Developing environmental awareness through experiential learning: A critical analysis of higher education students’ practices

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Abstract. Today’s higher education students recognize the importance of environmental issues, but the traditional learning curriculum is weak in opportunities for students to experience the link between the theory and practice of environmental sustainability. The aims of this study were given information about higher education students’ awareness of the environment according to their experiences. Furthermore, implementing best practices in Experiential Learning. Environmental awareness is an attitude in seeing and managing the environment surrounding. It is about the way how students thinking and viewing about surrounding based on their own perspectives. Experiential Learning is referred to learning by doing, experiencing, discovering, and exploring. It is a philosophy and methodology where educators intentionally involve with students in direct experience and focused reflection to improve knowledge, develop skills, and clarify values. The method of this study was descriptive qualitative research and the data were analyzed by the Rasch model. The participants were 30 physics students of semester two in Environmental Science/Ilmu Pengetahuan Lingkungan (IPL) subject. The students conducted in practice through experiential learning to gain the data. The results of this study concluded that students’ awareness of the environment was based on their existing and recent experiences.

1. Introduction

Experiential Learning (EL) is constructing knowledge and meaning from real-life experience. EL is constructing knowledge and meaning from real-life experience [1]. Learning is about the process, whereas, knowledge is about creating through the transformation of experience [2]. According to Kolb, there are six aspects of experience as the source of learning and development. Its results from synergetic transactions between the person and the environment as a process, not an outcome. All learning is relearning, requiring conflict resolution between dialectically opposing modes of adaptation to the world, the process of total adaptation to the world, and the process of creating knowledge [3]. EL refers to the process of receiving information, and changing experience. This is how individuals interpret and act on that information. There are four phases in Experiential Learning, concrete experience, reflective observation, abstract conceptualisation, and active experimentation. Concrete experience is where the learner actively experiences an activity such as a lab session or field work.
Whereas, reflective observation is when the learner consciously reflects back on that experience. Abstract conceptualisation is where the learner attempts to conceptualize a theory or model of what is observed. Then, active experimentation is where the learner is trying to plan how to test a model or theory or plan for a forthcoming experience [4], [5].

It is famous that environmental problems have become world issues, which has a great influence on various aspects of human life. The environmental situation in Indonesia has become an endless topic to be discussed and debated both domestically and internationally, especially during the last decade [6]. There are many environmental issues in Indonesia and all around the world. In Indonesia, environmental issues that often arise are those related to waste management, natural disasters, illegal logging, floods and earthquakes. These issues often become serious and endless problems. This is due to the lack of community knowledge on the importance of the role of the environment in its survival and knowledge of the environment itself. Thus, the awareness of the importance of the role of the environment must be increased. Therefore, environmental awareness is very important to be grown in the awareness of the people in Indonesia. Then from the awareness of the environment to be friendly to the environment [7].

The purpose of this research was to determine students’ awareness of the environment based on their existing and recent experiences. This research is expected to provide tangible benefits regarding environmental education practices while providing recommendations on how to integrate indigenous knowledge through experiential learning to stimulate and empower environmental awareness in higher education.

2. Method
The descriptive qualitative research method was guided by a survey and class discourses were used.

2.1. Participants
The samples in this study were 30 participants consisting of 5 men and 25 women enrolled in the Environmental Science class. The participants came from 24 regions in various provinces, they were 16 people from Central Java, five people from East Java, one person from Bengkulu, one person from West Nusa Tenggara, and one person from East Nusa Tenggara.

