School and Teachers’ Role to Empowerment of Environmental Literacy in Prominent Middle School Based on Adiwiyata Program

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Abstract. Environmental literacy is the most important and fundamental ability that a person must have in dealing with the 21st century. Wise decisions in utilizing the environment to meet the increasingly complex human needs in this century are needed. The Indonesian government has provided early Adiwiyata programs in junior high schools to empower environmental literacy. This study aims 1) to determine the implementation of the Adiwiyata program that runs in SMP N 2 Sragen; 2) to describe and analyze the role of science teachers in empowering environmental literacy of students in SMP N 2 Sragen on the environmental material. This research is a qualitative research with descriptive method. Research subjects were principals, teachers, and student representatives. Data collection is done by observation, in-depth interviews, and documentation. Data analysis used is descriptive analysis through triangulation of data sources. The results of the study show that schools have 3 ways of implementing environmental education including a vision mission that is environmentally sound, participatory activities, management of facilities and infrastructure. The role of the teacher in the learning process is still less than optimal. The learning process that emphasizes on empowering environmental literacy has not been explicitly integrated into the learning materials and materials. The recommendation for this study is that schools need to help teachers to develop learning tools and methods that facilitate students to effectively empower environmental literacy.

Keywords: Adiwiyata program; Environmental literacy; Science teacher.

1. Introduction
The environment is a system on earth that has the carrying capacity to meet the needs of human life. At this time the progress of the times and the rapid development of technology were also in line with human development. The nature of human beings who always feel dissatisfied with things that benefit their own impact on the environment. Environmental problems in the last decade are increasingly alarming. Starting from the problem of pollution, deforestation, reduced land, depletion of the ozone layer, global warming, to extreme climate change [1], [2], [3]. Based on data from the
Organization for Economic Co-operation and Development (OECD) also added that the depletion of world fisheries, unhealthy air to breathe, increased production of greenhouse gases resulting in global warming. Issues of environmental issues are the responsibility of all parties to work together to find a solution. Solutions related to problems are done by the result chain and causal chain approaches. The result chain approach is focused on the use of technology to overcome the problems that have occurred while causal change focuses more on the root of the problems that occur [4]. The approach to causal change is more focused on always being studied because of its direct impact on efforts to prevent environmental problems [5].

Analysis carried out through a causal chain approach shows that human knowledge of the environment is the underlying root for behaving towards the environment. Knowledge about the environment can affect attitudes and behavior towards the environment. Knowledge is an important factor in human consideration for acting on nature and the environment [6], [7]. Good knowledge and provided early can limit people to excessive use and exploitation of the environment. Based on the theory of recruiting in [8], [9], [10], human behavior is basically driven by readiness to behave that is influenced by the input of knowledge that enters his mind. The path of strengthening knowledge as one of the main aspects of environmental literacy can be done through environmental education. The aim of environmental education is to realize and shape individuals who have environmental literacy.

Strengthening environmental literacy is one of the keys to achieving a sustainable environment [11], [12]. Environmental literacy consists of three dimensions, namely knowledge, attitude, and concern [13], [14]. Individuals who have environmental literacy are individuals who are part of the results of a system that can be broadly grouped into cognitive, affective and behavioral. Improving environmental literacy skills is intended to prepare people who understand and can solve environmental issues because only people who are environmentally literate can find solutions to environmental problems that occur [15]. One way to empower environmental literacy is through environmental education that is integrated into formal learning in schools. This environmental education strategy aims to increase individual awareness of the environment, form a foundation from an early age in order to contribute in providing solutions to environmental problems and to get used to having environmentally friendly behavior [16].

Environmental education can play a role in integrating the concept of the environment into school subjects, teaching materials used and extracurricular activities [17], [18]. Environmental Education is one manifestation of Law no. 32 of 2009 concerning environmental protection and management, especially Article 65 paragraph 2, that one of the rights of the community is to get the environmental education. Adiwiyata-based school is one of the ways the Indonesian government supports the empowerment of environmental literacy. The Adiwiyata program aims to create a comfortable and clean school environment to become a place of learning for school residents so that they can raise awareness to contribute to safeguarding the environment and sustainable development. Adiwiyata program is expected to realize individuals who from the beginning have good environmental literacy. The Adiwiyata program really requires the role of all school residents to be well implemented so that they can instill knowledge about the environment to students. The role of the teacher is very necessary in the implementation of environmental education for junior high schools to run effectively [19], [20].

