

Environmental Literacy Analysis and Critical Thinking Skills of Middle School Students in Understanding Science Education

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Abstract: Environmental issues have become a significant challenge both locally and globally, making it essential for every individual to play a role in creating a better world. This study aims to analyze the environmental literacy and critical thinking skills of 7th-grade students at SMP Geeta School in understanding science learning. The research employs a descriptive method with a quantitative approach, utilizing two primary instruments: the Middle School Environmental Literacy Survey (MSELS) and a critical thinking skills test. The study sample consists of 26 students. The findings indicate that students' ecological knowledge scores an average percentage of 60%, categorized as fairly good; environmental sensitivity scores 58%, also categorized as fairly good; and environmental feelings score 93%, categorized as very good. In the critical thinking skills test related to environmental issues integrated with the concepts of physical and chemical changes, the average percentage obtained is 45.8%, categorized as fairly good. The distribution of results across sub-indicators includes elementary clarification at 43% (fairly good), strategies and tactics at 63% (good), advanced clarification at 48% (fairly good), basic support at 35% (poor), and inference at 40% (poor). These results illustrate that the development of students' environmental literacy and critical thinking skills requires greater attention, particularly in aspects categorized as poor, to enhance students' understanding and awareness of environmental issues.

Keywords: Critical Thinking; Ecology; Environmental Issues; Environmental Literacy; Physical And Chemical Changes.

Introduction

In the era of globalization, environmental challenges are increasingly complex, ranging from climate change pollution, to natural resource degradation [1]. Environmental issues have become the centre of attention from the local to the global level. Major challenges that will be faced around the world are global warming, forest destruction, social problems, poverty, water pollution, etc [2], [3]. Each individual has a very large role in creating a better world life towards economic balance, social welfare, and the environment so that it is expected to meet all future needs [4]. Individuals with environmental literacy skills have awareness and attention to the environmental conditions around them. They can take appropriate steps to maintain, repair, or improve the health of environmental systems [5].

Science lessons in middle school (IPA) are one of the contextually integrated environmental education efforts, which involves students directly observing the surrounding environment [6]. Education about environmental problems can be done by integrating environmental literacy skills in schools [7]. Environmental literacy skills help students understand sustainable issues such as social, economic, political and environmental issues [8]. This awareness includes the ability to understand environmental issues in depth, not just knowing but also being responsive, being able to provide solutions, and understanding environmental conditions in a good and directed manner [9]. Given the complexity that affects today's world, such as the availability

of a lot of information, students must be able to analyze, interpret, and evaluate information to make appropriate and useful decisions [10]. Critical thinking education is one of the concepts that is as important as the function of education in the 21st century [11].

Geeta School Junior High School is one of the institutions that aims to provide an understanding environmental literacy and students' critical thinking skills needs to be examined in depth. Therefore, this study was conducted to link environmental literacy with critical thinking skills in science learning. The results of this study are expected to contribute to improving the quality of science learning that is not only focused on understanding concepts but also strengthening student's environmental awareness and responsibility.

Research Methods

This research design uses descriptive research methods with a quantitative approach. The subjects of this study were 26 seventh-grade students of SMP Geeta School who studied material on physical and chemical changes as well as material on living things and their environment. This study used two instruments: an environmental literacy test adapted from the Middle School Environment Literacy Survey (MSELS) and critical thinking skills ability test questions. The MSELS written test uses questions validated with indicators that can be seen in Table 1, and indicators of critical thinking skills can be seen in Table 2.

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Table 1. Environmental Literacy Indicators

Environmental Literacy Indicators	Sub Indicators	Number of questions
Ecological knowledge	Basic ecological knowledge	17
Cognitive skills	Identification of environmental issues	3
	Environmental action plan	1
	Analysis of environmental issues	6
Environmentally conscious attitude	Intention to act	12
	Sensitivity to the environment	11
	A feeling of the environment	2
Environmentally responsible behaviour	Actual commitment	12

[12]

Table 2. Indicators of Critical Thinking Skills

Critical Thinking Skills Indicator	Sub Indicators of Critical Thinking Skills	Number of questions
Elementary clarification	Focusing the question	1
	Analyzing the argument	
	Answering an explanation or challenge	
Basic support	Customize with sources	1
Inference	Induce and consider the results of induction	1
Advanced clarification	Define terms and consider them	1
Strategy and tactics	Deciding on an action	1

[13]

The results of the research data were then analyzed descriptively based on the achievement

score of each environmental literacy indicator. Analysis of the results of the student environmental literacy test (MSLES) on indicators of knowledge and cognitive abilities analyzed using the following formula:

$$\% \text{Environmental Literacy} = \frac{\Sigma \text{ obtained score}}{\Sigma \text{ maximum score}} \times 100\%$$

Analysis of the results of the environmental literacy test (MSLES) on indicators of attitudes and behaviours towards the environment using the formula:

$$\% \text{Attitudes} = \frac{\Sigma \text{ respondents answer score}}{\text{max score} \times \Sigma \text{ questions} \times \Sigma \text{ respondents}} \times 100\% \quad [14]$$