2.2. Data collection
The survey was conducted toward 30 students in Environmental Science Class as the main source of data. In this study, a limited survey and class discourse are used to collect data. The survey consisted of 38 items that were used to determine the level of student awareness about environmental issues. Each participant fills in the survey before the activity starts and after completion. Furthermore, class discourse refers to experiential learning according to Kolb which includes: experiencing, reflecting, thinking, and acting. The participants were asked to fill in the survey before starting the lesson. Then, they started the activities in the class discourse in the order contained in experiential learning. First of all, they did the experiencing phase, how they carried out activities or practices as a form of real experiences that combine the activities carried out related to experiences that have been experienced before. Second, the reflecting phase is done by observing and reflecting on the activities they have done. Third, the participants conceptualized the theory obtained from observations in the thinking phase. Fourth, they planned how to test theories or planned for future experiences in the acting phase.

2.3. Data analysis
It can be seen from Table 1, a questionnaire consisted of 23 questions divided into three categories, easy, medium, and difficult questions. The criteria of the questions are; 1 = very low; 2 = moderate; 3 = height; and 4 = very high. The questions are relating to the themes in Environmental Science subject. Each of the students is given a questionnaire about environmental knowledge that refers to environmental awareness.
Table 1. Environmental Awareness Questionnaire

| Category | Number | Theme                      |
|----------|--------|----------------------------|
| Easy     | Q1     | Air Pollution              |
|          | Q2     | Water Pollution            |
|          | Q3     | Soil and Land Pollution    |
|          | Q4     | Light and Noise Pollution  |
|          | Q5     | Agricultural Pollution     |
|          | Q6     | Public Health Issues       |
| Medium   | Q7     | Deforestation              |
|          | Q8     | Overpopulation             |
|          | Q9     | Household and Industrial Waste |
|          | Q10    | Natural Disasters          |
|          | Q11    | Medical Waste              |
|          | Q12    | Littering and Landfills    |
|          | Q13    | Climate Change             |
|          | Q14    | Acid Rain                  |
|          | Q15    | Global Warming             |
|          | Q16    | Loss of Biodiversity       |
| Difficult| Q17    | Mining                     |
|          | Q18    | Effect on Marine Life      |
|          | Q19    | Natural Resource Depletion |
|          | Q20    | Nuclear Issues             |
|          | Q21    | The extinction of certain species |
|          | Q22    | Ozone Layer Depletion      |
|          | Q23    | Genetic Modification       |

The question categorization is based on students' experience in understanding environmental knowledge. Q1-Q6 are included in the easy category because most students can work on the material in that theme without many significant difficulties. While Q7-Q16 belongs to the category with moderate difficulty because some students can work on these themes, but some say that they have never heard of the problem. Questionnaire Q17 - Q23 is considered almost all students to be the most difficult because not all have heard the term used, for various reasons. The categorization of questionnaires based on students' opinions and experiences while working on them was indeed seen as subjective because they were taken from student opinion data, not development from experts. The categorization of themes in the questionnaire was done so that researchers obtain a comprehensive picture of students' views in general about environmental issues around them, especially in integrating learning experiences through experiential learning. Through the categorization of themes, the researcher can decide, which themes need more assistance, which themes can be studied casually, and which themes need more preparation.

3. Results and discussions

The survey results conducted gave a general description of the general condition of students' environmental awareness. Previous research on students' environmental awareness in primary and secondary schools has shown that environmental concern behavior can be designed early on through appropriate strategies. The teacher becomes the spearhead that is expected to be able to direct students not only to maintain environmental cleanliness but at the same time to empower the attitude of caring for the environment as a whole, including anticipating environmental problems that occur around it.

This research was conducted on prospective science teachers with the hope that when they become teachers, they can use appropriate environmental learning approaches and strategies, following the character of students. To that end, prospective teachers must know clearly what needs to be prepared, what environmental themes they must master, how to follow up to play an active role in environmental
issues that occur around them and whether they learn from their experiences. Experiential learning is the key to this research because it is considered the most appropriate way to optimize students' environmental care attitudes. Many problems that occur in the environment where the solution is also nearby.

