Promoting environmental literacy through a green project: a case study at adiwiyata school in Banda Aceh City

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Abstract: This article examines developing a community that cares about the environment through education in schools. As a place to study, Adiwiyata school has a special role in improving environmental literacy through green projects. The study used descriptive qualitative to determine the delay in green programs at Adiwiyata School at the high school level in Banda Aceh City. In addition, this study also wants to reveal the role of Adiwiyata School in realizing school community who is responsible for environmental protection and management efforts through good school governance to support sustainable development. One of its roles is the development of student work through green projects. The research result revealed that green project encourages students to learn more effectively and creatively. Because students need the flexibility to think, act and channel various needs, abilities, and skills in meeting environmental needs. Competency development of students can be honed through real work such as products that utilize waste, contain articles, art training and so on. In addition, Adiwiyata programme enhances learning and action, thus providing effective methods to improve student environmental literacy. Adiwiyata School is expected to be an agent of change for the community in the environment around the school. The schools must be a model in realizing a healthy and comfortable environment as a model in realizing caring and cultured citizens of the school.

1. Introduction
Generally, environmental problems in Indonesia have been alarming. Problems such as garbage on the streets and the poor quality river can be found in major cities in Indonesia. To face the increasing challenges of environmental degradation, there is a need to educate and inform the public about environmental problems. One of the ways that the community and government do is protecting the earth from pollution and damage through the implementation of environmental education [1], [2]. Environmental education is a key to prepare the community with knowledge, expertise, values and caring attitude so they can actively participate in solving environmental problems.

Students' knowledge and understanding of the environment must be provided early. This is an effort to equip students at the school of intermediate level to have capabilities at environmental literacy through the Adiwiyata School. This is a program as a form of implementation of environmental education in Indonesia. In the national curriculum in Indonesia, environmental education in the community is obtained from integrated formal education. The implementation of environmental education in the curriculum high school is done by integrating with subjectssuch as biology and geography, or it stands alone as Environmental Education subjects (EE) as local content. The main objective of environmental education is to improve environmental literacy, including better knowledge and attitudes towards the environment and a higher prevalence of pro-environmental behaviors [3]. Environmental literacy is interpreted as the knowledgeon the environment and its problem that it can laterbe manifested in real
activities in daily life[4]. The existence of aspects of environmental education in learning will form students’ environmental literacy. Practicing environmental literacy is a fundamental need for society and its future.

Adiwiyata School has a strategic function in providing environmental education to adolescents. The Adiwiyata program is integrated into the national standard of Education. This causes the implementation stage of Adiwiyata School follows Government Regulation Number 32 of 2013. The concern for the environment, which is the core of Adiwiyata, is listed in the competency standards of primary and secondary education graduates in Indonesia [5]. This competency is also a form of implementation of Law No. 32 of 2009 about the protection and management of an environment that is developed through partnerships with educational institutions in schools. Therefore, Adiwiyata School is a strong commitment from educational institutions to develop quality education models through knowledge, skills, values, norms and environmental ethics.

To achieve the objectives of environmental education that is the improvement of environmental literacy, approaches and learning models are applied in the Adiwiyata School’s curriculum. One of them is a project-based learning model. The project-based learning model has a constructionist approach. This learning provides opportunities for students to develop collaborative learning and sustainability skills.

Sustainability education can build students' expertise through a project-based learning approach where the teacher guides students working in small teams to determine solutions to environmental problems. The solution takes form in a student project that refers to contextual environmental problems [6]. Project-based learning is one of the student-centered learning models, aimed at developing more self-reliance on students so that students have a good response to the environment [7]. In Indonesia, among the significant changes in the national curriculum is the revision of the 2013 curriculum in 2016, project-based learning is highly recommended to be implemented in schools. Project-based learning is introduced at all levels of education, namely at the level of elementary, junior high and high school [8]. The introduction of project learning in schools is to give students authentic learning. Project-based learning is a comprehensive approach to classroom teaching and learning that is designed to engage students in investigation of authentic problems. In this article, we present an argument for why projects have the potential to help people learn; indicate factors in project design that affect motivation and thought; examine difficulties that students and teachers may encounter with projects; and describe how technology can support students and teachers as they work on projects, so that motivation and thought are sustained [9]–[11]. Learning experiences allow students to receive knowledge from and apply it to real-life situations. When students are involved in their project, they will acquire important skills such as collaboration and teamwork, communication and independent learning, thus becoming ready to face the challenges in the future [12]–[14].

The implementation of the Adiwiyata School is one strategic effort to success the sustainable environmental education program. Through the implementation of this school model, commitment, awareness, and responsibility will be built between the school community to participate in maintaining, maintaining and preserving the environment. One of the strategies is the green project that is integrated into learning. The uniqueness of the green project is the internalization of the Adiwiyata School culture in a learning activity that can encourage development through students' real work. One of them is by developing the students' creativity and innovation in designing products and to utilize waste by recycling. These are students' participatory activities in maintaining the school environment’s cleanliness.

