The Influence of Problem-Based Learning and Everyone Is A Teacher Here Models on Higher Order Thinking Skills in environmental Pollution Topics

Kurnia Putra[1], Hasruddin[2], Ahmad Rafiqi Tantawi[3]
Biology education Study Program, Postgraduate Program, Unimed
Jl. Willem Iskandar Psr. V Medan Estate, Medan, Indonesia, 20221
[*]E-mail : putra_atom@yahoo.co.id

Abstract—**The purpose of this study was to determine the influence of** *problem based learning* **and** *everyone is a teacher here* **models on student's higher order thinking skills in environmental pollution topics. The population of this study was all first year of junior high students at State Junior High School 1 North Rantau 2016/2017. Academic Year, which are consist of 373 students in total, ranged from classes VII$_1$ to VII$_9$. Three classes were taken as sample by cluster random sampling technique with 34 total students in every class. Higher order thinking instrument used was essay test of environmental pollution topics. Data analysis technique used was analysis of covariate (ANACOVA) with** α = **0.05. The results were ANACOVA showed that learning models significantly influence on higher order thinking (F = 1225.53; P = 0.000). Average score of higher order thinking in** *problem based learning* **class give 3.71 point influence higher than everyone is a teacher here class and 39.94 higher than conventional one.** *Everyone is a teacher here* **class give influence 36.23 higher compared to conventional class. In CONCLUSION, there were significant influences of both models on student's higher order thinking skills in environmental pollution topics.**

Keywords—*problem based learning, everyone is a teacher here, higher order thinking skills, environmental pollution.*

I.   INTRODUCTION

Observations on vice principals and teachers obtained a list of daily re-examination value of students in science specifically in subjects of environmental pollution in class VII Year Lessons 2015/2016 with an average value of 6.90 with minimal completeness criterion is 7.50, indicated that the value science lesson of environmental pollution material in class VII was in low category with test questions given were in low level, which were on remembering (C1) and understanding (C2) level. Moreover, the National Examination (UN) score of student science lesson of class IX in State Junior High School 1 North Rantau Lesson Year 2015/2016 showed that the average score of Natural Sciences (IPA) was 57.50, where graduation level is in poor category. This then becomes a problem that must be solved quickly so

that students' score in science lessons can be improved at State Junior High School 1 North Rantau.

Environmental pollution is one of the materials contained in science subjects which provide explanations to students about environmental pollution and its impact on the ecosystem. Ideally in providing this material, students need to actively involved in learning, so they able to analyze the problems of environmental pollution and overcome the problems they found. Referensi [1] said that science materials in schools serve not only provide the concept of material but also provide more value in life skills which students can use in everyday life. Students also are expected to seek and find the concepts in environmental pollution and able solve the problems that often arise in everyday life.

One student-centered model that can engage students actively and provide students with reasoning opportunities is learning with a problem-based learning model, which is a learning model that challenges students to "learn how to learn", work in groups to find solutions to real-world problems. Dewey's explained [13] problem based learning as the interaction between stimulus and response, which is between the two directions of learning and the environment. The environment provides input to students in the form of help and problems, whereas the brain's nervous system effectively interprets the aid so that it can be investigated, assessed, analyzed, and searched properly. Referensi [10] suggests two things that should be used as guidance in presenting the problem, First: the problem must be in accordance with the concepts and principles that will be learned; and Second: the problem presented in real, means the problem is exists in the daily life of students. According to [3] problem-based learning model has a number of characteristics that distinguish it from other learning model, which are; (1) learning is student centered; (2) learning occurs in small groups; (3) the educator acts as a facilitator or moderator; (4) problems become the focus and means to develop problem solving skills; and (5) new information derived from self-directed learning.

The active learning model of *everyone is a teacher here* is a model to get classroom participation as well as individuals

by giving each student a chance to become a teacher for his friends. This model is one of the alternatives to actively involve students in learning as well as actively involving students in hearing, explain to their friends, ask the teacher, discuss with other students, respond to questions, and argue. Successful learning by this model allow students to think about what is learned, got the opportunity to discuss with friends, prepare to learn before receiving lessons, ask questions, and share knowledge gained with other friends, if students able to explained well on the material learned to other students, then it can be said that the student mastered the material.

