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Environmental education for the younger generation at the Taman Keanekaragam Hayati Subang

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Abstract

Integrating school-based learning activities and environmental education can increase students' environmental knowledge, awareness, and positive attitudes. Nevertheless, many educational activities in schools have not been connected with actual environmental activities on the field. The objective of the environmental education program at Taman Kehati Subang was to assess its role in supporting the environmental education activities of SMK Tri Surya Bangsa students., Subang. It was held on August 21, 2020, with 10 representatives from classes X, XI, and XII and two accompanying instructors. The material was delivered through outdoor activities, games, and fieldwork. It comprises organic agriculture, biodiversity conservation, nurseries and compost production, cipondoh water sources, and soil and water conservation. Students were mostly in agreement that Taman Kehati contains a variety of plant species and is excellent for school environmental education activities. Students stated that a trip to Taman Kehati offered them new experiences that could expand their understanding of natural resource management. Delivering content through outdoor activities, field practices, and games make it simple to comprehend and practice regularly. Students and instructors usually agree that Taman Kehati is suitable for supporting the combination of school-based learning and environmental education. Students were pleased with the environmental education programs in Taman Kehati, Subang..

Keywords: biodiversity, forest-based ecosystem services, environmental education

INTRODUCTION

Environmental crises, such as deforestation, environmental pollution, and climate change, have become a significant concern for the global world (Huang et al., 2020). Indeed, environmental deterioration has devastating consequences for human life (Khan et al., 2020). Numerous Indonesian research indicates a surge in the conversion of forested areas (Margono et al., 2014; Tsujino et al., 2016), which eventually has led to an increase in hydro-meteorological disasters in Indonesia (Asdak et al., 2018; Muis et al., 2015).

In addition, a lack of information, care, and public awareness of environmental issues may exacerbate ecological degradation and the escalation of environmental problems. (Liu et al., 2020). Mitigation strategies, i.e., environmental education initiatives, are pivotal for tackling the abovementioned concerns. Environmental education is believed to play a significant role in preventing environmental damage by increasing an individual's knowledge, awareness, and willingness to actively overcome environmental problems(Otto et al., 2019; Varela-Candamio et al., 2018).

An earlier study suggested that environmental education will significantly impact a person's ability to grasp the significance and functionality of the environment in their life (Otto et al., 2019). In turn, this enhances individuals' attitudes and behavior toward sustainable utilization of natural resources. More importantly, environmental education for the younger generation is a prerequisite that can substantially affect a person's subsequent behavior to be more ecologically conscious (Oliver & Adkins, 2020;

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Otto et al., 2019; Varela-Candamio et al., 2018). Specifically, Otto *et al.* (2019) demonstrate that 14 to 17 years old is a decisive age with a potential for a downturn in pro-environmental attitudes (environmental attitude and behavior). Given these circumstances, boosting the environmental awareness of the younger generation is imperative. At this point, students' learning activities and environmental education should be integrated to increase the effectiveness of scientific knowledge in sustainable environmental management(Oliver & Adkins, 2020), disaster preparedness (Kamil et al., 2020), and positive attitude toward the environment (Liu et al., 2020).

In the current study, we investigate students' opinions concerning environmental education activities in Taman Keanekaragaman Hayati (hereby Taman Kehati) to examine its relevance in supporting environmental education activities for students in Subang. Taman Kehati is an area designated for conserving prominent flora and fauna outside of state forest areas (Permen LH No 3 Tahun 2012). Taman Kehati plays a vital role in education, research, scientific advancement, and ecotourism. Thus, environmental education activities at Taman Kehati are envisaged to allow students to expand their knowledge and understanding of the environment and eventually boost their positive environmental behavior.

METHODS

Study setting

On August 21, 2020, environmental education activities were conducted in Taman Kehati. Taman Kehati is located in Subang regency, West Java, Indonesia. This activity is a set of environmental education events that have been periodically conducted at Tri Surya Bangsa Vocational School throughout the year 2020, with the support of PT. Tirta Investama Plant Subang and the Yayasan Javlec Indonesia. The field trip activities at Taman Kehati Subang are projected to augment students with a direct array of various sustainable natural resource management strategies.

