Integration of SDGs in environmental education subjects of adiwiyata vocational high school

I K Rahayu*, Y Sanjaya, and R Solihat
Departemen Pendidikan Biologi, Universitas Pendidikan Indonesia, Jl. Dr. Setiabudi No. 229, Bandung 40154, Indonesia
*kartika.indira@gmail.com

Abstract. Environmental education plays an important role in promoting education for sustainable development (ESD) in schools. Environmental education is not always a stand-alone subject, but it has also been integrated into other subjects. This study aims to analyze the integration of SDGs in environmental education in building students' knowledge and attitudes following the ESD curriculum framework. This study employed a descriptive method. Data were collected through document analysis, test about SDGs, questionnaires, and interviews. Data were analyzed descriptively. Involving 60 students from tenth grade as the participants of this study. The result show that the integration of SDGs in environmental education can build good attitudes in students significantly but not in their knowledge. Based on this findings environmental education subjects becomes an important subject to be include in the school curriculum to build good attitude related to SDGs.

1. Introduction
The main purpose of education for sustainable development (ESD) is understanding the integration of the principles, values, and practices of sustainable development in all aspects of education and learning [1]. Thus, in implementing education in schools, every academic subject is required to contribute to ESD. Environmental knowledge, awareness, care, or values affect attitudes, intentions, and behaviors that are environmentally responsible [2]. In this case, it is important to understand how environmental education becomes a means of building students’ knowledge about ESD and shaping the character of students who are responsible for the environment around them, besides other factors that influence students’ prior knowledge, attitudes, and behavior.

Indonesia has agreed on the sustainable development goals (SDGs) which became a global agenda in 2030 at the 2015 UN general assembly [3]. SDGs describes the main development challenges for humanity, consisting of 17 goals with 169 achievements [4]. Thus, SDGs are important to be integrated into teaching and learning activities in schools, especially in environmental education. In environmental education, the curriculum becomes a means to gain experience from the learning process of students, to help them in developing environmental literacy, skills in problem-solving, and decision making, and to be active in taking action on the environment, social, and economy [5].

One approach in implementing environmental education in the school curriculum is to include it as a stand-alone subject [6]. This has become a traditional way of organizing the curriculum of many countries, including Indonesia. In Indonesia, environmental education is included as a stand-alone subject in the school curriculum, integrated into the formal education system. However, there are many arguments against the establishment of environmental education as a separate subject [7].
Aware of the need and importance of environmental education in Indonesia, several efforts have been made in reorganizing environmental education to be more formal. The Indonesian government has an adiwiyata school program as one of the policies in achieving ESD. In Bandung City, there are independent Adiwiyata schools that include environmental education as a separate subject. Yet, other schools integrate environmental education in other subjects. Therefore, the researcher was interested in conducting a study to analyze the integration of SDGs in environmental education and other subjects in the independent Adiwiyata school to build students' knowledge and attitudes towards ESD.

2. Methods
This study utilized a descriptive qualitative method, involving 60 tenth grade students from Adiwiyata Vocational High School (AVHS) A which integrated SDGs into environmental education subjects and Adiwiyata Vocational High School (AVHS) B which integrated SDGs in other subjects, another subject chosen by the researcher was microbiology. The study was taken place in Bandung City. Data were collected from respondents selected through purposive sampling. Data were collected through document analysis was used to analyze teacher’s learning design (RPP), test to identify students' knowledge about SDGs adapted from the ESD curriculum framework consist of 22 multiple choice questions, questionnaires was used to identify students' attitudes adapted from the ESD curriculum framework, and interviews to confirm findings of the research. Data were analyzed descriptively.

3. Result and Discussion

3.1 Integration of SDGs in environmental subjects and microbiology subjects
Based on the analysis of learning design in environmental subjects, in Adiwiyata Vocational High School (AVHS) A there were SDGs related to environmental issues discussed in learning activities, such as the material on current environmental issues, SDGs implemented in learning objectives, and activities including SDGs no. 7 (ensuring access to affordable, reliable, sustainable, and modern energy for all), SDGs no.13 (taking urgent action to go combat climate change and its impacts), and SDGs no. 14 (conserve and sustainably use the ocean, seas and marine resources for sustainable development). Based on the interview, environmental education teachers had integrated SDGs into their learning but limited to SDGs related to environmental issues only, while those related to social and economic fields did not yet been taught deeply.

