

Teachers' Exploration of Environmental Problems in Order to Enhance Problem-Based Learning

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Abstract—Environmental problem become a critical problem nowadays. Through science education, students understand environmental problem as a part of their learning process. Teacher need to find n appropriate learning approach that fits to teach about environmental problem. Many environmental problems trigger environmental awareness such as school hygiene, energy, natural resource, waste problem. The focus of this study is to explore teacher’s knowledge about environmental problem. The aim of this study is to describe teacher’s knowledge about environmental problem as an element to develop teacher training program about problem-based learning and connecting with science education. In this study, data are gathered by observation and questionnaire and interview. There are three parts of question: personal data, environmental problem reflection (environmental problem description, the frequency of learning about environment, the links between natural science and environment), priority of environmental problem. The object in this study is 25 teachers from some school above an education foundation in Bandung. Based on the result and analysis, waste become the main environmental and technology problem arround respondent and that be taught in class with problem-based learning approach.

Keywords—environmental problem; problem-based learning; teacher knowledge; science education

I. INTRODUCTION

The goals of education in Indonesia are preparing students with knowledge, skills and practice. In science education, students understand the basic relations of water, energy, air, soil, environment and human interaction with environment. Education system in Indonesia provides chance and opportunity to enhance science education in class, community.

In twenty first century, a nation will need citizens with good science and technology’s knowledge. Maybe only a few students choose to be a scientist, engineer, technician, but all student need teacher who know better way to teach science in order to understand technology and science’s change. The mission of education is to produce student with good science and technology literation. A good teacher must motivate student to learn science contextually.

Natural science is very important in modern life, so that it is needed to introduce science in early age. Many invention of product and technology trigger science education to find creative way in teach science.

Environmental, health, energy, natural resource is the center of science education. The goal of natural science is to grow knowledge about phenomena’s explanation. Student is experiencing about process and trying to know the answer of many questions.

Natural environment is a part of natural science. Many environmental problems trigger environmental awareness, such as hygiene in school, energy use, wasting problem. Learning process can help student and teacher to enhance their environmental awareness because students learn the problem contextually. Problem based learning can be a good choice to clarify environmental concepts.

Main focus in this study is to explore teacher’s knowledge about environmental problem. The exploration is done with giving questionnaire to teacher with variant background. The result will be a base for teacher training in problem-based learning. The aim of this study is to describe teacher knowledge about environmental problem and to describe environmental problem as an element to develop teacher training program.

II. RESEARCH METHOD

This study is a descriptive research, and the flowchart of methodology below:

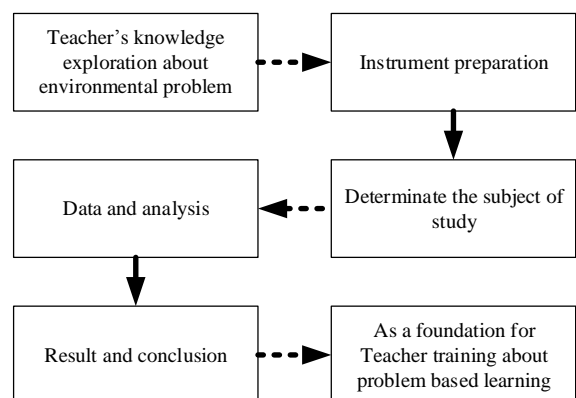


Fig. 1. Research Method

In this study, data are gathered by observation and questionnaire. The questionnaire consists of question about environmental knowledge. Point of questions are adapted from [1, 5]. There are three parts of question: personal data, environmental problem reflection (environmental problem description, the frequency of learning about environment,

the links between natural science and environment), priority of environmental problem.

Teacher should be a leader for student in environmental hygiene. This is the consideration in choosing teacher as subject of study. The object of study consist of 25 teacher from some school above an education foundation in Bandung. Data collected by spreading questionnaire to teacher and doing informal interview to get depth analysis.

III. RESULT AND DISCUSSION

This study is conducted in October 2014. The main goal of this study is exploring teacher’s knowledge about environmental problem. The result is expected to be a foundation for making teacher training program about problem-based learning and connecting with science education.

