KNOWLEDGE OF ENGINEERING STUDENTS ON ENVIRONMENTAL ISSUES

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The knowledge of environmental issues is one of parameters that affect the behavior of the student. This study try to analyze the issues related to the knowledge of environmental issues of the graduate students in Engineering Faculty Universitas Negeri Makassar. The sample of this research is 150 first year students in graduate program of engineering faculty. There are three variables in this research are factual, procedural and conceptual of knowledge, while environmental issues are global and local issues. Data were collected by true false questionnaire and analyzed by using descriptive analysis. The results showed that the scores of the students knowledge about local issues is higher than the global issues. The highest value is environment factual, while the lowest value on the procedural aspect of environmental knowledge. It is also indicated that the information of resources are still limited. Therefore, global issues still has minimal information. In addition, this article suggest that curriculum in Engineering Faculty should integrate with knowledge about local and global issues in each course due to improvement of environmental knowledge.

Keywords : knowledge, local, global, issues

Introduction

A human linkage with the environment continues over time. Every individual needs to require a better environment condition. The quality of human life is strongly influenced by the quality of their environment, and vice versa the quality of the environment is also very much influenced by human attention to protect environmental and solve the environmental problems. Moreover, environment has a huge potential resource in providing human resource needs. However, in line with the growth of the human population, the carrying capacity of the environment is decreasing and threatened caused by the people lifestyle. As result, the sustainability of human life is also threatened by a variety of environmental issues. Therefore the communities need to increase their awareness of environmental threats and issues due to improvement community livelihoods.

Environmental education aims to be environmentally conscious humans. Interpreted as an environmentally conscious, is expected to form a human character who loves the environment. (Afandi, 2013)[1]. Environmental education is directed to develop knowledge and motivation and skills tinged with concern over the use and conservation of natural resources appropriately. (Hamzah, 2013)[2]. It is also says that environmental education is the process of recognizing values and clarifying concepts in the inter-relatedness among man, his culture, and his biophysical surroundings. The environmental education also entails practice is decision making

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and self-formulation of a code of behavior about issues concerning environmental quality. (Daphne de Robelo, 2003)[3].

Faculty of Engineering, Makassar State University has a program to foster educational at undergraduate course programs which support to improve the technology education teacher candidates. The graduates are expected to be more aware about their environment or have a good environmental attitude. Moreover, as a basis for the development of environmental education, the level of student knowledge about environmental issues must be understand and related within their attitudes.

The graduate students or alumni needed to improve their environmental knowledge when they face the reality in their job place. In relation with this statement, university students gained environment-related values at the college are expected to carry forward to reviews their lives after school (Ozgurler and Cansaran, 2014)[4].

The attitudes and behavior of people in making decisions about the environment is a key element in efforts to improve the community lifelihoods and it's environment condition. There are three things that affect behavioral ecology that Affect, knowledge and intention. (Kaiser, et al 1999)[5]. Knowledge about environmnet has significat impact to the environmental attitude and the ecological behavior (Agussalim, 2014)[6]. By this statement, knowledge of environmental issues can influence human action towards environmental improvements.

In general, environmental issues can be divided into two parts based on the broad impact that caused by environmental damage. Local issues are problems that result in locally or impact is only understand by the surrounding community. Local environmental issues that frequently occur in Indonesia such as floods, landslides, and drought. Being a global issue is the environmental problems perceived by the world community. These problems may include thinning of the ozone layer, climate change, rising sea levels and acid rain.

The knowledge that is studied in this research is based on Bloom's Taxonomy. Which divides knowledge into four dimensions, namely factual knowledge, conceptual knowledge, procedural knowledge and metakognitive knowledge. (Anderson and Krathwohl, 2001)[7]. The description of the indicators of the four dimensions is presented in Table 1.

Based on these descriptions, then the study is conducted on the knowledge level of students in relation to issue environmental issues. This study contributes to the strategy of increasing the capacity of the students in the face of environmental problems in the future as well as the integration efforts of environmental education in the curriculum of higher education.