The green project is to encourage students to improve their environmental literacy. It should be pointed out that environmental literacy is not only knowledge of environmental and ecological concepts but also specific skills to manifest the continuous attitude and concern for the environment. It is this attitude and concern for the environment which then fosters a person's motivation to realize environmentally caring behavior [15]. Effective teaching about the environment to students involves the use context, connection, and communication elements [16], [17]. Students ideally study environmental literacy in an environmental context, connected with natural and social science disciplines, and communicate their ideas both among themselves and with their teachers [18]. Further research shows that
when students are involved in active teaching and learning, knowledge retention increases significantly [19].

Based on the background above, the implementation of environmental education in schools Adiwiyataneeds to be studied more deeply. This study chose a high school in the city of Banda Aceh that had received the Adiwiyata School award and had implemented environmental education in the learning curriculum. According to research that has been done by Parker, Prabawa-Sear and Kustiningsih[20] the conclusions from this research do not take the role as demonstrative for all levels of schooling in Indonesia. Most of the school students, especially at the high school level in Banda Aceh City, did not implement the Environmental Education program. Therefore, in this survey, the study only took one Adiwiyata School to observe the implementation of learning and student perceptions of knowledge towards environmental issues and green project activities to practice environmental literacy.

2. Method

This study used a descriptive qualitative approach to describe the implementation of environmental education at Adiwiyata School. Questionnaires were given to high school students of SMAN 4 Banda Aceh, especially students of Social Science class grade XI who had studied learning material related to environmental interactions during geography lessons. The selection of SMAN 4 Banda Aceh as the subject of research is because the school is a pilot school of the literacy movement on a national scale [21]. The school also has involved in education for sustainability and is the Adiwiyata School in Banda Aceh City. Qualitative data were from interviews, which then were analyzed, as well as classroom observations and analysis of book activities made by the teacher.

3. Result and discussion

3.1. Students’ Environmental Knowledge

Data on students' environmental knowledge are gathered by distributing questionnaires to social science class, grade XI students of SMAN 4 Banda Aceh. The aspects asked students were related to environmental issues that occurred in Indonesia. This was as indicators of information on environmental issues known to students of high schools in the city of Banda Aceh. The results of the study are presented in the table below.

| No | Environmental Issues                             | Students' Knowledge (%) |
|----|--------------------------------------------------|-------------------------|
| 1  | Effect of greenhouse gases                        | 73%                     |
| 2  | Impacts of global climate change                  | 23%                     |
| 3  | Ecosystem damage and loss of biodiversity         | 15.2%                   |
| 4  | Air pollution                                    | 76%                     |
| 5  | Water pollution                                   | 13.6%                   |
| 6  | Changes in land function                          | 15.2%                   |

Based on the results of the research in table 1 above, it is known that the students of Banda Aceh Public Senior High School, SMAN 4 Banda Aceh generally have known environmental issues that occur in Indonesia. This can be seen from the percentage of students' answers that environmental issues regarding air pollution and the effects of greenhouse gases were leading issue known. The issue that is most widely known by subject is the issue of air pollution. As many as 76% of students stated they "knew very well" about the issue and could explain it well. Next, students were most familiar with the greenhouse effect issue and said they were very aware of the issue as much as 73%. Furthermore, the issue of climate change impacts as much as 23%, and the issue of ecosystem damage and loss of biodiversity and changes in land functions as much as 13.5% of students are very aware and as many as 13.6% of students know of cases of water pollution. The data shows that among these seven


environmental issues, there are two issues of environmental problems that are very common in Indonesia and have been taught and integrated into learning curricula, especially in schools that are environmentally based, such as the Adiwiyata school.

3.2. Promoting Environmental Literacy Through the Green Project

Environmental literacy is a person's perception and competence of environmental problems and is active in developing necessary actions on this issue. Environmental literacy can also be defined as an individual or community understanding of the surrounding environment [22]. Therefore, environmental literacy is a condition where individuals have a complete environmental knowledge which is then manifested in environmental awareness to do things that preserve the environment (environmental concern) so that it becomes an environmental attitude and behavior [23].

The development of creativity and innovation in Adiwiyata school students at SMAN 4 Banda Aceh is a part of environmental literacy. Environmental literacy is integrated into the learning applied by the teacher. One of the learning models that can train environmental literacy is project-based. The project-based learning model is seen as one of the approaches to create a learning environment. This approach encourages students to construct knowledge and skills personally. Some research results show that the model Project Based Learning has the potential to shape skills, environmental literacy skills and attitudes needed by students to play an active role in the future [24]–[28]. The implementation of project-based learning has been applied in geography subjects. The results of interviews with geography teachers at SMAN 4 Banda Aceh state that Project-based learning in learning is used to understand all environmental problems and their solutions. Students can find and develop the basis of environmental ethics as well as understand the concepts of ecology and the results of experience in the field. Therefore, learning activities can also be developed through a green project such as the following:

a) Recycling

Recycling activities are the process of collecting garbage, sorting, cleaning, and processing the used materials for the production of new objects with new functions. Some materials that are often processed in recycling waste are plastic, glass, paper, batteries, and aluminum. The waste is garbage generated from the consumption of school residents. Recycling activities are carried out by students as a skill value and also a project from geography learning on environmental management materials. In groups, students are assigned by the teacher to design a recycling project. The following are pictures of the results of recycling activities carried out by class XI students of SMAN 4 Banda Aceh.