A. Personal data

The object of this study are 25 teachers from some school and also different educational level. Eight teacher teach Kindergarten, five teacher teach Elementary School, four teacher teach Junior High School, and eight teacher teach Senior High School. Their age varies from 21-25 years old. They also teach varied subject matter (not only Natural Science). This become very interesting for further analysis. Then, a question arise from this phenomena, ‘Can environmental problem develop for problem based learning?’

B. Environmental problem reflection

The result which potential to explore main idea of study is possibilities teacher’s knowledge about environmental problem that needed to overcome. The Exploration is done by five questions. The answer of those five questions are analyzed further to see environmental problems which are potential as development of problem-based learning. The result of the observation are:

- 1) Response to first question: ‘What kind of environmental and technology problem do you teach in your class?’

There are seven kind of answer as describe in Figure 2. About 10 teachers (40%) argue that environmental and technology they teach is waste problem. Another problem that concern to be teach in class is sophisticated technology (like cellular phone and computer). Teachers concern about this problem because student become individualist and ignoring environment around them.

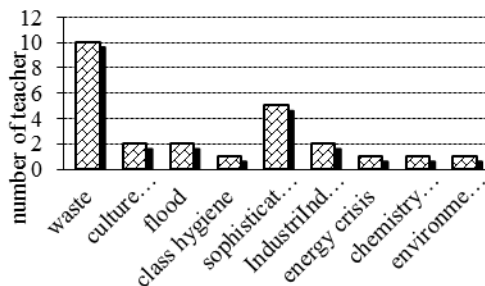


Fig. 2. Response about environmental and technology problem

Teachers also concerning about flood because flood is the impact of environmental damage (like forest destruction, less green spaces). The assumption of culture incompatibility is bad culture influence student in their attitude. Class hygiene, energy crisis, chemical compound and environmental awareness appear as teacher’s response for the first question. Energy crisis related to water as a resource for electricity energy. As we can see, there are many drought disaster in certain part of Indonesia that influence the works of energy plants (especially the plants that use water as their resource). On the other hand, the use of pesticide at farm land related to chemical polution. So, environmental awareness become a key in environmental problems completion.

Teacher should consider problem-based learning as their model of teaching [2]. When we discuss about problem-based learning, the word “problem” need to explore furthermore. Problem-based learning is different from other method of learning. In learning science, students works in individual problem, sometimes only answer the question at the end of the book. On the other hand, in problem-based learning, students are facing a problem to get the solution, like how to raise the water quality. Simple question can initiate problem-based learning. The ill-structured problem is realistic, authentic problem like pollution, hygiene, a problem that not refers to wrong or right answer.

- 2) Response to second question: ‘What kind of environmental problem around you?’

Teachers answer this question in many opinion. There are ten kind of answer as describe in Figure 3. There are 11 teachers (44%) express that waste is an environmental problem around them. Regarding to their opinion, the school need to organize waste separation (organic and inorganic) and waste recycle. Mixed waste will cause odor. About three teacher express that environmental problem around them is caused by human’s character, like throwing garbage/ waste away. Air pollutin (8%), flood (8%) and environmental awareness (8%) are concerned by teacher to be environmental problem around them.

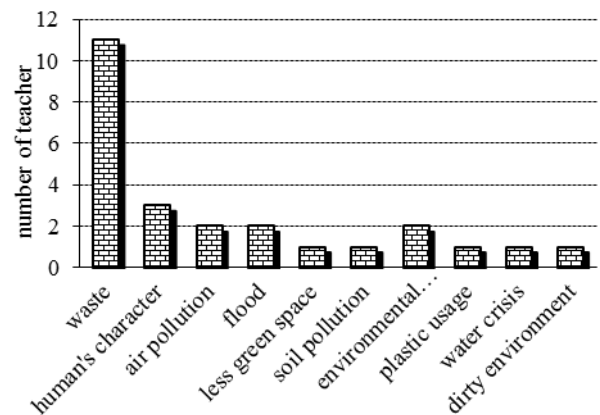


Fig. 3. Response about environmental problem around them

Air pollution is caused by gas waste from vehicle in school area. In the other hand, flood is cause by bad

drainage. The center of all problem is environmental awareness.