Materials and Methods

This research method is quantitative descriptive. Research subject is a first year student at the Faculty of Engineering, University of Makassar. First-year students

TABLE 1: DIMENSION OF KNOWLEDGE AND ELEMENTS

Dimension of Knowledge	Elements
Factual	Knowledge of terminology
	Knowledge of specific details and elements
	Knowledge of classifications and categories
Conceptual	Knowledge of principles and generalizations
	Knowledge of theories, models, and structures
	Knowledge of subject-specific skills and algorithms
Procedural	Knowledge of subject-specific technique and methods
	Knowledge of criteria for determining when to use appropriate procedures
	Strategic knowledge
Metakognitive	Knowledge about cognitive tasks
	Self-knowledge

selected as research subjects on the basis that the level of knowledge between the different programs of study assessed the same. Students who become the subject of study are prospective teachers of vocational education. Furthermore, total sample of 150 people by the method of sampling is probability sampling. Data analysis was performed by calculating the scores of students based on responses to questionnaires. Answer correctly rated 1 being the answer is wrong assessed 0. The average value of each student for each element and the variable is interpreted that the value below 0.5 indicates low knowledge are values above 0.5 indicate a high knowledge.

Results and Discussion

Characteristics of Respondents

Characteristics of respondents are supporting data collected in this study. These characteristics are described in Table 2 were revealed about gender, school and home study programs undertaken at this time.

Based on Table 2 it appears that the majority of respondent's gender male (74.67%). Based on the origin of high school, most of the respondents were high school graduates (77%). Furthermore, the distribution of respondents by program of study respondents place the current study indicates that disturbs evenly between 8% to 17.33%. This shows that the representativeness of the respondents come from all programs of study at the Faculty of Engineering University of Makassar.

Factual Knowledge of Graduate Students

Studies on factual knowledge which is divided into two elements indicate that graduate students generally understand both types of environmental issues or have knowledge tow (scores> 0.5). It is presented in Figure 1.

TABLE 2: CHARACTERISTICS OF RESPONDENTS

| Characteristic of respondent	Number	Percentage
Gender		
Male	112	74.67
Female	38	25.33
Graduates of High School		
SMA	77	51.33
SMK	68	45.33
MA	5	3.33
Program Study		
Building Engineering Education	21	14.00
Electrical Engineering Education	12	8.00
Electronics Engineering Education	16	10.67
Mechanical Engineering Education	18	12.00
Automotive Engineering Education	23	15.33
Family Welfare Education	17	11.33
Agriculture Engineering Education	17	11.33
Informatics and Computer Engineering Education	26	17.33
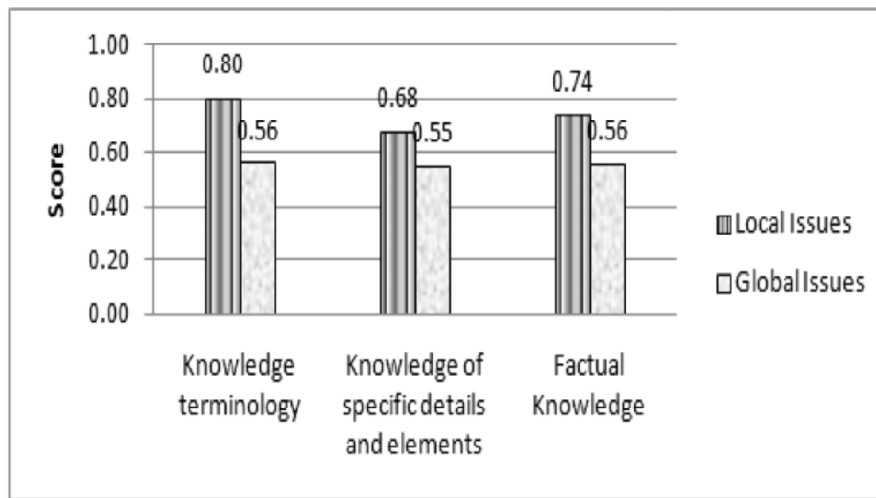
Figure 1: Score of Factual Knowledge

Based on figure 1 it can be seen that the respondents has better understand the terminology of local problems rather than global issues. Scores of students on this knowledge is in high category or above than 0.5. Indicator of student knowledge can be seen of their answer from the questionnaire. Most respondents answered true to the statement on the definition of flooding. They have same opinion that flooding is the condition of the land submerged due to overflowing of rivers or channels. Furthermore, the meaning of global warming is one of statement in questionnaire as part of indicator of terminology global issues

The same thing is shown in the study of knowledge of specific details and elements. Specific details are given in this test related to the causes of environmental problems and the resulting impact. Flooding as one of the local problems is caused by increased river flow, high rainfall and the volume of garbage in river. The impact caused by flooding is much paddy crop failure. In general, students have factual knowledge about local problems of 0.74 and 0.56 on global issues.

