

## Critical Thinking Skills and Sustainability Consciousness of Students for the Implementation Education for Sustainable Development

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### Keywords

Critical thinking skills, ESD, Sustainability consciousness, Environmental pollution

### Abstract

The study aimed to describe the critical thinking skills and sustainability consciousness of students of one junior high school in Bandung using an E-module of environmental pollution containing education for sustainability development (ESD). The research used descriptive qualitative and quantitative methods. This study involved 32 participants using a research instrument in the form of critical thinking skills essay questions that contained sustainability consciousness (ESD) with a total of 12 questions. The study indicated that critical thinking skills reach the highest score on the indicator of building basic skills of 78.1% and the lowest score on the concluding indicator of 64.8%. The average score of students' critical thinking skills was 74.4%, which showed the level of students' critical thinking skills in the adequate category. Meanwhile, the sustainability consciousness components showed that the sustainable knowledge, sustainable attitude, and sustainable behavior were constructed with percentages of 82.1%; 79.5%; and 77.8% indicating that the average students' sustainability consciousness was 79.8% in the good category.

### INTRODUCTION

In the 21<sup>st</sup> century, science and technology is advancing and continue to develop. The necessary skills for 21<sup>st</sup> Century Education are creativity, critical thinking, communication, and collaboration (Bialik and Fadel, 2015). The Regulation of the Ministry of Education and Culture Number 20 of 2016 on Competency Standards for Elementary and Secondary Education Graduates states the skill competencies that students must possess are: 1) creative; 2) productive; 3) critical; 4) independent; 5) collaborative, and 6) communicative (Permendikbud, 2016). Of the several skills, critical thinking is one of the most frequently discussed skills in education and is believed to play an important role in logical thinking, decision-making, argumentation, and problem-solving.

The essence of critical thinking skills is an attitude of trying hard in deciding actions and being open to reliable information and sources of information. But, the critical thinking ability of students in Indonesia is still relatively low. It is known based on the results of the Trends in International Mathematics and Science Study (TIMSS) that the science ability of Indonesian students is ranked 38th out of 40 countries.

Meanwhile, the Program for International Student Assessment (PISA) also provides information on the results of students' abilities in the field of science, which are relatively low (Wijayanti, 2020). Conducting critical thinking is not easy, but critical thinking skills can be learned and trained. Critical thinking is needed to check the truth of information so that it can be decided whether the information deserves to be rejected or accepted (Rohman, 2018). Thus, critical thinking skills are important to be developed in a lesson to be able to check the truth of information and communicate ideas that support the decisions.

A study by Urazizah (2017) shows that the profile of high school students' critical thinking skills on physics is still relatively low. Then, it needs learning innovations as an effort to improve it. One of the learning innovations is through integration with global problems that are currently occurring, for example, Education for Sustainable Development (ESD). UNESCO has formulated ESD. UNESCO (2012) defines ESD as an effort to empower students to take responsible decisions and actions for environmental integrity, economic viability, and just society, both for present and future generations, while respecting cultural diversity. Therefore, ESD must be integrated into learning activities to build consciousness and

concern for the environment for sustainable development.

ESD views problems based on three aspects, environmental, social, and economic. These aspects have relevance to global issues and sustainability of human life. Here, with the ESD context, it is hoped that students will have sustainability consciousness. Sustainability consciousness is especially needed to deal with global problems and to think critically about how to overcome problems by paying attention to the impact they will have on various aspects of life.

Sustainability consciousness is an element supporting the implementation of the concept of sustainable development, which is one of the new innovations of education, starting from ESD. A material in science learning that can be taught in the context of ESD is environmental pollution material, which aims to support life in the future and provide consciousness to students on the issues of the surrounding environment.

Based on the importance of critical thinking skills, sustainability consciousness in the 21st century, and the application of ESD, it is urgent to develop appropriate teaching materials. Several studies related to critical thinking skills, sustainability consciousness, and the application of ESD have been carried out, such as discussing the profile of students' sustainability consciousness through the integration of ESD (Nursadiah and Ramalis, 2018), profiles of students' critical thinking skills in science learning (Nursadiah and Ramalis, 2018), as well as introducing ESD in Indonesia in dealing with issues related to the global issue in learning (Tristananda, 2018). But, previous studies do not discuss the relationship among students' critical thinking skills, sustainability consciousness, the need for teaching materials, and ESD implementation.

## RESEARCH METHOD

The research used descriptive qualitative and quantitative methods. The research sample was 32 students in one junior high school in Bandung city. The research was conducted by collecting data on the need for teaching materials and the application of ESD, critical thinking skills, and sustainability consciousness.

### Teaching Material Needs

The sample was 55 students concerning the need for teaching materials and 22 teachers about the need for teaching materials and the application of ESD. Samples were taken randomly. The instrument was an open questionnaire using the Googleform platform.

### Critical Thinking Skills

The test instrument of critical thinking skill was developed using critical thinking indicators in the form of descriptive questions with indicators of providing simple clarifications, building basic skills, concluding, providing explanations, and strategies and tactics that are integrated with aspects of ESD. The research instrument used an essay on critical thinking skills containing 12 ESD questions.