Indigenous knowledge from ancestors or customs that have been maintained, many have been proven to overcome environmental problems scientifically. The results of student essays from various regions have proven many things. For example, students from Wonogiri, Central Java, Indonesia, who in their regions have problems getting clean water, have gained experience in designing water purification systems simply, using simple tools that are easily available. The summary statistics of students’ environmental awareness shows students’ consistency in answering the questions. It is stated that person reliability got .94, which means the criteria are good. Whereas the items’ consistency also very good in score .99.

3.1. Summary statistics of students’ environmental awareness
Figure 1 shows that the questionnaire items used have very good reliability, which means that the themes raised are appropriate and can measure students’ environmental awareness.

![Figure 1](image1.png)

Figure 1. Summary statistics of students’ environmental awareness

While the reliability of students as respondents has been very high, this shows that the consistency of student answers is very strong, with very good quality items. This shows that all students really master the themes that can be done well, although in some themes they still find difficulties.

3.2. Person measure table of students’ environmental awareness
Furthermore, the results of the calculation of the person measure are presented in Figure 2.
The person measure table of students’ environmental awareness states the student who can answer the most questions. The student who answers the most questions is indicated by 25F, female student with number 25, at the top of Table 2. Then, the student who answers the few questions is 29F, female student with number 29. The dominance of female students in the best score because, indeed, the proportion of female and male students is not balanced. The interview results show that students with high grades are indeed IT literate students and more access to the internet to update the latest issues. However, many students are also diligent in social media but tend to be less tactical in verifying data and facts.

3.3. Item measure table of students’ environmental awareness

The following is item measure table that presented in figure 3. The item measure table of students’ environmental awareness claims that the difficult questions are questions Q23. Loss of Endangered Species, Q22. Nuclear Issues, Q21. Natural Resource Depletion, Q20. Mining, Q19. Ozone Layer Depletion, Q18. Effect on Marine Life, Q17. Genetic Modification, Q16. Littering and Landfills, Q15. Medical Waste, Q14. Acid Rain, Q13. Natural Disasters, Q12. Household and Industrial Waste, Q11. Loss of Biodiversity, Q10. Overpopulation, , Q9. Deforestation, Q8. Global Warming, Q7. Climate Change, Q6. Public Health Issues, Q5. Light and Noise Pollution, Q4. Agricultural Pollution, Q3. Soil and Land Pollution, Q2. Water Pollution, Q1. Air Pollution. It turns out that these results are relevant to the categorization of the difficulty level of the problems experienced by students. This provides important information for lecturers and students. Lecturers need to plan learning that focuses on the latest environmental issues, not just following textbooks or lesson plans but must always relate to environmental phenomena that occur real, or are still discourses, but have a chance to occur in the future.
For students, the data shows the position of environmental knowledge they have, that is, they should be aware that the knowledge they have is not comprehensive, so they need to always update environmental issues and reference sources that can provide precise and accurate facts, not just raw data or opinions. Furthermore, the maturity of thinking of students is very much needed so that environmental education is no longer just a discourse but also a lifestyle that accompanies it.

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4. Conclusion
The results of this study concluded that students’ awareness of the environment was based on their existing and recent experiences. The biggest difficulty experienced by students is answering environmental issues that lead to bio molecular, nuclear, and radiation impacts. Further research is suggested to explore the potential of students’ creativity in providing solutions to real environmental cases that are occur globally.

Acknowledgments
I would like to thank every single party who have helped for finishing this research. My first thank to the Head of Religious Research Development and Education Training Centre in Jakarta who provided funding for my study. Then, thank you to the Head of Semarang Religious Training Centre, Ibnu Hasir, S.Pd., MM., and the Head of Denpasar Religious Training Centre, Dr. Japar, M.Pd. who has given permission and support for my study. Furthermore, my promoters; Prof. Dr. rer. nat. Sajidan,
M.Sc.; Prof. Sulistyoe Saputro, M.Sc., Ph.D.; and Prof. Dr. Sutikno, ST., MT. for the guidance and supports.

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