

Student Knowledge of Global Environmental Issues in Makassar City, South Sulawesi, Indonesia

A. Zulfikar Syaiful^{1,*} Muh. Fikruddin B Abd H¹

¹ *Department of Environmental Engineering, Bosowa University, Makassar, Indonesia*

*Corresponding author. Email: syaifulzulfikar@yahoo.com

ABSTRACT

This paper aims to analyze student knowledge of global environmental issues. This study was conducted on 200 students from five large universities in Makassar and taken proportionally by the simple random sampling method. Selected students are then asked to answer questionnaires arranged so that they only answer true or false from existing statements. The survey consisted of 3 indicators, namely factual knowledge (7 questions), conceptual knowledge (10 questions), and procedural knowledge (10 questions). The analysis showed that students' knowledge of global environmental issues was high, reaching 66%. If viewed from the three indicators, the highest level of procedural knowledge of students is 79,17%. Conceptual knowledge (60,25%), and the last is factual knowledge (60,07%).

Keywords: *Environmental knowledge, environmental issues, students*

1. INTRODUCTION

The knowledge is defined as unforgettable memories and general memories of various methods and processes, or recollections of patterns, structures, or circumstances [1], [2]. Furthermore, aspects relating to knowledge are classified into three groups: Firstly, knowledge of particular matters such as terms and facts. Secondly, knowledge of dealing with individual problems such as habits, inclinations, classifications, categories, methods. Thirdly, knowledge of universal norms such as principles, theories, and criteria [3], [4].

Krathwohl [5] developed the structure or taxonomy of knowledge in four levels, namely factual, conceptual procedural, and metacognitive. The factual knowledge is indicated that the knowledge about many information of elements. It includes the characteristics, form of pieces, and the terminological knowledge or other parts' details. Furthermore, conceptual knowledge is more complicated because of the extent of information and organizing it. This type includes knowledge about classification, principles, and generalizations of elements. The knowledge also refers to the theories, models, and structures. The third type is procedural knowledge. It explains about one's ability to answer questions in detail or describe the mechanism or way of working. The forth is metacognitive knowledge. It refers to the ability to monitor or evaluate the subject. Thus,

this type requires a more profound analysis capability than the previous three types [6], [7].

Knowledge is evidence of attention to objects. Such awareness can arise due to the response of the sense of sight, taste, and touch, while the most human knowledge is obtained through the eyes and ears. Provision of knowledge is needed in influencing pro-environment behavior of the community, without knowledge, people will not have a reason for what they believe as pro-environment behavior is doing, and how to do it. At a minimum, the public knows about the environmental issues. The audience knows about the various threats faced by the environment today. However, the community also knows what must be done. So that the environment is maintained and sustained. This is important because people should not only focus on avoiding threats rather than acting so that risks do not exist or continue. The community is expected to work proactively to maintain and preserve it.

Knowledge can be a reliable predictor of environmental behavior and hence can be said to have a dominant influence on behavior [8]. Dividing knowledge on the environment into two namely, knowledge of issues and knowledge of action strategies. Knowledge of issues is meaningful. The people who are familiar and care about problems and cases related to the environment, such as global warming, ozone depletion, greenhouse effect, acid rain, pollution,

declining biodiversity, biodiversity, toxic waste (B3), and natural consumption resources. On the other hand, knowledge of action strategies has diverse meanings.

The knowledge of environmental issues in this study refers to the understandable is obtained through their thought processes, information, or experiences. The knowledge includes facts, concepts, and procedures regarding global environmental issues. The indicators used to measure knowledge of students' ecological issues are matters relating to factual knowledge (terms/terminology), conceptual understanding (classification, categories, principles, generalizations, theories, models, and structures), and procedural knowledge (why and how) concerning global environmental issues such as global warming, ozone depletion, greenhouse effect, acid rain, pollution, declining biodiversity, hazardous waste, and consumption of natural resources.

2. RESEARCH METHODS

The study was conducted on 200 undergraduate students, specifically in the mechanical engineering study program. The sample was the students of public and private tertiary institutions in Makassar, and they have transportation and electrical equipment. Samples were taken from Hasanuddin University (UNHAS), Makassar State University (UNM), Indonesian Muslim University (UMI), and the Indonesian Christian University Paulus (UKIP). Selected respondents were then given a questionnaire sheet containing questions that could indicate their knowledge of global environmental issues.

Samples were drawn using probability sampling techniques with a simple random sampling method. So the sample was randomly selected until it reached 200 students from the mechanical engineering study program. Samples were taken from Hasanuddin University students (UNHAS), Makassar State University (UNM), Indonesian Muslim University (UMI), an Indonesian Christian Paulus University (UKIP). Selected respondents were then given a questionnaire sheet containing questions that could indicate their knowledge of global environmental issues.