The percentage results of the attitude and behaviour scores were then converted to the following criteria:

Table 3. Interpretation Criteria Score for Environmental Literacy and Critical Thinking Skills

Percentage (%)	Criteria
1-20	Not very good
21-40	Not good
41-60	Good enough
61-80	Good
81-100	Very good

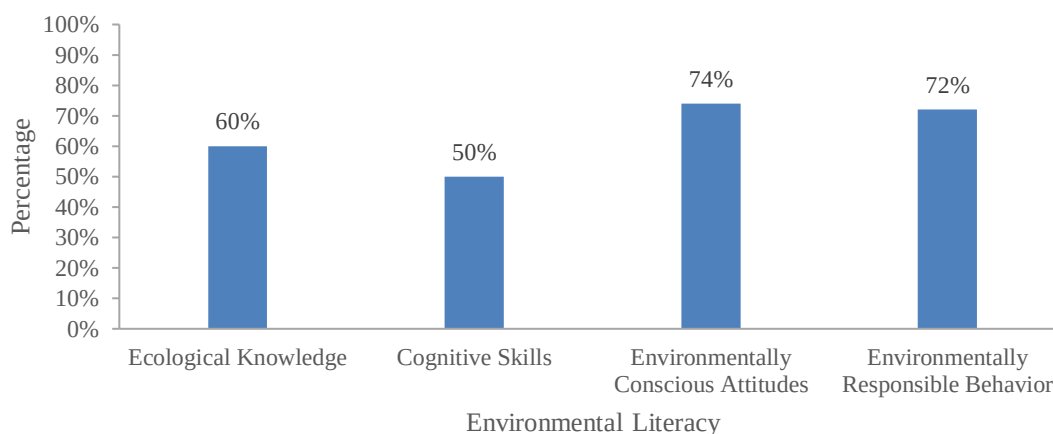
[15]

Results and Discussion

The data in this mini research writing was obtained from two instruments, the Student Environmental Literacy Question and the Critical Thinking Skills Comprehension Test on Science Learning, which was tested on a sample of 26 seventh-grade students at Geeta School Cirebon.

Environmental Literacy Analysis

The results of the data collected by the author from the Environmental Literacy instrument of seventh-grade students at Geeta School based on the indicators vary greatly; some are in the good and quite good categories. The results of the environmental literacy analysis of SMP Geeta School students can be seen in Figure 1.

**Figure 1.** Percentage of Student's Environmental Literacy

Based on Figure 1 above, students' Ecological Knowledge has a percentage of 60% in the good enough category. Environmental knowledge contains information owned by someone about ecological knowledge, namely about the relationship between living things and ecosystems [16]. I explained that the basic concepts of ecology include (1) ecosystem concepts, (2) the law of thermodynamics, (3) primary and secondary production, (4) food chains, trophic levels, and ecological pyramids, (5) cycles in ecosystems, (6) density and carrying capacity, (7) species diversity, and (8) succession [17]. The environmental literacy instrument that measures ecological knowledge contains seventeen questions that raise environmental issues such as human behaviour's positive and negative impacts on the use of organic waste, exploitation of animals and plants, waste pollution, and others.

The second indicator in the environmental literacy instrument is cognitive skills, with a result of 50%, which is a fairly good category. Cognitive skills are the process of students remembering (C1), understanding (C2), applying (C3), analyzing (C4), evaluating (C6), to the level of creating (C6) [18]. The sub-indicators measured in cognitive skills include three things, namely identification of environmental issues, analysis of environmental issues, and environmental action plans [19]. Figure 2 explains where the percentage of cognitive skills of 50% is obtained, namely from the average percentage of sub-indicators of identification of environmental issues 31% (not good enough), analysis of environmental issues 54% (good enough), and environmental action planning 73% (good). According to Hollweg [20], identifying environmental issues involves understanding and recognising various environmental issues, including explaining conditions, risks, and impacts. In contrast, environmental issue analysis includes skills in interpreting, utilizing scientific knowledge, and processing new information to identify relationships between aspects of environmental problems by estimating possible impacts. In contrast, environmental action planning is related to the ability of students to plan actions to solve environmental problems by making effective and responsible strategies or steps.

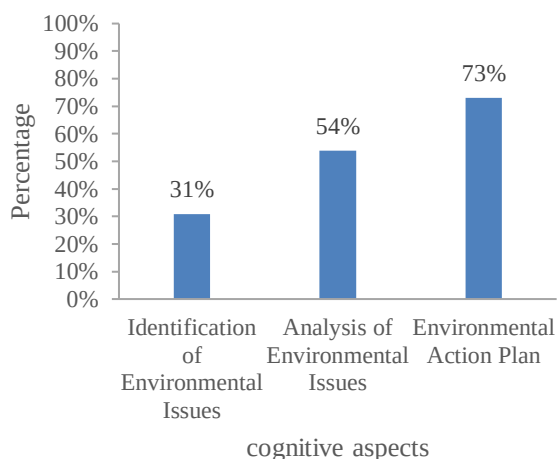


Figure 2. Environmental literacy results in cognitive aspects

Student's indicators of environmentally conscious attitudes are in a good category, with an acquisition of 74%. Attitudes are feelings and thoughts that influence the behaviour of students in

liking or disliking something, students' attitudes towards their awareness of the environment

consist of three main components, namely emotions, behaviour, and cognition [21]. Based on Figure 3 below is the percentage of environmentally conscious attitudes obtained in the instrument test on seventh grade Geeta School students with sub-indicators of intention to act 75% (good), sensitivity to the environment 58% (quite good), and feelings towards the environment 93% (very good).