Less green space (4%), soil pollution (4%), plastic usage (4%) and dirty environment (4%) become teacher's consideration in answering second question. Less green space in school is one of the environmental problem around school. Plastic usage cause environmental problem, because plastic is non-degradable component in environment. Clean environment become a key in the succession of environmental problem.

Real case around student can spur teacher's motivation in teaching [4]. Involvement student in class discussion can be a basic skill for seeking problem solution and taking decision for student. Many study found that case study will help student to develop their skill in synthesis, evaluation. Case/ problem help student to organize concept into complexity real world problem. Work at group help student make a relation between disciplines like natural science, environmental study, economy to break the complex problem.

3) Response to third question: 'Can you give a reason why you about environmental problem in class?'

The response of third question resulted in 8 kind of answer as we can see it in Figure 4. Only one teacher teach no environmental problem in class because he found no correlation between subjects and environmental. At least six teacher (24% of respondents) teach environmental problem in class especially about waste. Regarding to their opinion, the real problem is plastic waste mix with organic waste, so that separated bins are needed and student need to be taught about how to throw away waste/ garbage.

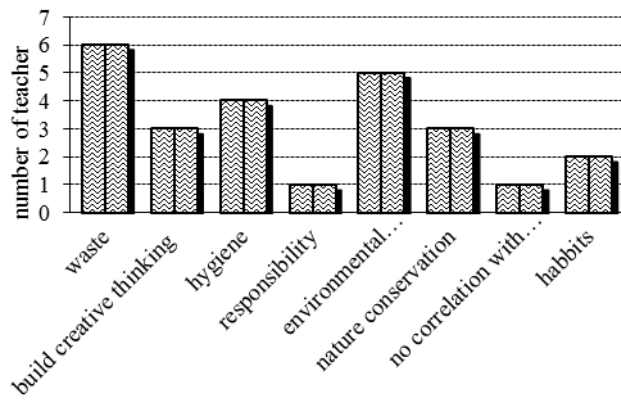


Fig. 4. Response about reason to teach environmental problem in class

Problem based learning can be a solution to improve environmental awareness. So, teacher need to find real world problem to help teacher learn about environment contextually. Teacher can improve student's creative thinking by doing project for waste management at school. For example, students create carbage bin with their creativity, make two kind of carbage bin (one for organic waste and one for inorganic waste). This kind of creativity can be assessed by art teacher. At least four teacher argue that they need to teach about environmental problem in

order to raise cleanliness at school. Cleanliness is one of the important thing to increase comfort learning situation. There is a link between school cleanliness and waste. The other reason is nature conservation. For example, students plant some flower at school park.

Two teacher argue that student's bad habits become a reason why they should teach about environmental problem in class. Some students throw the garbage away or not in the place, so they need to change their bad habits. One teacher consider that teach environmental problem become his responsibility as an educator.

Problem based learning initiate scaffolding and student learning outcomes [6]. Problem-based learning is not only guided instruction approach and scaffolding process to facilitate learning process. This approach enhance meaningful and depth learning that initiate student learning outcome. In Problem based learning, student learn content, strategy and skill through problem solving collaboratively, experience reflection. Student express the reason, explanation based on evidence and communicate the idea. Teacher have important role in facilitate learning process and construct knowledge.

4) Response to fourth question: 'How often do you teach about environmental problem in one semester?'

The mission of this question is to know how important environmental problem in their subject matter. Frequency of teaching environmental problem in one semester describe in Figure 5.

