PROMOTING RESPONSIBLE ENVIRONMENTAL BEHAVIOR OF STUDENTS IN BIOLOGY DEPARTMENT BY THE IMPLEMENTATION OF ENVIRONMENTAL EDUCATION

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Abstract: *Eco Campus is a national environmental management system and award scheme for the higher education sector for addressing key issues of environment. One of the education institutions at university level that was planned to implement an eco-campus is the State University of Surabaya (UNESA) especially at the Faculty of Mathematics and Science (FMIPA). However, to create such goal, it was important to begin with how to make the students have responsible environmental behavior (REB). Related to such problem, the pre experimental research has been conducted to promote three of responsible environmental behavior of students in Biology department of international class 2012, comprised of; eco-management action, persuasion, and economic/consumer action using the implementation of environmental education program. As a lifelong study, the environmental education was aimed to show that interdependency between humanity and the environment was needed to improve the human environment sustainability for the present and the future generations. This study was conducted using variety of data sources; observation, interview, questionnaire and test. Based on the data analyses descriptively and the discussion result, it was known that the ability of the lecturer to manage the learning activities for each category was good. Then, the implementation of environmental education program can promote three categories of responsible environmental behaviors of students. Moreover, the environmental education implemented in the current research has positive impact on students' cognitive learning outcomes of environmental knowledge subject, especially the strategies for sustainable development topic, based on the UNESA grade standard.*

Keywords: *Environmental education, responsible environmental behavior, student's learning outcome*.
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Abstrak: *Eko-kampus adalah sebuah sistem manajemen lingkungan nasional dan skema penghargaan untuk sektor pendidikan tinggi untuk mengatasi permasalahan utama lingkungan. Salah satu lembaga pendidikan di tingkat universitas yang telah mencanangkan eko-kampus adalah Universitas Negeri Surabaya (UNESA) khususnya di Fakultas Matematika dan Ilmu Pengetahuan Alam (FMIPA). Namun demikian, untuk mewujudkan tujuan tersebut, hal terpenting yang harus dipertimbangkan adalah bagaimana cara membentuk sikap mahasiswa memiliki perilaku yang bertanggung jawab terhadap lingkungan (REB).Terkait dengan permasalahan tersebut, penelitian pra-eksperimen telah dilakukan untuk mendorong terwujudnya tiga aspek perilaku yang bertanggung jawab terhadap lingkungan pada mahasiswa jurusan Biologi kelas internasional 2012, meliputi, tindakan eko-manajemen, persuasi, dan tindakan konsumen/ekonomi, melalui penerapan program pendidikan lingkungan. Sebagai pendidikan seumur hidup, pendidikan lingkungan bertujuan untuk menunjukkan bahwa saling ketergantungan antara manus ia dan lingkungan diperlukan untuk meningkatkan kelestarian lingkungan hidup manusia untuk saat ini dan generasi yang akan datang. Penelitian ini dilakukan dengan menggunakan berbagai teknik pengumpulan data meliputi, observasi, wawancara, angket dan tes. Berdasarkan analisis data secara deskriptif dan hasil pembahasan, diketahui bahwa kemampuan pengajar dalam mengelola aktivitas pembelajaran untuk setiap langkah pengajaran adalah baik. Kemudian, pelaksanaan program pendidikan lingkungan dapat mendorong tiga aspek perilaku yang bertanggung jawab terhadap lingkungan pada mahasiswa. Selain itu, pendidikan lingkungan yang telah diterapkan dalam penelitian ini memiliki dampak positif terhadap hasil belajar kognitif mahasiswa pada mata kuliah pengetahuan lingkungan, terutama pada materi strategi untuk pembangunan berkelanjutan, berdasarkan pada standar penilaian UNESA.*

Kata-kata Kunci: *Pendidikan lingkungan, perilaku yang bertanggung jawab terhadap lingkungan, hasil belajar siswa*
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INTRODUCTION

Indonesia was one of the countries with the largest population in the world. Among the countries with the largest population, Indonesia ranks fourth after China, India and the United States [4]. The large of population growth leads to increase the met of the needs of human life which is related to the environment and its natural resources. This process leads to increase the environmental problems in

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global and national scale.

