Environmental literacy profile of 7th grade junior high school students in science learning on global warming subject

I Maulaa\(^1\), I Hamidah\(^1\), and A Permanasari\(^2\)

\(^1\)Prodi Pendidikan IPA, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia
\(^2\)Departemen Pendidikan Kimia, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia

\(^*\)Corresponding author: ishmatulmaulaa@upi.edu

Abstract. This paper examined environmental literacy which has become a global issue in the world. This study aimed at analysing the environmental literacy profile of junior high school students in one of junior high schools in Bandung, West Java Indonesia. The method used was pre-experimental method employing scientific descriptions that were explored descriptively. The population and sample were 96 students in the 7th grade of junior high school. Environmental literacy was measured by 30 multiple choice questions covering aspects of knowledge, environmental affective, cognitive skills, and behaviour. An environmental literacy test was developed adopting the Middle Schools Environmental Survey/Instrument (MSELS/I) test questions used by NELA. The results indicated that the environmental literacy of the students was classified as the medium category. The scores obtained by students for each aspect were not significantly different. Knowledge aspects, affective environment, cognitive skills, and behaviour score of 53.28, 47.52, 56.64 and 49.17, respectively. Based on the achievement level of each group of students, environmental literacy obtained for the high, medium and low categories were 11%, 57%, and 32%, respectively. Based on these results, it can be concluded that teacher efforts to make learning better, more innovative, and oriented towards environmental literacy were highly required.

1. Introduction

Global issues about the environment have become very often heard lately. Lots of environmental damage that occurs and worsens the condition of the ecosystem in general. One reason is the high level of human activity to meet the needs of life resulting in one of the environmental problems such as the increasing number of greenhouse gases in the atmosphere. One of the causes of global warming that is happening now is due to air pollution that occurs in big cities [1]. Even a study shows that there is an increase in CO\(_2\) emissions and an increase in the amount of energy use in Jakarta, where CO\(_2\) emissions contribute to global warming [2].

One of the most effective tools to prevent disasters is education [3-5]. When the world is faced with critical environmental problems, the education system must produce environmentally literate citizens who care about the environment and have sufficient knowledge about environmental issues to behave responsibly [6]. Thus, there is an urgent need to promote environmental literacy through environmental education among its citizens so that they can reduce and be resilient to this threat. This can be achieved with environmental education (EE) which is equipped with science education (SE). EE emphasizes
instilling environmental values, fostering a positive attitude and generating pro-environment actions among students; while SE focuses primarily on teaching scientific knowledge and skills through inquiry-based instruction, for example, the concept of global warming and the means to reduce it. Thus, EE and SE have a unique set of epistemologies that must complement each other; and the convergence of these two disciplines in improving citizen environmental literacy is needed [7].

Today, environmental literacy has been widely discussed and developed, one of which is the NAAEE (North American Association for Environmental Education). NAEE has formulated the concept of environmental literacy, components of environmental literacy and conducted studies on environmental literacy. Environmental literacy is very important for students in order to prepare people who understand and can solve environmental problems. By knowing the environmental literacy abilities and attitudes of students towards the environment can build a sense of love for the environment and maintain the existence of abundant natural resources in Indonesia. The concept of environmental literacy is emphasized by the Environment Education and Training Partnership (EETAP) which states plainly that an environmentally literate person knows what he will do for the environment, he knows how to do this [8]. The literacy status of a person's environment can be measured based on the criteria of the components of environmental literacy, namely: knowledge, cognitive skills, attitude and behavior that is responsible for the environment [8].

According to [9], environmental literacy is defined as knowledge about the environment and the attitude of a person used to make effective decisions in various environmental contexts. Someone is said to have environmental literacy skills if the person has been able to act in environmental issues. According to [10] explained that environmental literacy is a perception and activeness of individuals in carrying out actions related to the environment. Environmental literacy can also be understood as knowledge, awareness, sensitivity, and responsibility to influence an individual's activity on natural resources [11]. Based on some definitions, it can be understood that environmental literacy is the ability of each individual related to knowledge, skills in thinking, attitudes and how to give behavior to the environment. Whereas according to [12] the literacy ability of a person's environment can be measured through four components, namely: (1). Environmental knowledge covering the basics of the environment; (2). Attitudes towards the environment include views on the environment, sensitivity to environmental conditions, and feelings towards the environment; (3) cognitive skills which include identification of environmental problems, environmental analysis and implementation of planning; and (4) behavior that includes concrete actions on the environment. These components are references that are used to assess the extent of a person's literacy abilities. In applying environmental literacy in schools these components should be described in the form of criteria listed in the assessment rubric.

Based on the background, the purpose of this study was to determine the Environmental Literacy Profile of 7th grade Junior High School Students in Bandung in Science Learning The Theme of Global Warming.

2. Methods
The method used is the pre-experimental method accompanied by scientific descriptions that were explored descriptively, namely research that aims to describe the profile of environmental literacy achievements of junior high school students in Bandung in the Global Warming science learning theme. The study was conducted at two junior high schools in Bandung with the number of respondents 96 students.