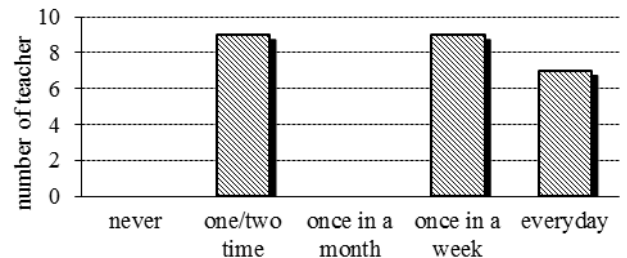


Fig. 5. Frequency of teaching environmental problem in one semester

There are three kind of answer that rise from this question. About 36% respondent teach environmental problem one/ two time in one semester. On the other hand, about 36% respondent teach environmental problem once in a week and about 28% respondent teach environmental problem every day. Time proportion in teaching environmental problem as one kind of reflexion in searching solution for environmental problem and can expressed in problem-based learning.

Most kindergarden teacher implement environmental problem in learning process everyday. Teacher discuss environmental problem as an effort to enhance student awareness, not only in natural science subject but also in other subject. Student must realize that natural environment is very important especially for sustainable life in the earth. Teaching frequency about environmental problem can be improved by environmental problem integration in subject

matter. Teacher can choose problem-based learning in learning process.

Problem based learning is effective when student work in group/ collaborative [9]. The improvement of frequency of problem-based learning can also enhance collaborative learning. Problem-based learning which is blend with collaborative learning can be a good strategy for promoting effective learning process for discuss contextual problem in real world. So, student can solve problem and promote their reasoning skill.

5) Response to ‘What is the important thing to be learned in science class?’

The aim of this part of questionnaire is to know teacher’s perception about science class and environmental problem. In common, teacher’s perception is environmental problem is only part of science class. Environmental problem should be a concern of other subject matter. The teacher are requested to give a grade (1-10) for two statement:

a) Science teacher in science class need to teach student, so that student will understand environmental problem

The teacher’s response of this statement is described in Figure 6. About 11 teachers give grade ‘8’ for statement a). This result show that almost respondent agree that science teacher in science class need to teach student, so that student will understand environmental problem. The average grade for this statement is 8.24. As we can see, student will understand environmental problem deeply when science teacher concern about it.

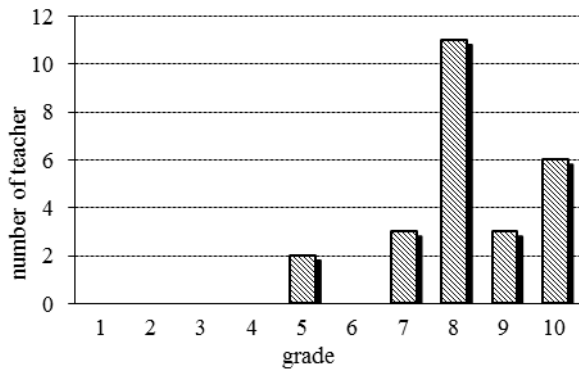


Fig. 6. Teacher’s response for statement ‘Science teacher in science class need to teach student, so that student will understand environmental problem’

b) Science teacher in science class need to teach scientific concept and theory, so that student will understand environmental problem.

The teacher response of this statement is described in Figure 7.

About 11 teachers give grade ‘8’ for statement b). This result show that almost respondent agree that science teacher in science class need to teach scientific concept and theory, so that student will understand environmental problem. The average grade for this statement is 7.76. As

we can see, student will understand environmental problem deeply when science teacher concern about scientific concept and theory. Some teacher (3 teacher) give low grade for statement b). This situation give an impact to average grade.

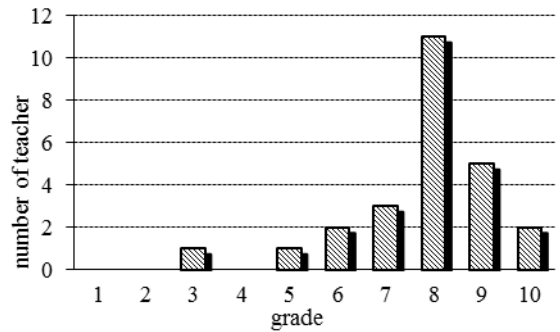


Fig. 7. Teacher’s response for statement ‘Science teacher in science class need to teach scientific concept and theory, so that student will understand environmental problem.’