In particular, a large population leads to a large amount of waste production from human consumptions and industries. A large amount of waste indicates a large amount of natural resources have been used. The processes of living, eating, working and dying all utilize consumer products whose production generates waste. Virtually every aspect of our daily lives generates waste.

Unfortunately, most societies have been reliant on landfills for waste disposal for so long. People automatically accept that this way is the proper way of dealing with wastes [15]. However, the presence of landfill is not really an ideal solution to the environmental problem. Some problems arise related to the landfill. If this situation persists, the condition of the earth will be unsustainable for the future. People need a change their thinking and recognize that nature is an essential part of human survival not only in the present but also for future generations. The reduction of the waste problems should start from an awareness of responsibility to the environment and action such as reduce, reuse, and recycle the waste.

One of the strategies to raise awareness and responsibility toward environment is applying environmental education. Environmental education is a process functioned to create a person who is knowledgeable concerning to the environment and its associated problem, aware of how to solve such problem, and motivated to work toward the solutions. Environmental education should be aimed at showing that interdependency between humanity and the environment is needed to improve the human environment sustainability for the present and the future generations [17]. It cannot be denied that all humans depend upon a healthy planet with unpolluted air and water resources, stable climate and the surrounding in which they life.

In order to reach such goals, environmental education should be conducted from grade school to adulthood as ecological communities. One rationale offered was that education would "broaden the basis for enlightened opinions and responsible conduct by individuals, enterprises and communities in protecting and improving the environment in its full human dimension" [16]. One of the education institutions at university level in Indonesia, especially in the East Java, is the State University of Surabaya. This university has conducted an eco-campus, especially at the Faculty of Mathematics and Science. Eco campus is a national environmental management system and award scheme for the higher education sector [5]. The scheme allows universities to be recognized for addressing key issues of environmental sustainability. However, to create an eco-campus, it is important to begin with how to make the student community who care about the environment.

One thing to do is promoting the responsible environmental behavior of students using the implementation of environmental education. The development of an environmentally literate citizenry is the major outcome of environmental education; and acquisition of responsible environmental behavior has long been recognized as the ultimate goal of environmental education [9]. Environmental education application is expected to produce a change in people's behavior towards the environment and nature through increased knowledge and awareness.

Although responsible environmental behavior is generally accepted as the ultimate goal of environmental education especially at university level, it has not been given adequate attention in practice in environmental education application [9]. In the current situation, environmental education tends to provide only the information about environmental problems and do not focus to encourage the learners to change their lifestyle to be environmentally responsible [2]. It cannot be denied that student's behaviors and their decision making can give impact to the environmental sustainability. Furthermore, teaching of Biology at university still relies on traditional methods [18]. The emphasis of these traditional approaches has been on rote memorizing of facts, principles, or concepts. Consequently, learners tend to adopt a surface learning and view only knowledge as the final product of education.

As we know, both the acquisition of cognitive knowledge and responsible environmental behavior are the objectives of environmental education program. The students will be able to change their behavior towards the environment and nature, if they can convert this knowledge into action that can be applied in daily life. Both knowledge of environmental issues and knowledge of how to act on these issues are important to help to prevent or to resolve the environmental problem. T he learner who converts this knowledge into actions is skilled in applying this knowledge to a certain problem appropriately. An individual is more likely to express an intention to take environmental action, if that individual has skills in using environmental action strategies, accepts environmental responsibility (i.e., a sense of obligation toward alleviating problems), and has a desire to take action [8]. Such activity is expected to reach the main aim of environmental education that is to aid citizens in becoming environmentally knowledgeable, skilled and dedicated citizens who are willing to work, individually and collectively, towards achieving and maintaining a dynamic equilibrium between quality of life and quality of the

environment [3].

For these reasons, in order to foster the biological learning, particularly for creating environmental knowledge to be a meaningful subject, students need to be involved in the learning activity which allows them to gain understanding both cognitive knowledge and environmentally responsible behavior through their real life experiences. One of the alternative approaches to achieve these purposes is by engaging students in environmental education approach.

Concerning about this problem, the investigator will investigate the promoting students' responsible environmental behaviors by the implementation of environmental education of students in Biology Education International Class of FMIPA UNESA.

