

$H_0 : \mu_{A_1B_1} = \mu_{A_2B_1}$

$H_1 : \mu_{A_1B_1} > \mu_{A_2B_1}$

Test Criteria: Reject H_0 if Sig < 0.05

Results of Tukey test Q=11.78 (p 5%) and Q=4.60 (p 1%). With reference to the test criteria, then H0 is rejected either at the significance level of 5% or 1%, which was: "Literacy science students who have to learn reliance high using model Science Technology Society (STS; A_1B_1)= 72, 00 is significantly higher than those using Problem Based Learning (PBL; A_2B_1) = 49.83 in Basic Chemistry course on carbon compound material.

Test of hypothesis 4

Scientific literacy of Students Who Have Low Learning Reliance Using the Community Technology Science (STS) Learning Model A_1B_2 is Lower if Compared to Those Using A_2B_2 Problem Based Learning (PBL) Learning Models.

A_1B_2 : A_2B_2

Hipotesis Statistik:

$H_0 : \mu_{A_1B_2} = \mu_{A_2B_2}$

$H_1 : \mu_{A_1B_2} < \mu_{A_2B_2}$

Test Criteria: Reject H_0 if Sig > 0.05

Results of Tukey test obtained Q=-5.07 (p > 5%) and Q=4.60 (p >1%). With reference to the test criteriaH0 is either rejected at significance level of 5% or 1%, it means "Scientific literacy students who have low

7

learning reliance, which uses a learning model Science Technology Society (STS; A_1B_2)= 36.89 lower than those using Problem Based Learning (PBL; A_2B_2) = 46.28 in Basic Chemistry course on carbon compound material.

The use of learning model of Community Technology Science (STS) in constant chemistry learning is more effective than the use of the model of learning Problem Based Learning (PBL)in improving students' scientific literacy in Chemistry Basic subject of carbon compound material. STS learning model has the main characteristic that in the learning process discusses real issues that occur in the community around the students. The problems discussed were extracted from the students and sought by the solution by the students by way of investigation (investigation) through various sources. The STS learning model embraces constructivism learning theory and is implemented through a contextual approach, making the experience more relevant to real-life problems in society. Contrastingly, constructivist views imply that a teacher's role is to co-collaborate, guide, facilitate and coordinate the learning process, while the student's role is to participate in the process of acquiring and constructing knowledge actively. Students actively create their knowledge based on their previous and new experience through investigations, questioning, discussing, and reasoning (Zhukova, 2017; OECD 2009; Leonard, 2002; McCoaghan, 2008). Constructivism is a learning process that emphasizes the active, creative, and productive awakening of knowledge by prior knowledge and from meaningful learning experiences (Hosnan, 2014; Bonney et al., 2009). In line with that Richey et al. (2010) stated that learning refers to the relative permanent change in a person's knowledge or behavior due to experience. The learning model of STS gives the effect of accompaniment in the form of improvement of critical thinking ability, high-level thinking and problem-solving ability covering cognitive, affective and psychomotor aspects, as well as improvement of religious experience adopted (Wisudawati & Sulistyowati, 2014).

Problem Based Learning (PBL) learning model is also called Problem Based Learning Model (MPBM); MPBM facilitates students to take an active role in the class through activities thinking about issues related to daily life, finding procedures to find needed information, thinking about contextual situations, solving problems, and presenting solutions to the problem (Abidin, 2014). We suggest that the objective of uplift ecology teaching, and the ecological literacy of professionals (Lewinsohn et al., 2015).

The problem-based learning model is similar to the STS learning model, which in its learning practice provides an authentic experience that encourages the active learning process, constructs knowledge, and integrates the learning context in real life naturally. PBL learning model and STS learning model place problematic situation as a learning center, attract and retain an interest of learners to be able to express their opinion in multi-perspective. The difference is that the issues discussed in the STS learning were excavated from the students, while the lecturer presents the problems discussed in the PBL modeling lesson. This difference proved to have a significant effect concerning the learning process and the results.

Literacy of science can interpret as an understanding of science and its application in solving real problems in society. Many science topics have suggested for science education, such as Climate Change, 'greenhouse gas' emissions from factories, modes of transportation and energy generation stations. However, these authors point out that there are many other topics in the life of the sciences, such as health and social justice, pharmaceuticals, biotechnologies, toxic chemicals, and agricultural research and practices (Dos Santos, 2014; Bencze, 2009). Literacy enables the development of new and more powerful forms of understanding,

8

including science, mathematics, and technology (Tobin, 2015). Student learning process in solving problems in PBL class impressed as completion of learning tasks given by lecturers, while in the learning class STS model students solve the problem done to overcome the problem itself. Scientific literacy development is enhanced when learning contextualized in an exploration of socioscientific issues (Bay et al., 2017). Students are excited about conducting field investigations, tracking information across multiple sources, pursuing several learning methods such as discussion, questioning, experimentation or demonstration. Literacy is constantly evolving, and how teachers must evolve with it (Botzakis, 2014).