Taman Kehati Subang is managed by PT. Tirta Investama Plant Subang. It occupies a total area of 5.8 hectares. In accordance with the mandate of Minister of Environment Regulation No. 3 of 2012, Taman Kehati plays a strategic role as a habitat for various types of plants (local and exotic), a model for managing organic agricultural land, fisheries, and integrated organic waste management (making organic fertilizer), which makes it ideally suited for ecotourism and environmental education.

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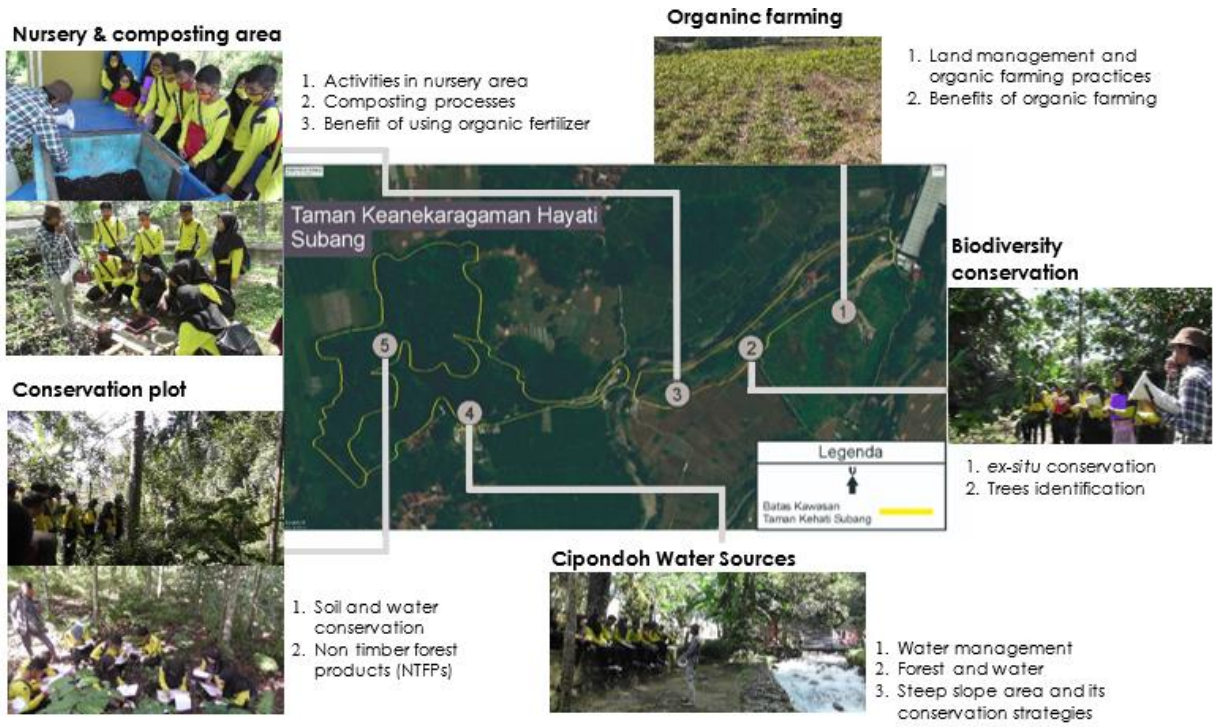

Figure 1. Environmental education sites in Taman Kehati

Methods

The environmental education activities were separated into five thematic points, and participants visited each point for an explanation and predetermined practical tasks. We provided information on organic agriculture, biodiversity conservation, nurseries and composting, Cipondoh water sources, and soil and water conservation (see Figure 1). Participants were instructed to follow the directions and proceed from one location to the next. The resource persons, namely the Javlec Indonesia Foundation and the manager of the Farmers Group Unit, Taman Kehati, provided students with materials according to the topic of each point. In addition, observational games and practices were conducted at multiple sites to enhance participants' understanding of related materials. A questionnaire with a Likert scale ranging from strongly disagree (1) to strongly agree (5) is administered to evaluate environmental education initiatives.

RESULTS AND DISCUSSION

Environmental education in Taman Kehati

The environmental education program emphasizes biodiversity, integrated land management, and eco-friendly practices. Consequently, the information offered to participants covers organic farming, biodiversity conservation, nurseries and composting, Cipondoh water sources, and soil and water conservation.