There are three indicators used to measure students' knowledge of global environmental problems, namely, factual knowledge (term/terminology) consisting of 7 questions, conceptual knowledge (classification, categories, principles, generalizations, theories, models, and structures) 10 questions, and procedural knowledge (why and how) 10 questions. Global environmental issues in question include global warming, ozone depletion, greenhouse effect, acid rain, pollution, declining biodiversity, hazardous waste, and natural resources consumption. The questions are arranged in such a way that they only need to be answered right or

wrong. Items with a positive statement form, each correct answer is given a score of 1, and the wrong answer is given a score of 0. While questions with a negative statement form, a correct answer is given a value of 0, and an incorrect answer is given a value of 1. Furthermore, the data are analyzed by using the SPSS 21 program. The form of the research questionnaire can be seen in Table 1, Table 2 and Table 3.

Table 1. Questionnaire of Factual Knowledge

| No. | Question Item |
|-----|--|
| 1 | Global warming is associated with rising temperatures of the earth's surface |
| 2 | Waste that is easily decomposed by nature is called inorganic waste |
| 3 | Environmental pollution is a decrease in the quality of the environment because it is polluted (contaminated) by human activity and not from natural processes |
| 4 | Declining biodiversity is associated with a reduction in animal and plant species |
| 5 | In general, what is called waste is residual material produced from an activity or production process |
| 6 | Abbreviation of hazardous waste is a hazardous and toxic material |
| 7 | Natural resources are all materials contained in nature that can be used by humans for their life |

Table 2. Questionnaire of Conceptual Knowledge

| No. | Question Item |
|-----|--|
| 1 | Trees can absorb carbon dioxide (CO ₂) |
| 2 | Waste management is not related to environmental sanitation |
| 3 | Planting and maintaining trees can reduce the greenhouse effect |
| 4 | The ozone layer functions as a filter to filter out ultraviolet radiation from the sun |
| 5 | Refrigerators and air conditioners produce CFC gas which can damage the ozone layer |
| 6 | Pollution can be in the form of sea, land and air pollution |
| 7 | Reduce, reuse, and recycle is a way to preserve natural resources. |
| 8 | Used oil does not include hazardous waste |
| 9 | Oil, natural gas and coal are renewable natural resources |
| 10 | Natural resources can be in the form of natural and non-biological natural resources, which can be renewed or non-renewable. |

Table 3. Questionnaire of Procedural Knowledge

| No. | Question Item |
|-----|---|
| 1 | One of the effects of global warming is the eruption of a volcano |
| 2 | Forest fires can be caused by global warming |
| 3 | Carrying out maintenance of air conditioners and household refrigerators can reduce ozone layer depletion |
| 4 | Fuel oil can cause air pollution |
| 5 | Burning of fuel oil can trigger a greenhouse effect |
| 6 | Toxic waste can cause illness or death in humans |
| 7 | Natural resource depletion is largely due to natural processes |
| 8 | Natural resources can be converted into an energy source |
| 9 | Pesticides can threaten biodiversity |
| 10 | Deforestation is not associated with decreased biodiversity |

3. RESULT AND DISCUSSION

Data distribution for knowledge of environmental issues is divided into five categories: very low (VL), low (L), moderate (S), high (H), and very high (VH). The data categories are then grouped into five class intervals based on the total score per respondent. The table of the frequency of knowledge of environmental issues can be seen in table 4.

Table 4. Variable Knowledge Environmental Issues

| Category | Class | Frequency | % |
|----------|---------|-----------|-----|
| VL | 0 - 5 | 0 | 0 |
| L | 6 - 11 | 5 | 2.5 |
| S | 12 - 17 | 52 | 26 |
| H | 18 - 23 | 132 | 66 |
| VH | 24 - 29 | 11 | 5.5 |
| Total | | 200 | 100 |

Based on Table 4, it can be said that the respondent's knowledge (students) on global environmental issues is quite high. This is evident from the total score of student answers at an interval of 18-23 (High) of 132 people or 66%. This is a natural thing considering that they have gained knowledge about global environmental issues from basic education to higher education. At the elementary to high school level (elementary to high school), learning about the environment is usually included in one of the subjects of science and social studies. Whereas at the tertiary level, it is usually in the form of environmental knowledge courses.

The results shown in Table 3 show that out of 200 students, only 60.07% answered the questions correctly, and 39.93% were wrong in answering questions. The highest number of students who answered correctly is 183 people. While the third and sixth question items where the most students responded to the question wrong (187 people). Based on these results, the actual

knowledge of students is included in the medium category.