![Figure 1](image1.png)

Figure 1. (a) The products of students' work in recycling activities, (b) Students present the process of making waste recycling (research documentation, 2018)

b) Water Management and Energy Efficiency

The availability of clean water in schools is needed in relatively large numbers. The availability of water in the SMAN 4 Banda Aceh is sufficient for the needs of drinking water, watering plants, and bathrooms. Besides, the electrical energy needs of SMAN 4 Banda Aceh schools support all activities in
the school. Almost all rooms are equipped with electricity networks. To save energy, one main switch is made to be able to regulate the power of electrical energy used. So that one operator controls the electricity network in the school. The main aspect of an environmentally sound school is to consider the use of alternative energy such as lighting and air ventilation, in classrooms or other spaces. Decent ventilation in the room must meet the fixed ventilation hole area requirements of at least 15% of the floor area, while the ventilation’s hole area can be opened and closed at least 5% of the floor area[5].

c) Student Participation in Environmental Activities

In the context of green projects, environmental education activities are a form of school community involvement in environmental management activities. Based on the observations and interviews with teachers and students, the activities carried out at the High School in Banda Aceh which was included in the Adiwiyata School. This included maintenance of the school environment and was the responsibility of the entire school community. Although the school has a budget for maintaining the school environment and its facilities, the responsible use in the daily lives of all school members is the best way to maintain long-termly. Here are some simple ways students can take care of the school environment.

- **Class Sanitation: Students’ Duty**
  Picket for classroom cleanliness is a form of environmental education activities in SMAN 4 Banda Aceh. The implementation of cleaning pickets can be done through various-creative ways, for example by holding a cleaning competition regularly or distributing routine class cleaning pickets. Besides, all school residents can also conduct scheduled picket or service work every month or every semester.

- **Maintenance of smart garden and facade parks**
  In utilizing land optimally, the school innovatively designed the park as much as possible. In this school, the class park program is carried out in various ways, such as each class is responsible for caring and managing their classroom parks. At every beginning of school-year, each student is required to bring one plant to school. Homeroom teachers routinely supervise each class of guidance to take turns following picket care and arrange the classroom garden. Regularly, at the school year, the school will hold an inter-class garden creation competition. Besides, the frontage garden in the front yard area of the school serves to welcome school guests when they enter the school environment.

- **Vertical Garden and Green Wall**
  The vertical garden in SMAN 4 Banda Aceh is a garden concept that emphasizes effective land use, especially with limited open space. This park is designed for vertical planting land - such as the walls or fences of alternative planting media that are hung, tied or nailed. Besides, the planting media in the vertical garden is made of perforated pipe holes. For plants in the green wall area, students use recycled materials such as plastic bottles, glass bottles and used boxes. This is a very good step in managing plastic waste that is harmful to the environment.

- **Waste Bank**
  A form of pro-environmental action carried out by school community of SMAN 4 Banda Aceh is a garbage bank in each class. Students voluntarily separate organic and non-organic waste according to the place. Then non-organic waste such as plastic bottles they collect and then will be handed over to the teacher for further processing. Usually, for organic waste, the composting process will be carried out. Some plastic bottle waste is used as a planting medium in the school environment. Below is a picture of plastic waste collection to be stored in a school waste bank.
Figure 2. Collection of plastic bottles to be stored in waste banks

In class X, Class XI, and class XII there is also a garbage bank that is useful for storing garbage from each class. In the bank, the waste is divided into 2 classes, namely: 1) plastic (black) and paper (blue).

4. Conclusion
The knowledge of Adiwiyata School students in Banda Aceh is excellent about environmental issues that occur in Indonesia. This is known based on the results of research that show that the issue widely known by students of Adiwiyata School in SMAN 4 Banda Aceh, which is the issue of air pollution. As many as 76% of students stated they "know very well" about the issue and could explain it well. Next, students were most familiar with the greenhouse effect issue and stated that they were very aware of the issue. In total as much as 73%, the issue of climate change impacts as much as 23%, and the issue of ecosystem damage and loss of biodiversity and 15.2% of students knew very well.

The implementation of the Adiwiyata School is a strategic effort in the success of a sustainable national program. Through the implementation of this school model, the school community will build commitment, awareness, and responsibility to participate in maintaining, stabilizing and preserving the environment. One of them is through a green project that is integrated into learning. The green project is unique in the internalization of the Adiwiyata School's culture. It is a learning activity that can encourage the development of student competencies through students' real work. Environmental education activities in the context of green projects are activities to practice environmental literacy to school residents both teachers and students.

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