RESEARCH METHOD
Participants

The subject of this study was twenty four students from Biology education of the international class 2012 of the State University of Surabaya (UNESA) with different social backgrounds, gender, and ages ranging from 17-20 years old. The class is known as international class since the students are frequently taught using English. For tryout of the study, ten students of the international class 2011 of UNESA were involved in this study.

Procedure

The current research was conducted within two phases. The first phase was development of teaching materials and research instruments. The teaching materials included syllabus, lesson plan and student's worksheet were designed in order to guide the implementation of environmental education program, whereas the research instruments functioned to collect data. Those teaching materials and research instrumental had been validated by the experts. The validation functioned to get some suggestions from the experts in designing as perfect teaching materials and research instruments as possible. The second phase was the implementation of teaching and learning process using the implementation of environmental education. It is important to know the feasibility of teaching activities based on several teaching steps comprised of engagement, presentation of information, organizing and assisting the students, evaluation, summarizing and rewarding, conducted by the lecturer.

In this study, the implementation of teaching and learning consisted of six meetings. Those meetings were used to help the students to be knowledgably concerning to the environment and its associated problem, to provide students the alternative solutions of such

problem, and then to promote responsible environmental behaviors of students in their lives.

Data collection techniques

For collecting data, this present study relies on four techniques. The first was observation which aimed to collect information about the implication of teaching and learning process using environmental education program. The observation result was recorded by observation sheet. The second was interview which was conducted for collecting data included students' opinion, feeling, and experiences during the implementation of environmental education. The third was questionnaire of student's responsible environmental behavior. This method was used to investigate student's behavior based on the student's honesty. The questionnaire consists of three category of responsible environmental behavior included eco-management actions, economic/consumer actions, and persuasions. The last was test of students' learning outcome of the topic under study that was assessed by paper-and-pencil test.

Data analysis

This study collected both qualitative and quantitative data. The data were collected from observation sheet, questionnaire, interview and test. Those data, then, were analyzed descriptively. The raw data of students' learning outcome were counted using formula as follows:

$$Students'score = \frac{gained\ score}{maximum\ score} \times 100$$

Then, the score gained from such formula were matched with the standard of Biology department of UNESA score in order to get information of student's learning achievement level. In this case, the minimum mastery score is 60.

RESEARCH FINDINGS AND DISCUSSION
The implementation of environmental education

The implementation of environmental education program was conducted for six meetings in which the last meeting was used to assess the student's learning outcome using paper and pencil test. In the first meeting, each aspect of learning implementation was well done. The first meeting was used to discuss eco-management action. In engagement phase, the result category of earning implementation was excellent. The observation results showed that this activity motivated students to follow the lesson. Motivation is a salient aspect since it enables to enhance learners' cognitive engagement and thereby increase learning [11]. In the same manner Stipek asserted that highly motivated learners tend to success at learning

process [13]. In the main activity, the category result of learning implementation was excellent. In this section, the lecturer guided students to identify the environmental problems around the FMIPA campus especially related to the waste problem. The students in group were expected to give the alternative solutions to resolve the environmental problem in the FMIPA through discussion activity. It is in line with the statement proposed by Rickinson that is "the environmental education is not just a classroom learning activity but it is related to the environment [12]". In the end of teaching and learning process, the lecturer and students summarized together the concepts learnt. The lecturer also gave the student's reward. For the time management, the category result was good. It is appropriately enough with specified time determined in this learning process.

For the second meeting, the result of learning implementation was excellent. This meeting was conducted outside the routine class lesson. In the second meeting, the students observe the "Waste Bank" in RT. 07 RW. 03., Jambangan. The purpose of such activity was to help students to understand how to help prevent or resolve environmental problem related to the waste problem in Surabaya especially in Jambangan. Such activity provides alternative solutions to resolve the waste problem in campus. As a result, through this activity the students were encouraged to create the waste bank community in the Biology department.

In the third meeting, the observation result shows that the ability of the lecturer to manage the learning activities was very good. Three of four aspects of learning implementation observed (i.e., introduction, main activity, and closing) were implemented with excellent category. Then, for time management met the good category. The third meeting was used to discuss the persuasion related to the environmental action in which individuals or groups encourage others to help prevent or resolve environmental problems/issues. This activity was conducted to encourage students to have the ability for communicating or make argumentation needed in the persuasion action.