In addition [2] says the active learning model of *everyone is a teacher here* is one of the instructional techniques of active learning which is included in peer teaching. This type provides an opportunity to act as a teacher for other students. Some experts believe that a new subject is completely mastered when the learner is able to teach it to others. In the model of *everyone is a teacher here*, teachers only act as facilitators and crucial role learning process were play by students. Learners are asked to explain about a material proposed by a friend. When learners are able to explain or teach a material to their friends, then they are considered understand what is taught by the teacher.

Higher Order Thinking Skills (HOTS) can be interpreted as thinking achievements to higher-order thinking. The reason for educators to pay attention to high-order thinking is the assumption that higher order thinking develops by itself. As a result, students should be assisted to acquire higher-order thinking skills either through conventional teaching and learning environment or from instructional, individual instruction [6].

Referensi [7] said the indicators that state to measure high-order thinking include: (1) analyzing incoming information and distributing information into smaller sections to recognize patterns or relationships and be able to recognize and distinguish factors and the consequences of a complicated scenario, and identifying or formulating questions; (2) to evaluate by means; hypothesize, criticize and test, accept or reject a statement based on predetermined criteria, and provide an assessment of solutions, ideas and methodologies using appropriate criteria or standards to ensure the value of its effectiveness or benefits; and (3) creating: organizing elements or parts into new structures that never exist before, generalizing an idea or perspective on something and designing a way to solve the problem.

As [8]-have outlined, the quality of life depends on one's higher orders thinking skills. A person with a higher order thinking skills is less likely to encounter difficulties in his or her daily life therefore should be developed programmatically through training in the form of guidance or direction to develop effective and efficient ways of thinking. It prepares students for higher order thinking skills as well as to find in the use of appropriate learning resources [5].

Higher-order thinking skills using complex (non-algorithmic) thinking to accomplish a task can be unpredictable using a different model ever exist and different from the example. So, higher-order thinking is the ability to complete tasks where no algorithm has been taught, which requires justification or explanation and may have more than one solution [12].

II. RESEARCH METHODS

This research was held in State Junior High School 1 North Rantau, Jl. Majapahit No. 19 Rantau prapat, postal code 21417 Phone. (0624) 21727. This research was held in even semester of academic year 2016/2017 from March until May 2017. The population was all first grader State Junior High School 1 North Rantau, with 373 students in total, range from class VII_1 to class VII_9. Sample was taken form students in 3 classes, with 34 total students in each class. Sample were taken by *cluster random sampling,* with class A as experiment class taught by PBL, class B taught by *everyone is a teacher here*, and class C as control which taught by expository. Research design used was *Pretest-Posttest Control Group Design*. The procedures taken were: pre-experiment, experiment and post-experiment treatments. Data collection technique were taken by a test to gathered data of student's higher-order thinking in environment pollution topics.

Table 1. Draft of Higher order thinking test

Test topics	Indicator	Higher-order Thinking Skills Aspects			Score
		C4	C5	C6	
Environment pollution	Environment pollution	1			5
	Water pollution	2 and 3	4		15
	Air pollution	5	6		10
	Land pollution	9 and 10			10
	Global warming			7 and 8	10
Total score					50

In doing the data grouping and calculating the size of data centering, descriptive statistics were used while inferential statistic were used in testing hypothesis. SPSS 2.2 for windows were used as software, using anacova technique at significant level (α = 0,05) where pretest served as covarian. In addition, the follow-up test will be performed when H0 is rejected. Before anacova analysis technique is used, first tested prerequisite preliminary test is normality and homogeneity test data.