Table 5. Number of True and False Answers to Procedural Knowledge

| Question | Shortcuts | | | | Respondent |
|----------|-----------|-------|-----------|-------|------------|
| | Correct | % | Incorrect | % | |
| 1 | 183 | 91.5 | 17 | 8.5 | 200 |
| 2 | 93 | 46.5 | 107 | 53.5 | 200 |
| 3 | 13 | 6.5 | 187 | 93.5 | 200 |
| 4 | 174 | 87 | 26 | 13 | 200 |
| 5 | 182 | 91 | 18 | 9 | 200 |
| 6 | 13 | 6.5 | 187 | 93.5 | 200 |
| 7 | 183 | 91.5 | 17 | 8.5 | 200 |
| R | 120.14 | 60.07 | 79.86 | 39.93 | 200 |

Table 6. Number of True and False Answers to Conceptual Knowledge

| Question | Shortcuts | | | | Respondent |
|----------|-----------|-------|-----------|-------|------------|
| | Correct | % | Incorrect | % | |
| 8 | 174 | 87 | 26 | 13 | 200 |
| 9 | 130 | 65 | 70 | 35 | 200 |
| 10 | 179 | 89.5 | 21 | 10.5 | 200 |
| 11 | 192 | 96 | 8 | 4 | 200 |
| 12 | 152 | 76 | 48 | 24 | 200 |
| 13 | 8 | 4 | 192 | 96 | 200 |
| 14 | 167 | 83.5 | 33 | 16.5 | 200 |
| 15 | 148 | 74 | 52 | 26 | 200 |
| 17 | 150 | 75 | 50 | 25 | 200 |
| r | 120.50 | 60.25 | 79.50 | 39.75 | 200 |

The analysis of the indicators of students' conceptual knowledge shows that in the eleventh question item, the correct number of students answering the question was the highest, reaching 96% (192 people). The most answering the wrong was in the thirteenth question whose value reached 96% (192 people). In general, the remaining 60.25% of students answered 39.75% incorrectly. Based on these results, and referring to the categories created, it can be said that students' conceptual knowledge of global environmental issues is moderate.

Table 7. Number of True and False Answers to Procedural Knowledge

| Question | Shortcuts | | | | Respondent |
|----------|-----------|------|-----------|------|------------|
| | Correct | % | Incorrect | % | |
| 18 | 113 | 56.5 | 87 | 43.5 | 200 |
| 19 | 162 | 81 | 38 | 19 | 200 |
| 20 | 137 | 68.5 | 63 | 31.5 | 200 |
| 21 | 178 | 89 | 22 | 11 | 200 |
| 22 | 154 | 77 | 46 | 23 | 200 |
| 23 | 177 | 88.5 | 23 | 11.5 | 200 |
| 24 | 108 | 54 | 92 | 46 | 200 |

| | | | | | |
|----|------------|-----------|-------|-----------|-----|
| 25 | 191 | 95.5 | 9 | 4.5 | 200 |
| 26 | 165 | 82.5 | 35 | 17.5 | 200 |
| 27 | 155 | 77.5 | 45 | 22.5 | 200 |
| r | 158. 33 | 79.1 7 | 41.67 | 20.8 3 | 200 |

The results of the analysis of procedural knowledge indicators show that most students answered correctly. There were twenty-five question items with a value of 95.5% (191 people) and the least correct answer, and there were the twenty-fourth question items with a value of 54% (108 people). Overall, the students who answered correctly were high at 79.17%, so it can be said that students' procedural knowledge of global environmental issues was high.

Based on the analysis, the students know more about why and how the occurrence of the issue. It related to procedural knowledge, compared to their knowledge of what and classification of some global environmental issues, in this case concerning the factual knowledge and conceptual knowledge.

Students' knowledge derives from age, education, and experience [9], [10]. Based on their age, respondents are generally over 17 years old. It indicates that they have various skills related to the utilization of energy and other resources. With this experience, respondents can analyze the source of the causes of environmental problems. Directly, this knowledge develops and can become a predisposition in the formation of behavior [11].

Environmental knowledge is also sourced from information held by individuals about environmental facts [12]. The information he receives can be sourced from outside such as social media or sourced from his experience. Related to this study, respondents quickly get access to information. Students generally have broad access to information both directly from the lecturer or through electronic media.

4. CONCLUSION

The results showed that the level of knowledge of mechanical engineering students in Makassar's city on global environmental issues was high (66%). Meanwhile, if reviewed per indicator, it shows that students' procedural knowledge is the highest (79.17%), then conceptual knowledge (60.25%), and factual knowledge (60.07%).

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