For the fourth meeting, the observation result shows that the ability of the lecturer to manage the learning activities was good. Overall aspects of learning implementation which were observed were implemented with excellent category. In the fourth meeting, the lecturer discussed about economic actions that refer to the environmental actions in which people use monetary support or financial pressure to help prevent or resolve the environmental problem/issues. In this learning process, students were encouraged to select some products or materials that can give bad or good impact to the environmental sustainability. This activity was aimed at encouraging student to be a person who is developing personal lifestyles compatible with ecological sustainability. It is in line with the statement proposed by Gough and Sharpley that "Environmental education should produce learners who understand about the social responsibilities as an integral element of the world in which they live and considering their action as a part of their way of life [7]".

The fifth meeting was conducted outside the routine class lesson. In this meeting, the lecturer managed the learning activities with good category. This learning process was used to implement persuasion action of students through environmental campaign of responsible environmental behaviors using students' leaflets. In this section, the lecturer observed the students' efforts to campaign their leaflets. This action emphasizes on the development of a personal ethic and a sense of responsibility for the environment that its aim is to form positive caring attitude and behavior towards the environment through persuasion. In the sixth meeting, the lecturer assessed the students' cognitive learning outcomes using paper and pencil test. Through such test, the lecturer and students will know the effectiveness of environmental education implementation on the students' knowledge. Both knowledge of environmental issues and knowledge of how to act on these issues had been taught in the environmental education. It was hoped that students can convert such knowledge into action as a skill in appropriately applying this knowledge to solve a problem.

The students' responsible environmental behaviors

The data of students' responsible environmental behavior observed using a variety of data collections, including observations, interviews and questionnaire. The development of three components of responsible environmental behaviors has become the ultimate goals of Environmental Education implementation. The first category of responsible environmental behavior is Eco-management actions. Based on the observation result, the students were most active in the area of such behavior. In general, there is a change for the better of eco-management action of students in each meeting. Eco-management action, for the purpose of this study, included those factors pertaining to knowledge of the environment or to some aspect of an environmental issue. These entailed not only knowledge of environmental problems and their consequences, but also pertained to knowledge of how to take action on a particular environmental problem. To reach such goal of eco-management action, students have been observed "Waste bank" in Jambangan. This activity was known effective for students to increase both knowledge of environmental issues and knowledge of how

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to act on these issues so that they can convert this knowledge into action to be applied to help prevent or resolve the environmental problems. It is in line with the goal of environmental education proposed by Gough, that is " *environmental education is hoped can provide the opportunities for the learners in creating awareness and a better understanding of environmental problems, then take certain action to reduce such problems* [6]".

To get in depth information of student's responsible environmental behavior, interviews were conducted. Through these processes, the information of students' concepts understanding related to the eco- management action could be analyzed. This process was important to represent an individual's perceptions of whether or not he or she has the ability to bring about change through his or her own behavior. According to Hines an individual who accepts a sense of obligation toward alleviating environmental problems will be more likely to express an intention to act on these problems [8]. In addition Sutarto argued that the balance of heart, head and hand is necessary for improving human character toward environmentally responsible behavior [14].

To support the data gained from the observation and interview techniques, the questionnaire was used to investigate students' responsible environmental behaviors. Twenty four students were investigated through such technique. The result of this study showed that the environmental education course significantly promote the students' responsible environmental behaviors. Such research finding is relevant with Shih- Jung Hsu research discovered in 2004 [9]. Based on the questionnaire data for eco- management actions, the category score of such behavior was improved that met fair category at the Prior to the treatment then met good category of behavior after the treatment.