The data was obtained by analyzing students' answers using a rubric. After that, the score is converted into a percentage using the following formula:

$$\text{Student Score} = \frac{\sum \text{raw score}}{\sum \text{max score}} \times 100\%.$$

After obtaining the score, then the overall average score is calculated with the following formula:

$$\text{Average Score} = \frac{\sum \text{Students' scores}}{\sum \text{Number of students}}.$$

Then, the percentage of critical thinking skills are given in Table 1.

**Table 1.** Critical Thinking Interpretation

Percentage (%)	Criteria
86 - 100	Very critical
76 - 85	Critical
60 - 75	Pretty critical
55 - 59	Less critical
< 55	Very less critical

### Sustainability Consciousness

The sustainability consciousness profile includes three constructs, i.e.: knowledge, attitude, and behavior. Sustainability consciousness was measured via a questionnaire adopted from Gericke (2019) using a Likert scale with five answer choices, namely: strongly agree (SS), agree (S), disagree (TS), and strongly disagree (STS). The results of filling out the questionnaire are calculated in a percentage using the following formula:

$$\text{Percentage} = \frac{\text{total score obtained}}{\text{total maximum score}} \times 100\%.$$

The sustainability consciousness score is given in Table 2.

**Table 2.** Percentage of Sustainability Consciousness (Purwanto, 2012)

Percentage (%)	Criteria
86 - 100	Very good
76 - 85	Good
60 - 75	Adequate
55 - 59	Inadequate
< 55	Very Inadequate

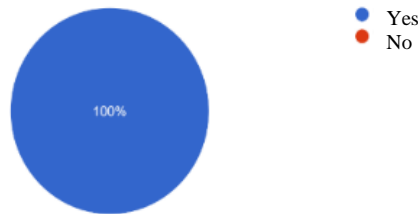
## RESULT AND DISCUSSION

### The Need for Teaching Materials

Based on the results of a survey conducted by the researchers through the Googleform platform, it is found that 22 samples of science teachers

stated the need for e-modules containing ESD in Integrated Science learning.

Do you think that an e-module containing Education for Sustainable Development (ESD) is needed to support Integrated Science learning?



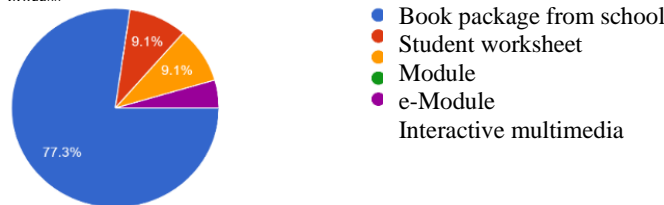
**Figure 1.** The results of a survey of the need for teaching materials containing ESD

Figure 1 means that the development of ESD-based e-module teaching materials is very urgent to be developed. The implementation of ESD in e-modules is designed with pictures, videos, animations, and quizzes to attract students' attention and motivate them to apply "what is expected" in education that contains sustainable development, which includes knowledge, skills, attitudes, and values for a better future. According

to Nawawi (2017), the module should contain material with a series of activities, training, and self-assessments to monitor the level of student learning completeness. The module also has the potential as a means of empowering critical thinking.

A survey is performed to find out the types of teaching materials used in the science learning. The results of the survey are presented in Figure 2.

Teaching materials that are often used by fathers/mothers in the science learning process

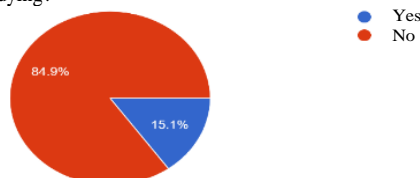


**Figure 2.** Survey results of teaching materials that are often used.

Based on Figure 2, 77.3% often use teaching materials in the form of school textbooks, but there are limitations when using school textbooks such as easily damaged, blurry images, requiring a lot of paper, and difficult to distribute or cannot be accessed. On the other hand, electronic teaching materials are considered more accessible to students because the technology to access them is already available. So, students can access teaching

materials anywhere and anytime through their gadgets. Also, e-modules have not been used optimally. Hence, it is urgent to develop teaching materials in the form of e-modules as the teaching materials are easily accessible anytime and anywhere. This finding is in line with the results of a random survey conducted on 55 students as given in Figure 3.

Do you have any other handbooks besides textbooks/student worksheets for studying?

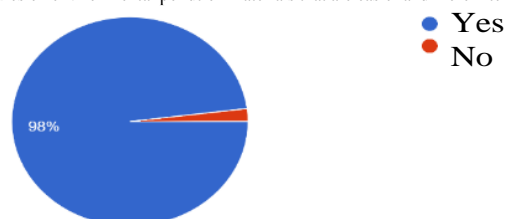


**Figure 3.** Survey results of students' handbooks other than textbooks

Based on the figure 3, 84.9% stated that students did not have a learning resource , except the textbooks. Then, it needs to develop teaching materials as alternative teaching materials. Based

on the survey results in Figure 4 shows that 98% of students agree with the alternative teaching materials in the form of e-modules.