While in AVHS B, based on the analysis of learning design in microbiology, the teacher associated SDGs no. 2 (end hunger, achieve food security and improved nutrition, and promote sustainable agriculture), SDGs no. 3 (ensure healthy lives and promote well-being for all at all ages), SDGs no. 6 (ensure availability and sustainable management of water and sanitation for all), and SDGs no. 12 (ensure sustainable consumption and production patterns) on learning design of water and food quality. Based on the interview, most students and teachers are familiar with the concept of ESD, the school has a policy of integrating ESD values in environmental education into every subject in the school. Thus, students gained knowledge not only the environment dimension but also social and economic dimension. In conclusion, students' knowledge became holistic. However, in this case, there was a drawback in the form of the absence of monitoring student behavior towards the environment after the learning process took place.

3.2 Students’ Knowledge and Attitude
Table 1 presents the average difference in the results of the dependent variables of students in different schools. Based on the results of data analysis, it is known that there were statistically significant differences between schools that integrate SDGs into environmental education subjects and schools that integrate SDGs into other subjects. AVHS A had an average score of knowledge of 37.80 which was categorized low. However, it showed an average score of the attitude of 82.53% which was considered high. Whereas AVHS B had a knowledge score of 60.80 and an attitude of 69.07% which were both medium categories.
Table 1 The scores of knowledge about ESD and the attitude of students

|         | Statistic | AVHS A | AVHS B |
|---------|-----------|--------|--------|
|         | Mean      | Median | Modus  | Min    | Max    | Std.   | Var    |
| Knowledge | 37.80     | 36.50  | 31.82  | 2.00   | 91.00  | 25.06  | 627.89 |
| Attitude  | 82.53%    | 82.00  | 74.00  | 63.00  | 97.00  | 9.01   | 81.22  |
| Knowledge | 60.80     | 64.00  | 77.27  | 18.00  | 95.45  | 23.70  | 561.75 |
| Attitude  | 69.07%    | 71.00  | 61.00  | 53.00  | 87.00  | 9.49   | 90.20  |

Table 1 shows, students at AVHS A had a low score of knowledge about SDGs while based on the interviews, most students at AVHS A had never known the concept of ESD in advance. They were well acquainted with the term sustainable development from the goal of the school adiwiyata program. This is supported by the results of teacher interviews stating that students were not familiar with the concepts related to ESD and did not know the values contained therein. However, this opinion is varied from one teacher to another for the teacher who taught environmental education subjects already knows the terms related to ESD.

Teachers as educators are powerful agents of change who can provide the educational response needed to achieve SDGs [8]. Teacher knowledge and competence are also very important in restructuring the education process towards sustainability [9]. However, efforts to integrate SDGs into environmental education learning are not enough. Teachers are required to always provide an understanding of ESD values to students. Thus, the students will have the knowledge, skills, values, and attitudes expected for the success of ESD in schools. Cooperation is needed for all school members in implementing ESD.

Related to integrating ESD values in environmental education into every subject in school, SDGs can be included in various disciplines including arts education, English, guidance and career counseling, interdisciplinary studies, mathematics, natural sciences, social sciences, humanities, and educational technology [10]. The problem is not because environmental education is embedded in the curriculum, but there are still subjects that have not been integrated with SDGs. Teachers have different reasons for not applying them in their learning activities. Evaluation and monitoring are the main requirements for the successful adoption and implementation of ESD in learning [11]. Therefore, structured evaluation and monitoring are needed to be carried out to overcome this.

Based on the review of literature on interdisciplinary subjects, students are encouraged to be involved in exploring and integrating various perspectives as well as building knowledge from a variety of different disciplines [12]. This is different from what we call multidisciplinary subjects where students learn various perspectives on a topic without integrity that stays at certain limits. Meanwhile, transdisciplinary creates a unified intellectual framework outside disciplinary perspectives [13]. These three things have their advantages and disadvantages. ESD can be achieved well if it is integrated into a variety of different disciplines [14].