The second category of responsible environmental behavior is Persuasion actions. Based on the observation data, the result of student's behavior was changed for the better in each meeting. It is relevant with the result of students' interviews and students' questionnaires. Based on the interview results related to the persuasion action, most students engage to persuade others to be aware and environmentally responsible. It is proved by student comment in the interview section "…*Using persuasion action, I actively told others the importance of protecting the environment to promote a willingness and ability to adopt lifestyles that are compatible with the environment*…"

The interview data of persuasion action was supported by the result of student's questionnaire. Based on the questionnaire data for persuasive actions, the category score of such behavior was improved that met fair category

at the prior to the treatment then met good category of behavior after the treatment. The result showed that most students met the good categories of such behavior after participating in the implementation of an environmental education program. According to Marchincowsky persuasion is an effective way to appeal others to have environmental literacy. In this study, the students conducted environmental campaign as an persuasive action in the campus [10].

The third aspect of responsible environmental behavior is economic/consumer action. In order to encourage student to accept environmental responsibility, economic/consumer action had been taught. Through such learning process, students are expected to understand what impact their lifestyles have on the environment especially related to the consumer choice. In the same manner Amarant argued that environmental education should lead student to understand interrelationship of ecological balance and human survival, understand what impact their action have on the environment, and investigate alternative behaviors which are more environmentally responsible [1].

Based on the observation data, it was obvious that student's behavior was changed for the better in each meeting. Most students have conducted the economic/consumer action for their life. Based on the interview results, the students were explained good reasons of implementing the economic action as their lifestyle. It was proved by student comment in the interview section"…*I prefer to use glasses rather than plastic glasses as one of the economic action. One of the reasons is that glasses can be use many times over so this choice can help to reduce plastic waste production. If I use plastic glass to drink, the plastic waste will increase because I will throw the plastic glass after used. In addition, I just use one time plastic glass to drink my juice*…"

This was obvious that learning implementation have good potential effort to promote an individual's acceptance of environmental responsibility especially for economic category. It is relevant with the result of student's questionnaire. Based on the questionnaire data for economic actions, the category score of such behavior was improved that met fair category at the prior to the treatment then met good category of behavior after the treatment. The result showed that most students met the good categories of such behavior after participating in the implementation of an environmental education program. This category was determined based on the frequently of student's action in their life.

Based on the data gained through a variety of data collecting instruments, it showed that students were motivated to bring their lifestyle with the responsible

environmental behavior. The students have the ability to bring about change through his or her behavior. They accepted a sense of obligation toward alleviating environmental problems and were more likely to express an intention to act on these problems.

The students' learning outcomes

The students' learning outcomes was one of the important objectives of this study. As we know that, knowledge is essential factor that should be possessed by students to help prevent or resolve the environmental problem. Using their knowledge, students can have the ability to understand about environmental problems and their consequences and also obtained to know of how to take action on a particular environmental problem.

In this study, the students learning outcome refers to the scores of cognitive ability which has been acquired by the students during the implementation of environmental education program to the achieving of learning objectives or indicators. Based on the data, it is known that for the posttest, all students achieved mastered of the learning outcomes with the range of students' scores 72- 95. This was a good achievement of students. It is obvious that the implementation of learning process using environmental education can give good effect on the student's achievement. Similarly, Bartosh in quantitative study of environmental education experiences found that students who learned through environmental education approach gained better scores on traditional paper-and-pencil test than the students from non-environmental education schools [3].

Based on the research data, the average of percentage of learning objective achieved is excellent with reached 90.83%. Then, the average of the sensitivity of question items between pretest and posttest is 0.45. This means that the question items have the sensitivity on the affectivity of students learning outcomes that have been conducted. It is hoped that student's knowledge and skill gained from the class can be used as a lifestyle in their life. It is important to take action to help prevent or resolve the environmental problem around them using their knowledge for achieving the sustainable development and sustainable earth.

CONCLUSION

Based on the findings of the research, it can be concluded that the ability of the lecturer to manage the learning activities for each category of teaching implementation was good. Then, the implementation of environmental education program can promote three categories of student's responsible environmental behavior. Most students met good category in using eco-management

actions, economic actions, and persuasion as three aspects of responsible environmental behavior. Moreover, the environmental education implemented in the current research has a positive impact on students' cognitive learning outcomes, especially the strategies for sustainable development topic, based on the UNESA grade standard. In suggestion, to strengthen the trustworthiness of the findings of this study, it is recommended to do further investigation related to the objectives of this study and pay special attention to political and legal action as other aspects of responsible environmental behaviors.

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