The SMP Negeri 2 Sragen is a school that receives “Adiwiyata Mandiri” awards and fosters 5 other Adiwiyaya Middle Schools in Sragen. SMP Negeri 2 Sragen has a high level of concern and also participates from all school residents in protecting the environment. Likewise with work programs that are run with the utmost to provide satisfactory results for school residents. Thus, this study aims 1) to determine the implementation of the Adiwiyata program that runs in SMP N 2 Sragen; 2) to describe and analyze the role of science teachers in empowering environmental literacy of students in SMP N 2 Sragen on the environmental material.

The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally Section 4 concludes this work.
2. Research Method
This research is a qualitative research conducted in February-March 2018. In accordance with the opinion that emphasizes that qualitative research is research that interprets phenomena that occur naturally according to observations and experiences of researchers [21]. This research was conducted by SMP N 2 Sragen which became the only junior high school in Central Java Province which managed to make a proud achievement at the National Level, with the "Adiwiyata Mandiri" Award in 2017. Research subjects included principals, 5 science subject teachers and 4 representatives of SMP N 2 Sragen students who were randomly selected. The data obtained in this study were carried out using non-test techniques, namely observation, in-depth interviews, and documentation. Observations are made on the condition and situation of the school, interviews are conducted with principals related to policies that implement environmental education in schools while teachers are related to the tools and learning processes that are environmentally sound. Students are interviewed about activities related to Adiwiyata. Documentation is carried out by analyzing the vision and mission of learning documents. The entire data is then analyzed descriptively using triangulation of data collection techniques to obtain data validity. Triangulation of data collection techniques is the method used by combining data from different data collection techniques, namely observation, interviews and documentation to test data credibility so that conclusions can be drawn according to the research objectives.

3. Result and Discussion
This section presents the obtained results and following by discussion.

3.1. Implementation of Adiwiyata Program in SMP N 2 Sragen
The implementation of the Adiwiyata program in SMP Negeri 2 Sragen researchers grouped into 3 topics, namely the vision and mission that is environmentally sound, participatory activities, management of facilities and infrastructure.

3.1.1 Vision and mission based on environmental
The SMP N 2 Sragen which became the only junior high school in Central Java Province that managed to carve a proud achievement at the National Level, was achieved by the "Independent of Adiwiyata" Award in 2017. "Adiwiyata Mandiri" is a program from the Ministry of Environment and Forestry of the Republic of Indonesia, in order to encourage the creation of Knowledge and Awareness of School Residents in Environmental Conservation Efforts. One of the schools that received the Adiwiyata Mandiri award. Based on the results of interviews with the school principal who explained that SMP N 2 Sragen had a role to play as an example and fostered 4 other junior high schools in the City of Sragen which were still in the national Adiwiyata program to go to Adiwiyata Mandiri. The school developed by SMP N 2 Sragen is SMP N 1 Sragen, SMP N 1 Sidoharjo, SMP N 1 Sambirejo and SMP N 1 Miri.

Respondent: "Adiwiyata Mandiri" National Level, an Advanced Program, started from several similar Assessment Processes, at the District Level, and the Province. Assessment Process "Adiwiyata Mandiri" National Level, conducted directly, by the Team from the Ministry of Environment and Forestry of the Republic of Indonesia So there are 11 schools including elementary, middle school and high school who became the SMP 2 Sragen (Headmaster of Adiwiyata-Based School).

The SMP N 2 Sragen basically has been based on an environmental vision and mission. Vision and mission is a reference to the success or failure of a system towards the main objectives to be achieved. The vision is "Excellent in Quality, Character, Cultured, Nationally Minded and Caring for the Environment". There are 8 missions that make reference in this school and 3 of the schools emphasize the attitude of environmental care. Three environmental-related missions read to help and encourage students to prevent environmental pollution, increase students' awareness to prevent environmental damage, and implement participatory management by involving all school citizens and stakeholders in preserving environmental functions in schools. This vision and mission clearly greatly influenced the
course of the *Adiwiyata* program that had been implemented until finally it was awarded the independent *Adiwiyata*.