Conceptual Knowledge of Graduate Student

Conceptual knowledge indicates knowledge of graduate students in classifying issues, supporting the theory and basic principles on environmental issues. Students were given a test on group problem based on the period and extent of impact caused by the problem. Based on the research results presented in Figure 2 appears that conceptual knowledge on local issues are in the category of medium height knowledge of global issues in the low category.
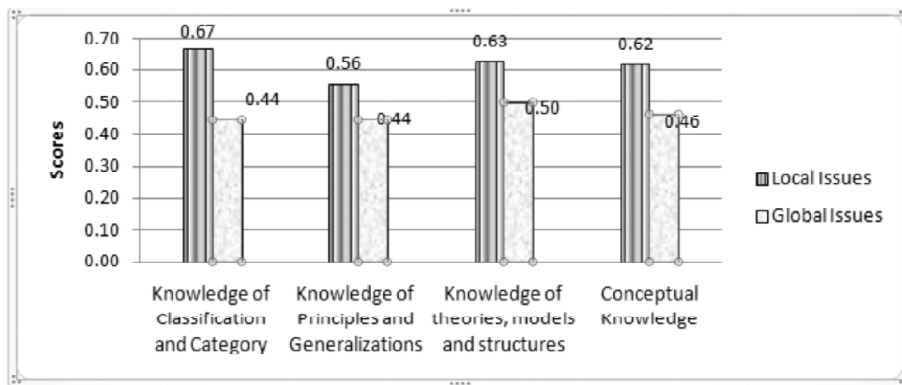

Figure 2:   Score of Conceptual Knowledge

At the conceptual level of student knowledge, it is shows that all three elements show a high level of category on local issues. In contrast to the global issue of the three elements showed a low category of knowledge. The results of this study indicate that students generally do not know the classification and impact of local issues such as climate change, acid rain and ozone layer depletion.

Procedural knowledge

Procedural knowledge revealed knowledge about techniques and procedures. In general, students have a high level of procedural knowledge on local issues (0.54) are the global issues showed a low level (0.36). Many statements in the questionnaire related techniques and methods of prevention of environmental issues. In local issues related to landslides the sample of statement is; "One of method to avoid the

landslide is reduce the water pressure in land. Making drainage is one method to reduce water pressure in the hillside". While in one of negative statement to find student knowledge is: "the use of fuel-efficient vehicles have no effect on global warming'.

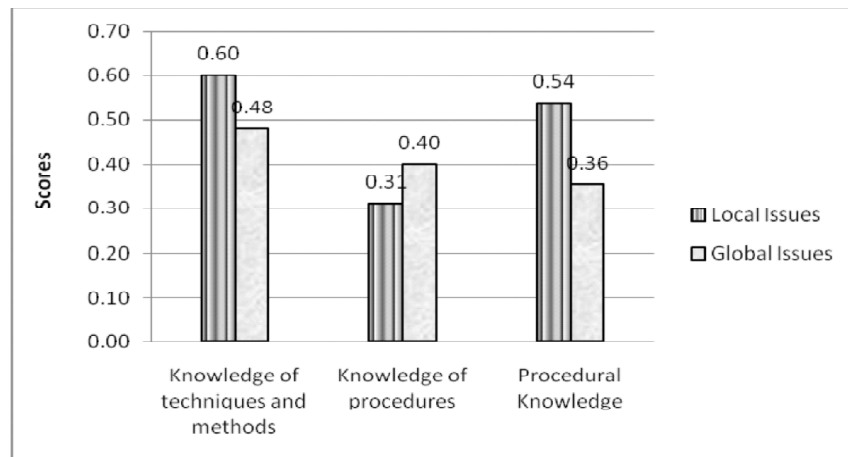Figure 3 shows about the level of procedural knowledge with two indicators.

Figure 3: Score of Procedural Knowledge

Based on Figure 3 it appears that the students' knowledge the various techniques or methods of overcoming local issues; however they not understand the global issues. The knowledge of procedures of the student has a low level of knowledge either on local nor on global issues.