III. RESULT AND DISCUSSION

A. Higher Order Thinking Skills Data Description

The result of pretest shows that students' higher order thinking skills in the problem-based learning class was 62 as a highest score and score 32 as the lowest with the standard deviation 44.7 ± 7.18. In the *class everyone is a teacher here* highest score was 60 and the lowest score was 30 with standard deviation 43.05 ± 7.53. In the conventional class

obtained the highest score was 70 and the lowest score was 24 with standard deviation value 44.17 ± 7.83. Post-test results show that students' higher-order thinking skills in problem-based learning model class was 96 as the highest and the lowest value was 82 with standard deviation was 90.47 ± 3.84. In `*everyone is a teacher here* class the highest score was 96 and the lowest score was 80 with standard deviation value was 86.76 ± 4.87. In conventional learning class, the highest score obtained was 65 and the lowest was 45 with standard deviation value was 52.5 ± 5.4. The improvement of students' higher-order thinking skills is presented in the form of diagram in Figure 1.
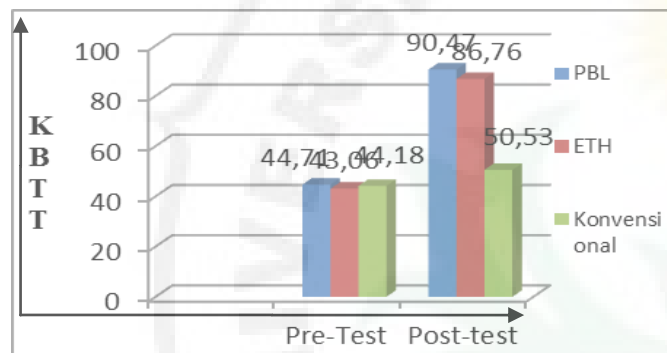

Fig 1. Student's Higher Order Thingking Skills improvement in environment pollution in class VII State Junior High School 1 Rantau Utara.

B. Normality test

Data is normally distributed or can not be seen from the significant data obtained with the provision if sig > 0,05 then the data is called normally distributed. Summarizing the results of normality data test of students' high-order thinking ability of environmental pollution material by kolmogorov smirnof test. The test is presented in Table 2 below:

Table 2. Higher Order Thinking Skill Data Normality

No	Learning Model	Count Value		Sig	Note
		Pre test	Post test		
1	*Problem Based Learning*	0,930	0,827	0,05	Significant
2	*Everyone is a Teacher Here*	0,762	0,424	0,05	Significant
3	Conventional	0,552	0,230	0,05	Significant

Based on Table 2. Data of students pretest in Problem Based Learning class distributed normally because Sig value 0,93>0,05; *In the Everyone is a Teacher Here* class student's pretest data also distributed normally with a Sig value of 0.762>0.05; and in the conventional class pretest data also distributed normally with Sig value 0,552>0,05. Whereas data of student posttest in Problem Based Learning class distributed normally because sig value 0,827>0,05; In *the Everyone is a Teacher Here* class, the distribution of posttest data is normally distributed with a sig value of 0.424>0.05;

and in the conventional class the distribution of posttest data is normally distributed with Sig value 0.230>0.05).

C. Homogeity test

The homogeneity test of variance was conducted to find out whether the sample variance came from a homogeneous population or not. The sample variancecomes from a homogeneous population or not if sig > 0.05. Summary of homogeneity testing of sample groups is presented in Table 3 below:

Table 3. Summary of Levene Test Homogeneity Test

Sample group	KBTT	Sig	Note
Students with treatment learning model of *Problem Based Learning, Everyone is a Teacher Here* and conventional	0,140	0,05	homogeneous

IV. HYPOTHESIS TEST

A. The Influence of Learning Model on Higher Order Thinking Skills

The results of covariate analysis (Anacova) showed that the significant learning model influenced the students higher order thinking skills (F = 1225,53; P = 0,000). Based on the test with P <0.05, then Ha was accepted, which states that there is a significant influence on the implementation of Problem Based Learning model of learning, learning model, Everyone is a Teacher Here and conventional learning model on higher order thinking skills on environmental pollution topics and Ho was rejected, which were stated that there is no significant influence on the implementation of Problem Based Learning model of learning, learning model, Everyone is a Teacher Here and conventional learning model on higher order thinking skills on environmental pollution topics. The average value of higher order thinking skills on environmental pollution topic after treatment of various learning models is presented in graph form in Figure 2.
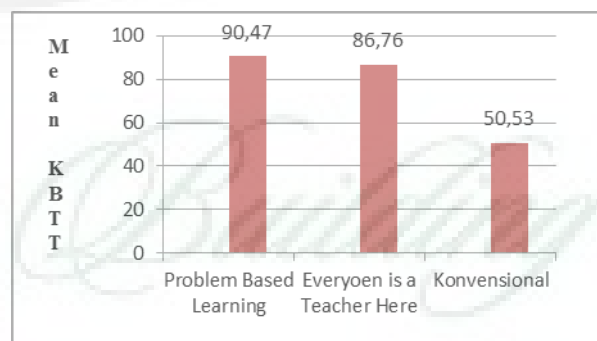

Fig 2. Value of average posttest Based on the Influence of Learning Model on Higher Order Thinking Skills of Environmental Pollution topic in Class VII State

Junior High School 1 North Rantau (F = 1225,53; P = 0,00).