3.1.2 *Participatory activities that are environmentally sound*

Based on observations and interviews with school principals and 4 children of SMP N 2 Sragen randomly chosen stating that there were various activities carried out jointly by school residents in order to increase awareness of the environment. First, the waste bank program is conducted once a month on Saturdays. After one week each class is guided by the teacher collecting plastic bags in the collector. The collector weighs the weight of each plastic bag and provides an appropriate price. The money generated from the waste bank is kept together for later use by the class itself. On the other hand, collectors who have received plastic waste are recycled into more useful items.

Respondent: *"We carry out garbage collection for a week. Most of the garbage collection is plastic bottles. Then when it is collected for sale and the money obtained can be in the form of class cash" (student of 7th-grade junior high school).*

The second activity is a collection of used boxes made by students and then sold to the Indonesian Red Cross (PMI). The proceeds from the sale are replaced with clean water, which is donated to areas in need. This activity can be done once a year to really have a lot of used boxes collected.

Respondent: *"In addition to waste banks there is a collection of used boxes. This activity is only held once a year. Last year the results were exchanged for water and given to one remote village in Sragen Regency, Indonesia" (student of 7th-grade junior high school).*

The third activity is clean Saturday. Every Saturday all school residents clean the class for 15 minutes before the first lesson begins. This activity aims to train students’ caring attitudes and improve good relations among school people. Another activity is holding various student creativity competitions. One of the most frequent competitions is creating class parks, creating posters with environmental themes, and recycling classes between classes.

3.1.3 *Management of Facilities and Infrastructure*

The results of observation and documentation accompanied by photo evidence indicate that each *Adiwiyata*-based school always strives to develop all facilities, infrastructure, facilities and infrastructure to support the creation of an environment that is environmentally sound. The environment developed in each school has neatness and beauty to be seen. Based on the experience of researchers when entering school, starting from the front page, center, to the backyard is arranged in such a way that shows the identity of the green school. Various forms of decoration such as parks, fish ponds, organic and an-organic bins, health units and school canteens, are all well-organized and built. Setting up facilities to maintain schools has important lessons for students. Students can understand that an unclean environment has the potential to greatly affect the health of the human population so that it can cause various diseases [22].

![Figure 1. Display one of Adiwiyata-based School](image-url)
3.2. The Role of Science Teachers in Empowering Students’ Environmental Literacy in SMP N 2 Sragen

3.2.1 Curriculum Analysis on Environmental Materials

Natural Science or science is a way of thinking in an effort to investigate and look for causes of all events, natural phenomena and phenomena that occur in nature through a series of systematic processes [23]. Learning of science in Indonesia is mandated at the level of primary and junior high school education. The implementation of the national curriculum referred to as the 2013 curriculum not only emphasizes knowledge as a product of science learning but also strongly emphasizes the process and value in the form of scientific attitudes that must be instilled early [24], [25], [26], [27]. This is in line with environmental literacy which emphasizes aspects of knowledge, attitudes, and behavior [13], [28]. Therefore, the objectives of the 2013 curriculum and environmental literacy have a similar direction which is to form individuals who are knowledgeable, character and noble. When individuals have these three aspects, they are expected to be able to maintain and contribute to solving increasingly worrisome environmental problems.

The environment in the 2013 curriculum is part of science or science. Based on the results of the RPP documentation in junior high school and literature studies from the syllabus contained in the Annex to Permendikbud Number 24 of 2016, it is concretely shown that there are Basic Competencies related to the achievement of environmental literacy [29]. There are three basic competencies in the environment that are taught in class VII in natural science subjects in junior high school. The Three Basic Competencies each consist of aspects of knowledge (3.7; 3.8; 3.9) which are equipped with aspects of skills (4.7; 4.8; 4.9) as shown in Table 1 below.