Data analysis was performed using a t-test to see the differences between two variables. T-test analysis is a parametric test where the sample is required to meet the prerequisites for normality and homogeneity tests [15]. The results of the analysis of the normality test showed that the data of knowledge about ESD students of VHS A was 0.125 and their attitude was 0.070. Meanwhile, data on students’ knowledge of ESD at VHS B was 0.192 and their attitude was 0.198. Overall, data on knowledge and attitude of students > 0.05 it means that the data were normally distributed. The results of the analysis of the homogeneity test showed that students’ knowledge was 0.863 and students' attitude was 0.610. Both of those data > 0.05 indicating that the data of knowledge and attitudes of students were homogeneous. After analyzing that the data were normally distributed and homogeneous, a t-test was then performed to investigate the differences in the research samples in the two schools. Table 2 indicates the t-test analysis of students’ knowledge and attitudes at AVHS that integrated SDGs in environmental education and AVHS that integrated SDGs in other subjects.
Table. 2 T-test analysis of students’ knowledge and attitude on SDGs

|                            | Levene’s Test | t-test for Equality of Means | 95% Confidence Interval of Difference | Lower | Upper |
|-----------------------------|---------------|------------------------------|---------------------------------------|-------|-------|
|                            | Equality of Variance |                |                                       |       |       |
| Knowledge                   |                |                |                                       |       |       |
| Equal var. assumed          | .030 .863     | -3.652 58      | .001 -23.000 6.297 -35.605 -10.395   |       |       |
| Equal var. not assumed      | -3.652 57.821 | .001 -23.000 6.297 -35.606 -10.394 |       |       |
| Attitude                    |                |                |                                       |       |       |
| Equal var. assumed          | .263 .610     | 5.634 58       | .000 13.467 2.390 8.682 18.252       |       |       |
| Equal var. not assumed      | 5.634 57.841  | .000 13.467 2.390 8.681 18.252     |       |       |

Significance level α = 0.05

Based on the t-test analysis in Table 2, it can be interpreted that the students’ knowledge and attitude data p < 0.05. It means that H₀ is rejected for there is a significant difference between the knowledge and attitudes of AVHS A students who integrated SDGs in environmental education and AVHS B students who integrated SDGs in other subjects.

Success in integrating SDGs into curriculum and subjects in schools depends on the specific conditions, educational goals, and socioeconomic structure of a country [16]. Schools that integrate SDGs into learning environmental education have a great impact on building the attitudes and character of students through SDGs in schools [17]. The results of this study invite experts in environmental disciplines to review the importance of sustainable environmental pedagogical design in schools.

ESD is a holistic and transformational education that addresses the content and outcomes of learning, pedagogy, and learning environments [18]. Thus, SDGs does not only integrate with content such as environmental issues, poverty, and sustainable consumption; but also creates interactive patterns on student-centered learning. The integration of SDGs in learning is required to be action-oriented, transformative pedagogy, which supports independent learning, participation, and collaboration, problem orientation between transdisciplinary, as well as connecting formal and informal learning [19]. Such an approach enables the development of core competencies to promote sustainable development.

The results of this study indicate a link between environmental education and student attitudes. This shows that environmental education is important to be included in the school curriculum. Environmental education is a multidisciplinary field of social science, physics, and biology [20]. Environmental education helps people to make informed decisions and provide information about their environmental behavior based on their embedded understanding, expertise, skills, and attitudes [21]. Integrating of SDGs into one subject, though, is not enough. It is necessary to integrate SDGs in interdisciplinary subjects. The success in achieving ESD can apply them in their well being as well. This success can be achieved if there are good monitoring and evaluation carried out by the school in monitoring the progress of the success of ESD.

4. Conclusion

The integration of SDGs in environmental education can build good attitudes in students significantly but not in their knowledge. Based on this findings environmental education subjects becomes an important subject to be include in the school curriculum to build good attitude related to SDGs. For
further research students should be introduced to the concept of ESD and SDGs first, so that during the learning process students already have that knowledge.

5. References

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