B. Advanced Test Using Tukey's test

The results of Tuckey's test on Post Hoc showed the specific difference of Higher Order Thinking Skills student's which was taught by *problem based learning* model, learning model of *everyone is a teacher here* and with conventional learning model with provision if Sig. <0.05 then therein lies the difference. Based on further tests for students' Higher Order Thinking Skills, it was found that the value of Sig. which was less than 0.05 lies in the conventional problem-based learning model - conventional and everybody is a teacher here (0,000 <0,05) and problem based learning model - everyone is a teacher here (0,018> 0,05) was significantly different.

Tuckey test results showed that high-order thinking skills of students who were taught by Problem Based Learning model was 90.47 ± 3.84, significantly higher than Higher Order Thinking Skills in the class that was taught by the learning model Everyone is a Teacher Here 86,76 ± 4.87 and significantly higher than taught by conventional learning model 50,52 ± 7,24.

V. DISCUSSION

Based on the result of the research, it can be concluded that there is a significant influence of implementation of problem based learning model, everyone is a teacher here and conventional to the *higher order thinking skills* on environmental pollution topic in class VII State Junior High School 1 North Rantau. Tuckey's test results showed that students' high-order thinking skills taught by problem based learning model was significantly higher than *higher order thinking skills* of the class which taught by the learning model of everyone is a teacher here and the conventional learning model. The results of this study are in line with-[5] suggesting that PBLs can develop higher-order thinking skills because in the process of finding and solving problems will stimulate students to analyze, synthesize, and evaluate these problems in schools.

The existence of the influence of problem-based learning model to *higher order thinking skills* during learning process happened because the stages of learning model problem-based learning (1) students understand the concepts better because they taught to find the concept themselves; (2) actively involve solving problems and demanding higher student thinking skills; (3) embedded knowledge based on scheme owned by students so that learning is more meaningful; (4) students can feel the benefits of learning because the problems that are solved are related to real life; (5) learning process through problem based learning can familiarize the students to face and solve problems skillfully; and (6) able to develop students' ability to think critically and develop their ability to adapt to new knowledge.

Beside problem-based learning, one of the learning models that can also improve students' higher order thinking skills is the learning model of *everyone is a teacher here*. *everyone is a teacher here* is a model that allows every learner to act as a "teacher" to other students [14]. Model *Everyone is a teacher here* is a learning model that can be used to improve the learning process of learners and can be adjusted to the learning experience so that learning objectives are achieved in various subjects. This model is a great way to gain great class participation and individual responsibility [11]**.** The results of this study are in line with the results [9], said that the students taught by using the model *everyone is a teacher here* experienced a significant increase in biological cognitive domain learning outcomes in Public High School 1 Sukoharjo.

The students in class which taught by *everyone is a teacher here* were very enthusiastic to ask questions because the teacher who gives the material is their peers so they are aroused and trained in developing thinking power, memory to ask the next questions. While the class which taught by expository expenditure model which learning process emphasizes the process of verbal material delivery from a teacher to students with intention that students can learn the subject matter optimally and where student behavior and knowledge dissemination will be controlled by teachers and teachers who are called also with conventional teaching models such as lecture and demonstration methods cause the absence of mutual interaction among students so that high-order thinking skills of students is not created.

VI. CONCLUSION

Based on the results of the research, the CONCLUSION can be stated that there is the influence of the use of problem based learning model, everyone is a teacher here and conventional to student's higher order thinking skills on environmental pollution topics in class VII State Junior High School 1 North Rantau. Problem based learning models gave an influence of 3.71 higher than the class which was taught by learning model of *everyone is a teacher here* and 39.94 higher than the class which was taught by conventional model. Class that was taught by *everyone is a teacher here* learning models, gave an influence 36.23 point higher than the class taught by conventional learning model.