Research Instruments Students' environmental literacy abilities are measured using environmental literacy tests adapted from the Middle School Environment Literacy Survey (MSELS / I) developed by the National Environmental Literacy Assessment [13]. Then modified according to pollution content totaling 30 questions that represent all aspects of environmental literacy including knowledge, cognitive, affective, and environmentally responsible behavior. The aspects of environmental literacy based on the Middle Schools Environment Literacy Survey / Instrument (MSELS / I) are fully contained in Table 1.
Table 1. Student's Environmental Literacy Test Design

| Component of Environmental Literacy | Sub Component              | Item Number | Item Total | Range Score | Category          |
|-------------------------------------|----------------------------|-------------|------------|-------------|-------------------|
| Knowledge                           | Ecological knowledge       | 1-5         | 5          | 0-15        | Low = 0-5         |
|                                     | Verbal Commitment          | 6-9         | 4          | 0-12        | Moderate = 6-10   |
|                                     | Environmental Sensitivity   | 10-13       | 4          | 0-11-15     | High = 11-15      |
| Affective about the Environment     | Environmental Feeling      | 14-17       | 4          | 0-24        | Low = 0-12        |
|                                     | Issue Identification       | 18-20       | 3          | 0-21        | Moderate = 13-24  |
|                                     | Issue Analysis             | 21-23       | 3          | 0-27        | High = 25-36      |
|                                     | Action Planning            | 24-26       | 3          | 0-18        | Low = 0-9         |
|                                     | A real commitment (pro-environmental Action) | 27-30 | 4 | 0-12 | Moderate = 5-8 |
|                                     |                            |             |            |             | High = 9-12       |
| Total                               |                            |             | 30         | 0-90        |                   |

3. Result and Discussion

The results on average environmental literacy is presented table 2. The achievements of environmental literacy modified by the global warming concept of the students can be classified into four aspects of environmental literacy, namely knowledge, cognitive skill, attitude/affective, and behaviour. The highest achievement aspect is the aspect of cognitive skill and the lowest is the affective environment aspect. This has many factors, one of which is the low knowledge of students about the environment.

Table 2. Average of Environmental Literacy Score

| Component of Environmental Literacy | average (%) |
|-------------------------------------|-------------|
| Knowledge                           | 53.28       |
| Affective about the Environment     | 47.52       |
| Competency (Cognitive Skills)       | 56.64       |
| Environmental Responsible Behaviour | 49.17       |

Environmental education does not only deal with theories and concepts but also knows real problems so students are involved in solving problems and encouraging students to take action on environmental problems [14]. In addition, learning in schools also influences the level of environmental literacy possessed by students as stated by [15] is a process in which a person's environment is intentionally managed to enable him to participate in certain behaviors in special conditions or produce certain responses learning is something most special in the world of education. In another understanding learning is an effort to make students learn, need learning, motivated to learn, willing to learn, and interested in continuing to learn something so that learning is meaningful. That is why it is said that students' environmental literacy can be seen from the learning outcomes in school.

From each aspect of Environmental literacy above, then the researcher conducts further processing and calculation to obtain a percentage of each category. The following is Figure 1. that is supported by the percentage environmental literacy profile of 7th grade junior high school students in Bandung in science learning the theme of global warming.
Figure 1. Category of Environmental Literacy

The graph above is obtained based on data processing about environmental literacy by presenting 30 questions related to global warming. It appears that 11% of students can be categorized as having high literacy skills, 57% have moderate literacy skills, while 32% have low literacy skills. This percentage shows that VII grade students of SMP in Bandung who are the subjects of research generally understand the concept of environmental literacy and can apply it to practical situations.

Respondents who were categorized as having literacy abilities were at 57%, indicating that respondents could only answer 11-20 questions correctly. Other respondents who are categorized as having low literacy skills are at 32%, this figure shows that as many as 32% of respondents can only fill in the exact statement no more than half. The acquisition of this percentage can at least be caused by two factors, namely, the respondent does not understand the material of global warming or does not know the answer to the question asked. There are many ways to improve environmental literacy, for example with environmental education in schools accompanied by direct practice aiming at raising students’ awareness on the recent and future environmental problems that are happening in the world.

Of the 30 questions presented, there are 7 dominant questions in the right answer, among others, about global warming, greenhouse gases, and the effects of global warming. One of the main causes of global warming and the causes of global warming. This implies that students’ knowledge on the environment is limited to the simple and directly intersect problems in their everyday life. To improve students’ environmental literacy skills, a long and continuous process is required [16]. Efforts to improve environmental literacy are what must be done continuously considering that a person's literacy environment greatly influences the way someone treats their environment. The knowledge of environmental literacy obtained is expected to provide understanding and awareness to better understand the environment, and to save the environment properly.

4. Conclusion
Based on the research finding the average of Bandung junior high school students environmental literacy is in moderate category.

5. References
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