Two normative models of science in the public sphere, based on their analysis of the representation of science in the news media. They argue that in a "science dominated public sphere," the contrast, in the "contextualized scientific public sphere," science is given no special epistemological status, and decisions about science must also recognize other values and social interests. Science represented as requiring a social license to operate (Cronin, 2010). Based on some of the above description it is possible to happen "achievement of student scientific literacy using STS learning model higher than that using PBL learning model, especially in Basic Chemistry course.

The result of the ANOVA test shows that score significance < α 0,05. The means that there is a significant interaction between the learning model and the learning reliance of the Literacy of science. Shows that learning model and learning reliance significant determine the success of improving student scientific literacy in learning basic chemistry of carbon compound material. Any different learning model, if applied to students who have different learning reliance, will achieve different scientific literacy.

Through the STS learning model, on the discussion of the "properties and benefits of polymer compounds," students find the idea that the use of plastics in everyday life is more appropriate if for equipment that can be used repeatedly in a long time. As for packaging and tableware or drinking should not use plastic, because they already know that: 1) some commonly used food types for food (e.g., Styrofoam) if exposed to heat or oil can release (plastic molecule particles (Steyrenacarcinogenic) in the body. (2) The average food packaging plastic has a lifespan of only 15 minutes, then disposed of into trash. (3) Plastic waste has become a real pollutant for the soil and water environment because the plastic properties are difficult to decompose by bacteria decay so that the process of decomposition long. (4) If the plastic burned, it would cause smoke which is a pollutant in the air and harmful to human health.

From this discussion the students express their attitude as an alternative solution to the problems caused by the use of plastics, namely: a) Avoiding plastic materials for packaging or eating or drinking equipment, and replace it using natural materials. b) Avoid using a single-use plastic material (e.g., a crackle bag) and replace it with other materials (or plastics) that can use repeatedly. c) Creating posters containing appeals for people to use the types of plastics whose garbage can be disassembled by micro-organisms or recycled, making them safe for human health and not polluting the environment.

This finding is consistent with the results of previous studies; that learning STS on Colloidal (Chemical) material at MAN Kuta Baro Aceh, can increase activity and result learn and get the positive response from the student. In the exploration, stage students can explore critical issues in local and global scope. At the concept application stage, students can define how to manage factory exhaust gas, purify water and try to minimize the use of materials that can cause river pollution. Students are happy to learn the colloid material. Associated with daily life using STS learning, they are more curious,

9

more daring to ask an opinion, and can cultivate environmental awareness (Rintayati et al., 2014).

Chemical educators have a responsibility to equip students in developing the scientific and technological insights of the social dimension and help improve their ability to devise solutions to their impact. There are many situations in which the society looks to science for accurate information, and guidance. Examples in the modern world include the scientific discourses on the state of the ozone layer, the likelihood of catastrophic earthquakes, tsunamis, or volcanoes, and the threat of radioactive sources in the environment. Current international issues such as solid wastes, atmospheric pollution, deforestation, deforestation, biological warfare and human cloning (Donald & Kovac, 2012).

Further analysis of ANOVA using test Tukey; show Qcount = 11.78> Qtable = 3.20 at α 0.05 or 4.60 at α 0.01. Thus H0 rejected, which means the average Literacy science group of students who have a high learning reliance using the STS learning model of 71.56 is significantly higher than the average Literacy science group of students using PBL learning model, which amounted to 49.33. In an issue-oriented classroom, students analyze and discuss personal, societal, and global issues that require an application of the relevant scientific evidence. Learning in the context of issues can help the people in the global community (Lenz & Willcox, 2012).

Those with high learning reliance set a learning goal to improve the mastery of the material and determine the success of learning by comparing it with the results that have been achieved by themselves before, not compared to the results achieved by his friend. Self-learning means learning in an initiative with or without a teacher (Rusman, 2011). Students with high learning reliance are more responsible for making decisions in their study groups, students with low learning reliance are apathetic in their group (Wahyuni & Sunarno, 2012). The factors that influence the learning reliance are the factors that come from within the students and the factors that come from outside the student self. The factors that come from within students include psychological factors such as, self-efficacy, learning motivation, attitudes, interests, a focus on control, self-discipline and learning habits. While the factors that come from outside the students are natural environmental factors, socioeconomic factors, teachers, teaching methods, curriculum, subjects, and facilities infrastructure (Wang et al., 2008; Woolfolk, 2009; Johnson & Johnson, 2009).