REFERENCES

[1] D. Agustini, IW. Subagia, dan IN Suardana, "Pengaruh Model Pembelajaran Sains Teknologi Masyarakat (STM) terhadap Penguasaan Pada Mata Pelajaran IPA di MTs. Negeri Patas," e-Journal Program Pascasarjana Universitas Pendidikan Ganesha Program Studi Pendidikan Sains, vol. 3, 2013.

[2] R. Asruna, "Pengaruh Model Belajar Aktiff Tipe Everyone Is A Teacher Her (ETH) terhadap Hasil Belajar Matematika Siswa Kelas X SMA N 01 Tapung Hilir Kabupaten Kampar," Universitas Islam Negeri Sultan Syarif Kasim Riau, Pekanbaru, 2012.

[3] HS. Barrows, "New direction for teaching and learning Problem Based Learning medichine and beyond: A brief overbiew," Jossey Bass Publisher, No. 68, 1996,

[4] A. Fadly, "Peningkatan Aktivitas dan Hasil Belajar Siswa Melalui Model Pembelajaran Problem Baased Learning (Studi Pada kelas X

Bisnis dan Manajemen Mata Pelajaran Kewirausahaan di SMK Ardjuna 1 Malang)," Fakultas Ekonomi Universitas Negeri Malang, Malang, 2012.

[5] P. Guedri, "Problem-Based Learning: Bringing Higher Order Thinking to Business School," (online), (http://neumann.hec.ca/oipg /fichiers/ 2001-002ProblemBased_Learning....pdf, 2001. *(referensi)*

[6] YM. Heong, WD Othman, Md J. Yunos, TT. Kiong, R. Hassan, dan, MM. Mohamad, "The Level of Marzano Higher Order Thinking Skills Among Technical Education Students," Journal International of Social and humanity, vol. 1, hlm. 121-125, 2011.

[7] DR. Krathwohl, "A Taksonomy for Learning Teaching and Assesing: A Revision of Bloom's Taksonomy of Edicational Objectives," Addison Wesley Longman, Inc, 2002.

[8] R. Paul, dan L. Elder, "Critical thinking: The art of Socratic Questioning," Journal of Developmental Education, vol. 31, hlm. 36-37, 2007.

[9] EN. Pratomo, A. Rosyidi, dan P. Karyanto, "Hasil Belajar Biologi Ranah Jognitif Ditinjau dari Staretgi Everyone Is A Teacher Here dan Minat Belajar Siswa Kelas XI di SMA Negeri 1 Sukoharjo," Pendidikan Biologi FKIP UNS, Surakarta, 2012.

[10] Savery, R. John, Duffy, dan M. Thomas, "Project Based Learning : An Intructional Model and Its Constructivist Framework, Bloomingtoon : Indiana University," (online), (https://books. google.co.id/books?hl=id&lr=&id=mpsHa5f712wC&oi=fnd&pg=PA13 5&dq=Project+Based+Learning+:+An+Instructional+Model+and+Its+ Constructivist+Framework,&ots=sYghwffZOn&sig=3KDawUZFBQibf QjHDfPyI44Vkw&redir_esc=y#v=onepage&q&f=false, 1995. *(referensi)*

[11] Silberman, dan L. Melvin, "Active Learning: 101 Cara Belajar Siswa Aktif (Alih bahasa: Raisul Muttaqien)," Nusamedia rev.ed, Bandung, 2009.

[12] Trianto, "Model-Model Pembelajaran Inovatif Berorientasi Konstrukvistik," Prestasi Pustaka, Jakarta, 2007.

[13] Thompson, dan Tony, "Mathematics Teachers Interpretation of Higher-Order Thinking In Bloom's Taxonomy," Journal of Mathematics Education, International Elektronik, vol. 3, hlm. 96-109, 2008.

[14] R. Zikri, "Keefektifan Penggunaan Metode Everyone Is A Teacher Here dalam Pembelajaran Gramatika Bahasa Jermaan Peserta Didik Kelas XI SMA Negeri 1 Sawon Bantul," Universitas Negeri Yogyakarta, Yogyakarta, 2014.