Do you agree if there are alternative teaching materials in the form of electronic modules on environmental pollution materials that are easier and more interesting?



**Figure 4.** The results of the survey on the existence of alternative teaching materials

According to Kimianti and Prasetyo (2019), worksheets and printed books have limitations. Thus, this opens opportunities to integrate teaching materials with the latest information technology to support the achievement of 21<sup>st</sup> century skills. The students agree to an effort to develop teaching materials that can be accessed and used independently by students. Darmayasa (2018) defines a module as a book written with the aim that students can learn independently. The development of information technology has made it possible to change teaching materials, such as

printed modules into digital formats or e-modules. E-Module allows students to learn independently, and teachers are no longer the only source of learning.

#### Critical Thinking Skills

Critical thinking skills are crucial skills to face the challenges of life in the 21st century. Critical thinking plays an important role in the world of education and is the main goal of learning. Table 3 shows the results of the analysis of critical thinking indicators after implementing ESD-based e-modules.

**Table 3.** The achievement of each indicator of critical thinking skills

Indicator	Percentage (%)
Provide simple clarification	75.3
Building basic skills	78.1
Conclude	64.8
Provide further explanation	77.3
Provide strategy and tactics	76.7
<b>Average</b>	<b>74.4</b>

Table 3 shows the average acquisition of students' critical thinking skills of 74.4%. The data shows students' critical thinking skills are in the adequate category. The low level of students' critical thinking may be caused by the learning process that does not train critical thinking skills. According to Ritdamaya and Suhandi (2016), critical thinking skills are not innate so they can be applied, trained, and developed through the learning process.

Based on the Table 3, each indicator of the critical thinking skill has a different percentage score, i.e.: 75.3%; 78.1%; 64.8%; 77.3%; and 76.7% for providing simple clarification; building basic skills; concluding; providing further explanation; and providing strategies and tactics, respectively. Based on the data, the indicator of concluding has the lowest percentage. In line with a study conducted by Prasetyowati and Suyatno

(2016), the indicator is in a difficult category because students' literacy skills are still low in understanding and critiquing questions. The indicator of building basic skills shows the highest percentage because the indicator is the basic indicator of critical thinking skills. The indicator is in the form of observing problems that occur around their environment and most of them have experienced them.

#### Sustainability Consciousness

Sustainability consciousness may be built with knowledge and consciousness about the things to do (Salsabila *et al.*, 2019). Sustainability education aims to raise consciousness and help students to master sustainable behaviors. Sustainability consciousness, in this study, is measured using a sustainability consciousness questionnaire containing 33 statements, in which students are

asked to choose one of four statements. This sustainability consciousness questionnaire uses three constructs, consisting of sustainable knowledge, sustainable attitudes, and sustainable behaviors. The three constructs in this questionnaire are integrated with the three pillars

of sustainable development consisting of environmental, social, and economic dimensions. Students obtain the sustainability consciousness questionnaire after using the developed e-module with the results of the percentage for each construct is presented in Table 4.

**Table 4.** Sustainability consciousness profile

No.	Construct	Percentage (%)
1.	Sustainable knowledge	82.1
2.	Sustainable attitude	79.5
3.	Sustainable behavior	77.8
	<b>Average</b>	<b>79.8</b>

Table 4 shows the results of the sustainability consciousness profile on the sustainable knowledge construct with the highest percentage at 82.1%. Those students have a high concern for their environment. But, the sustainable behavior construct has the lowest percentage at 77.8%. It means, they rarely or never act in sustainability practices. Lack of efforts to persuade students to practice sustainability consciousness can be a factor that causes students to rarely or never take sustainability actions. Knowledge is the basis for strengthening attitudes and behavior. The main problem of environmental education is how to encourage and develop students' sense of connectedness with the environment, which can turn into pro-environmental behaviors. The average of these three constructs is 79.8% in the good category. Wangid (2018) states that the school is one of the foundations to achieve its function of building people who care about the environment. Schools must provide positive learning experiences and motivation for students to build a caring character for the environment. Also, Susilowati (2018) argues that integrating sustainability education to develop a caring attitude toward the environment is a challenge for science teachers. Environmental consciousness is part of environmental literacy and can be grown through science learning so that students have the knowledge and can orient it towards sustainable attitudes and behaviors.

## CONCLUSION

The developed ESD-based teaching materials can facilitate the implementation of ESD and meet the needs of accessible materials and can be used independently by students. In general, the students' critical thinking skills after using the developed e-module are categorized as adequate. Each indicator of critical thinking skills has a different percentage score. The indicators of concluding and building basic skills have the lowest and highest achievements, respectively. The results of the sustainability consciousness

profile on the sustainable knowledge construct is the highest at 82.1%. Those students have a high concern for their environment. But, the sustainable behavior construct has the lowest percentage at 77.8%. The average of the three constructs is 79.8% in the good category.

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