The results of this research show that students who have the reliance on higher learning using learning model STS reach the value of scientific literacy tests than students using the PBL learning model. It can state that the Science Community Technology learning model (STS) are useful if used to improve students ' scientific literacy in Basic Chemistry course material discussion of carbon compounds, particularly for students who have a higher score of learning reliance.

On the other hand the value of scientific literacy of the average student who has a low learning reliance using STS learning model (36.89), are very significant lower than using the learning model of PBL (46.28), evidenced by the Tukey test results Q = α significance level at 5.07 0.05 or Q = α 0.01 at 4.60. Suggests that to improve scientific literacy courses necessary chemistry discussion of carbon compounds for groups of students who have a low learning reliance less well using STS than learning model using learning model PBL.

STS learning model or a model learning PBL in practice equally lead to the development of real problem-solving abilities that occur in the life of the community; as for the different is that the problems discussed in the STS learning model is determined by the student, while the lecturer presents the problems discussed in the PBL learning model. Professors organize student groups to conduct investigation and study of literature in the field

10

in an attempt to problem-solve that assigned to him. The focus of the foundations' course is not on teaching specific topics within specific disciplines, but instead on how scientific knowledge constructed. Students immersed in the entire process of doing science while experiencing firsthand how aspects of Nature of Science (NOS need to consider when constructing scientific knowledge (Koenig et al., 2012).

The principle of "Dewey," i.e., learning by doing and experiencing. The Dewey principle ensures that the school should become a laboratory for search troubleshooting. PBL developed based on cognitive psychological theory, which States that learning is an active process of someone in construct his knowledge through interactions with a learning environment that was designed by a teacher/lecturer. Learning patterns like this are appropriate for students who have a low learning reliance, but less appropriate for those with high learning self-reliance; those with high learning reliance initiative select their methods or learning resources that are judged more appropriate. Vygotsky's zone of proximal concept with the development of the scaffolding idea reinforced with Bruner; insist that learning occurs through a process of social interaction assisted by teachers and peers who are better able to overcome the problems encountered, and the effort to master a skill that slightly above the current level of development (Woolfolk, 2009).

Through Problem Based Learning, students are expected to be involved in the research process which requires students to identify problems, collect data and use the data to solve problems. Students will be involved very intensively so that motivation to continue learning and keep finding out is increasing. The learning process that gives students the opportunity to be actively involved in building knowledge contributes to the development of thinking skills and feels more meaningful (Ardianto & Rubini, 2016).

However the higher the freedom is given to the students in problem-based learning, higher supervision needs also to be done by the lecturer. The mistakes made in identifying student problems lead students anxious, and problems become too big or broad. At this stage of information gathering may occur when a change of direction of study, students find the more interesting new information. Similarly, in the stage analysis and report writing, students are not yet used to think holistically so those experience difficulties in taking the conclusion. In the circumstances such as these tuitions, lecturers are very necessary and very decisive. It appears that the student who has a low learning reliance tend to do only learning activities which assigned to him. They are a less bold initiative to select another learning resource or learning ways drove alone, in addition to the appointed lecturer.

Based on some of the above description then the reliance of the student who has studied low can learn better and can achieve better results by using the model of PBL learning in a learning model that uses the STS. Thus the value of scientific literacy that students have a high learning reliance using STS learning model is lower than on the use of model learning PBL.

CONCLUSIONS

The overall results of hypothesis testing research show that there is the influence of the interaction between the learning model of learning and reliance on scientific literacy students. In general, the model of learning Science Technology Society (STS) is more useful for improving student's scientific literacy in comparison with the model of learning Problem-Based Learning PBL. Achievement of the value of scientific literacy student who has a high learning reliance, better use of model STS learning, whereas students who have learning reliance is

11

better to use a low learning model (Problem Based Learning LBC). Thus the implications of the results of this research are: (1) the STS learning model needs to apply on a Basic Chemistry course including on science subjects in addition to clumps of IPA. In order for the results of the use of the model, STS learning can provide benefits of higher value, should be directed and motivated students to choose an urgent and real problem concerning the interests of the broader community. (2) the Professors need to innovate creatively build on the learning model of STS and following the level of reliance of learning (characteristics) students as well as following the discussion materials, so learning to be effective and achieve optimal learning outcomes. (3) Required the existence of a modification in the implementation of model STS learning, for example by the use of learning methods and media variations as well as the expansion of access to learning resources utilization so that every student can learn and achieve optimum results even though they have a low learning reliance.

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