| Basic Competencies | 3.7 Analyze interactions between living things and their environment and population dynamics due to these interactions. | 4.7 Presenting observations on the interaction of living things with the surrounding environment. |
|--------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
|                    | 3.8 Analyze the occurrence of environmental pollution and its impact on the ecosystem                           | 4.8 Make writing about the idea of solving pollution problems in their environment based on observations |
|                    | 3.9 Understanding climate change and its impacts on ecosystems                                                | 4.9 Make writing about the idea of adaptation / overcoming the problem of climate change      |

3.2.2 Analysis of the Role of Teachers in Empowering Environmental Literacy in the Learning Process

Environmental literacy is part of the goal of environmental education that is packaged in the Adiwiyata program. Adiwiyata program requires all parties in the school to run effectively. Fundamental parties are those that relate to the process of inputting knowledge about the environment. The role of teachers is very necessary for the application of environmental education in junior high schools.

Environmental literacy empowerment in SMP N 2 Sragen has been going well in terms of carrying capacity of facilities and infrastructure. The achievement of environmental literacy in this school has not yet achieved maximum results. Based on the results of the preliminary study through technical tests for aspects of knowledge and non-tests for aspects of attitude, it can be seen from the students’ environmental literacy ability is still low. Through the initial profile tests conducted in 5 junior high schools, one of them was in SMP N 2 Sragen, the average value of knowledge was only 58, 2 while for the average SMP N 2 was 75, 01. The value of 75, 01 was not much different from the value the minimum completeness criteria in the City of Sragen is 75. Most students also still have low behavior readiness when measured using the New Ecological Paradigm questionnaire [30]. So, it can be said
that environmental literacy skills (environmental knowledge and environmental attitude) are still quite low and must be immediately empowered through the learning process at school.

There were several factors found based on the results of interviews with science teachers at junior high schools in the city of Sragen related to the results of environmental literacy. First, the scientific field of some science teachers in SMP N 2 Sragen is not from the science department. When teaching material related to biology the teacher finds it difficult to develop learning plans, especially syllabi and lesson plans. There is a gap between factual indicators in schools with an ideal ecological concept indicator in learning about the environment [31]. Second, teachers have limited time if they have to package teaching material in an interesting media form. Teachers only use textbooks that are owned by each student so that the use of learning media has not been optimized. Fourth, students are less guided to find and build their concepts actively and independently through contextual facts. Fifth, several basic competencies that are interrelated about environmental material have not been optimally integrated. Integrated science learning makes the students’ concepts that are built become more holistic. Thus, efforts need to be made to improve the science learning process to empower students’ environmental literacy.

3.2.3 The Role that the Teacher Can Do

Learning science in junior high school has input from students who are still 13-15 years old. Piaget’s theory describes that the cognitive levels of students in the age range 13-15 are in the formal operational stage [32]. At this stage, students are able to think about something that is abstract and able to plan steps in problem-solving. The ability to solve problems is very closely related to environmental learning [33]. Environmental problems around students need to be integrated through tools, models, and learning materials that lead students to discover the ecological concepts that are in the problem so that they can provide ideas or ideas for a solution [1], [17]. Ecological concepts that must be understood by each individual are about ecosystem resilience, productivity, nutrient cycle, functional redundancy, trophic cascade, habitat fragmentation, community meetings, dissemination, population control, ecophysiological adaptation [31].

Thus, teachers can play a role in optimizing learning planning for environmental material. The material must be integrated with ecological concepts and adapted to the level of child development. The development of tools, materials, and learning models must continue to be carried out to continue to empower environmental literacy among students. For example, in the selection of learning models followed by methods, media, and all aspects needed must be in accordance with the subject being taught. Discovery-based learning models that are in accordance with the cognitive level of junior high school students are discovery-based learning models such as discovery learning, inquiry, problem-based learning [34], [35].

4. Conclusion

The field of education is an important factor to realize generations that have environmental literacy so that they are more concerned with environmental issues. Adiwiyata-based schools in Indonesia have provided good results in integrating environmental value literacy into students at the school. Various positive activities and environmentally friendly infrastructure development guide students to love the environment. The role of the teacher must also be optimized in integrating ideal ecological concepts in the environmental material. Teachers can develop various learning tools that support the achievement of environmental literacy. Therefore, this research is expected to be a reference for other researchers in developing learning tools in the Adiwiyata-based school.

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