Science class play role in teaching environmental problem, especially the concept and theory. Student will learn how think critically and can develop reasoning skill when they are facing real world problem (environmental problem). Problem based learning is suitable for this kind of learning outcome. More of that we must consider interdisciplinary study.

In interdisciplinary content, problem-based learning will make a challenge for student to solve complex problem in real world [2]. Teacher introduce a problem and help student to work in a group for leaning-need identification and get to know what kind of information is needed for solving a problem. Teacher can use concept and theory to help student learn in problem-based learning approach. In problem-based learning, teacher guide student work in group, stay focus and teacher also make a feedback. Collaboration is a key on problem-based learning because enable student to draw perspective each other in order to solve problem. Group reflection enable student to develop strategy in problem management.

C. Priority of Environmental Problem

Third part of this study is getting know teacher’s opinion about priority of environmental problem. In this part, there are eight environmental problem: 1) human conflict and violence; 2) natural resource depletion; 3) ecosystem damage; 4) environmental pollution; 5) human health; 6) land conversion; 7) sustainable development; 8) famine/starving disaster. Respondent need to make order for these environmental problem, because one problem link to another problem. The result for teacher’s opinion about priority of environmental problem as ranked in Table 1.

Giving a rank of environmental problem means teacher know the priority environmental problem that discussed in the learning process. Based on analysis, it is found that the first rank of environmental problem is human health (about 36% of respondent place this problem in the first position). This rank shows teacher’s comprehension that

environmental problem gives impact to human health. The second rank is environmental pollution (about 28% respondent place this problem in second position). Environmental pollution is an important problem to discuss in learning process in class.

TABLE I. STUDY RESULT: PRIORITY OF ENVIRONMENTAL PROBLEM

Order	Environmental Problem
I	Human health
II	Environmental pollution
II	Famin
IV	Land conversion
V	Ecosystem damage
VI	Natural Resource depletion
VII	Sustainable development
VIII	Human conflict and violence

The third rank is Famine or starving disaster in the earth. About 28% respondent place famine at the third position. Respondent consider that this disaster will happen if there were crop failure. Climate change can cause this condition. Famine is also related with land conversion (fourth position). Regarding their opinion, we can see the relation when farm land no more available for planting crops. Many farmlands turn into housing board. Then, the fifth rank is ecosystem damage (about 24% respondent places this problem in fifth position). For example, illegal logging for palm plantation will cause tropical forest ecosystem damage.

Natural resources are depletion place in sixth position in priority of environmental problems. Nowadays, people are hardly to find clean water as an important natural resource in some place in Indonesia. In the dry season, we find drought in many places in Indonesia. We can find little watersheds especially in urban area. This condition becomes a key problem for natural depletion. The seventh position is sustainable development as a dilemma. Sustainable development is important for citizen's welfare, but on the other hand, it damages natural environment. For example, the construction of sport stadium ruins watershed and green area. The last rank is human conflict and violence. This problem refers to war between countries. Human conflict and violence tend to social disaster, so that they placed this problem in the last position.

Problem based learning is effective for promoting relevant learning [7]. Student from different culture and language background work collaboratively in problem based learning. This condition indicates that curriculum can develop inquiry skill from different background. So, students learn to solve real/ contextual problem.

Based on the result and analysis of this study, teacher training is needed. So that, teacher is accustomed with problem-based learning in class and discussion. Discussion

activities can promoted through research project [3]. Student should involved in collaborative and problem based learning. We could make solving problem as a good habits of life. Problem based learning can be done in a creative way such as making projects based on subject matter. Discussion also trigger learning motivation and habits of research. Some problems need to explore further in order to promote problem-based learning.

IV. CONCLUSION

From the comprehensive result and discussion, there are two main conclusion in this study. The first conclusion is teacher's knowledge about environmental problem can be reviewed from subject matter, basic question. Environmental problem's reflection can be a key to explore teacher's knowledge.

Second conclusion is there are some environmental problem that fit for problem-based learning. They are waste problem (recycle, waste separation), school hygiene as part of student health, right methods to grow environmental awareness, and interdisciplinary study in problem-based learning.

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