As a summary of all figure above description, it is described scores of knowledge of students in figure 4 below.
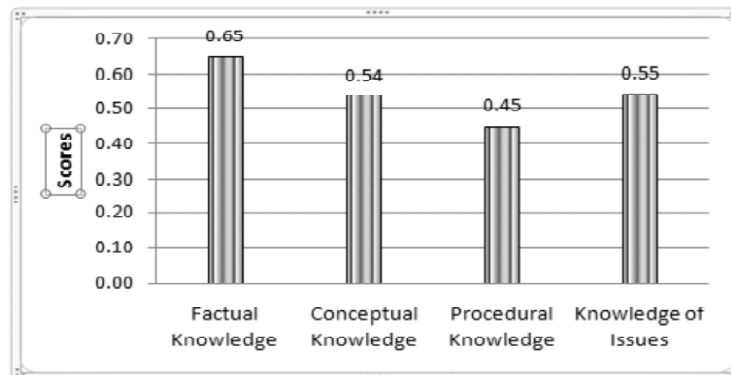

Figure 4: Score of Knowledge of Issues

Figure 4 shows that knowledge of student issues at the high category supported by factual and conceptual knowledge of good. Medium procedural knowledge indicates a low category.

Discussion

In general, knowledge of global issues is still low, especially in the factual and procedural elements. The introduction of the terminology and history of events about local issues and global issues are already known by the student. It is indicated that the information resources about global issues are still limited. This condition does not only happen in Indonesia. One study reported that 63 percent of American student believe that global warming is happening, but many do not understand why that happened. The study also found important gaps in knowledge and common misconceptions about climate change and the earth system. These misconceptions lead some people to doubt that global warming is happening or that human activities are a major contributor, to misunderstand the causes and therefore the solutions, and to be unaware of the risks. (Leiserowitz dan Marlon, J.R. 2010)[8].

If the terms of an overview of the courses presented, some programs do not present study environmental science courses. In addition, some programs of study that presents the environmental science courses for two credits of course. This condition cannot be used as a measure student knowledge to improve environment awareness. The solutions that can be done is to integrate environmental education efforts in each course Generally these efforts are part of the educational environment itself.

The knowledge of environmental issues can be through theory and practice. In addition, the program at the university must demonstrate a variety of actions that facilitate student understanding environmental issues. As a basic reference, various methods of implementation of environmental education at the university is presented as follows:

– In Spanish University, the most common method of teaching environmental issues in Spain is by means of embedded subjects (horizontal integration) in comparison with stand-alone subjects (vertical integration) as a response of the necessity of providing a systemic and holistic approach toward environmental aspects (Larran and Andrades (2015)[9].

– In China, the government developed a green slogan university that aims to enhance the university's role in sustainable development. There are five actions taken in achieving green university, namely: 1) As a social institution, university management has a significant environmental impact; 2) In education methods, changes in the nature of the curriculum and individual courses. Students at least be aware of the environmental problems in Reviews their society and knowledgeable about them; 3) University research develops the research to Encourage social

sustainability; 4) As the agency culture, the university be the Spearhead for adaptation the new relationship between human and environment require the sustainable development; 5) Change in the relationship between university and society. University work together with the church, secular parts of the city and isolated of society. The mission of sustainable development will increase of the university services to the community and the states. (Mc. Beath and Huang, 2014)[10]

– The University of Waterloo has created a strong environmental policy and is considered a high profile best practice case for sustainability in higher education. The responsibilities designated to the Committee are to animate environmental activities on campus; coordinate project activities of students, staff and faculty; raise awareness in the campus community; and, develop guidelines for environmentally responsible design practices on campus (Wright, 2002)[11]

Various actions described can be adopted by the university for the development of students' knowledge, namely: 1) Environmental education is included as part of all the courses in college. It is associated with complexity environmental problems associated with technological, social, economic, ecological and policy; 2) Develop a partnership involving the University faculty, staff and students in environmental sustainability efforts and 3) Students who demonstrate environmental concerns with action should be appreciated by colleges with incentives or scholarships.

Conclusion

The results showed that the scores of knowledge about local issues are higher than the global issues. The highest value is shown on the score about environment factual, while the lowest value on the procedural of environmental knowledge. Knowledge of local and global issues showed same situation. This situation is better on the knowledge of local issues as well as on global issues. It is indicated that the information resources are still limited, so that global issues still minimal information. Thus, this article suggest that curriculum in Engineering Faculty should integrate knowledge about local and global issues in each course so that students can increase environmental knowledge

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