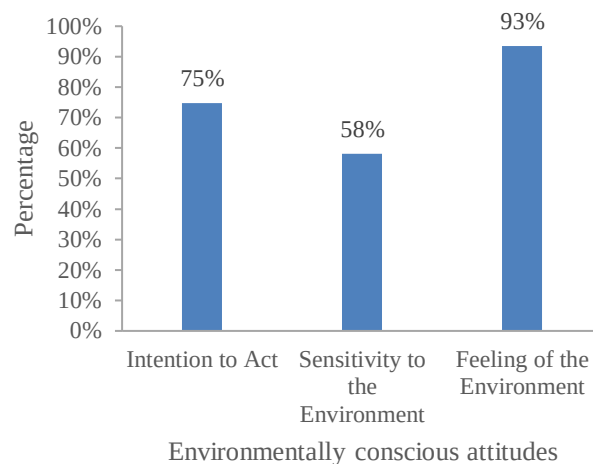


Figure 3. Environmental literacy results in environmentally conscious attitudes.

Thinking Skills Comprehension Test Analysis

The critical thinking skills comprehension test conducted by the author in seventh-grade students of Geeta School Junior High School obtained the results as shown in Figure 4, in accordance with what Ennis stated in Sunardjo that the sub-indicators measured in the critical thinking skills comprehension test are providing simple explanations (Elementary Clarification) 43% quite a good category, building basic skills (basic support) 35%, inferring (inference) 40%, making further explanations (advanced clarification) 48%, organizing strategies and tactics (strategies and tactics) 63% [22].

The results of the above research show that the percentage of all indicators of critical thinking skills based on the test of understanding questions about environmental issues integrated with the concept of physical and chemical changes is 45.8%. This shows that the critical thinking skills of Geeta School junior high school students are in the good enough category. Developing critical thinking skills in students is widely recognized as an important goal of higher education [23]. The elementary clarification sub-indicator focuses on asking questions with argument analysis and answering questions that require explanation or challenge; strategies and tactics include determining actions or interacting with others; advanced clarification contains questions by measuring whether children can identify terms and consider definitions, as well as identify assumptions; basic support includes judgment in the reliability of sources and making judgments based on observations; while inference is considering results and making decisions [24]. From these results, it can be seen that the highest results are in the strategies and tactics sub-indicator, while the lowest percentage of results are in the basic support sub-indicator.

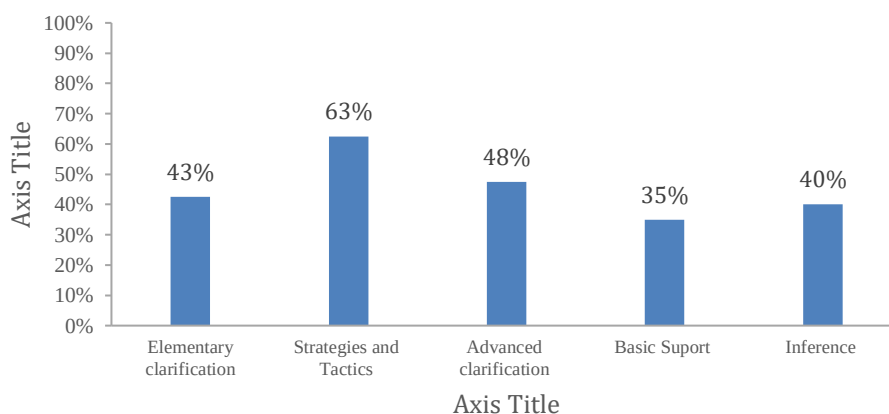


Figure 4. Critical thinking skills comprehension test results

Conclusion

Based on the results and discussion of the research with these two instruments, it can be concluded that the environmental literacy skills of seventh-grade Geeta School students are in a good category, with the distribution of sub-indicators of ecological knowledge in the good enough category, sensitivity to the environment in the good enough category, and environmental feelings in the very good category. While the results of the test of understanding critical thinking skills about environmental issues integrated with the concept of chemical physics changes obtained percentage results with a fairly good category with the distribution of sub-indicators of elementary clarification in a fairly good category, strategies and tactics in a good category, advanced clarification in a fairly good category, basic support in a poor category, and inference in a poor category. With the results of the research data above, further research is needed on improving students' environmental literacy and critical thinking, especially in sub-indicators that get poor results, such as basic support and inference in critical thinking skills.

Author's Contribution

Dinda Febrihastatiwi served as the main author and was responsible for data collection. Fenny Roshayanti, Mega Novita, and M. Syaiful Hayat were supervisors and significantly directed the research.

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