1) Organic farming

At the organic farming thematic point, students were taught about land management practices of organic farming. Taman Kehati is located in an area where most local people grow crops. However, chemical pesticides and herbicides are utilized in the community's farming practices, particularly when cultivating vegetables susceptible to pests and weeds. Using these chemicals may harm the environment and the long-term viability of the products. In addition, research indicates that excessive use of pesticides and chemicals can contaminate soil and water (Utami et al., 2020), as well as significantly impact the health of farmers (Ratna et al., 2020).

On the other hand, it has been demonstrated that land management practices affect agricultural productivity. Long-term organic land management, for instance, can increase soil organic matter availability and rice productivity in Thailand (Oechaiyaphum et al., 2020). According

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to the research done by Azadi et al. (2011), organic plant cultivation provides a number of benefits, including more effective water use, less soil damage, and resistance to pests and diseases. Moreover, organic and eco-friendly agriculture can improve the soil nutrient cycle over time (Sarker et al., 2018; Singh et al., 2020).

2) Biodiversity conservation

Biodiversity is the variation of living organisms according to their genes, species, and ecosystems. Indonesia is known as a mega-biodiversity country or a nation with incredibly high biodiversity (von Rintelen et al., 2017). The Subang Conservation Park area has tree-level (38 species), pole-level (8 species), sapling-level (10 species), seedling-level (17 species), and palm species (5 species). The Kehati Park is home to 65 plants, including numerous species with considerable conservation value, such as the Sulawesi Ebony Wood (*Diospyros celebica*) and the local plant identity of the West Java region, namely Gandaria (*Bouea macrophylla*).

At the biodiversity conservation thematic point, participants were instructed in techniques for identifying tree species. This enables participants to identify and differentiate the numerous types of trees. In addition, students receive a comprehensive introduction to ebony (*Diospyros celebica*)., a Sulawesi plant with high conservation value that is endemic and protected

3) Nursery and composting area

Nursery

A nursery is a location or area used to prepare seeds or other plant parts, so they are ready to be sown in the ground. There are areas designated for specific nursery activities, such as a room for sowing seeds, a nursery for seedlings, a nursery for growth with moderate light intensity, an open area for the growth of large seedlings, and the other regions that facilitate nursery activities.

Students learn about the procedures for sowing plant seeds, weaning seedlings, and choosing seeds in this environmental education program. *First*, the size of the seed determines how it is sown. Large seeds can be put straight into polybags, while tiny seeds can be dispersed equally on a tray filled with soil mixed with sand to provide a growing environment for seedlings. *Second*, weaning is transferring germinated seeds from a tray into a polybag. For the sprouts to be successfully weaned from the mother plant, they must have at least two roots and leaves. Weaning now needs to take place in a shaded area. So that the freshly severed roots don't dry up, the transplanted sprouts are promptly hydrated. *Thirdly*, the selection is the phase in which the seedlings that have received treatment within a short time are chosen based on their size, lack of defects, and general health. Healthy seedlings with large sizes and no defects can be relocated to an open area without shade, whereas seedlings with stunted growth due to defects, disease, or other factors can be divided and treated separately according to each issue.

Composting area

Taman Kehati Subang puts an emphasis on ecologically sustainable land management and resource management. In this regard, there is great potential for using organic material from various plant species' organic waste in Taman Kehati. Taman Kehati has 38 various types of woody plants, three different kinds of palm plants, and a range of herbs. Plants have a mechanism in their metabolism to discharge leaves that have dried out or are past their best. The fall of leaves will naturally increase the organic matter content that may be used to fertilize plants in the top layer of soil. Nevertheless, the management of plant organic waste into organic fertilizer (compost) can accelerate the decomposition process and produce fertilizers that are ready to be used for agricultural activities and forestry (Agegnehu et al., 2016; Chen et al., 2020). Additionally, the compost can be created by pulling weeds in grass that interferes with farmers' crops.

Students learned about the steps in generating compost at the thematic point of composting. Students were shown the steps involved in making compost, which included collecting the materials needed (grass and leaves from forestry plants), counting the materials, setting up storage rooms, using bio-activators, and controlling the compost until it was ready. The advantages and potential of employing compost in forestry and agricultural plant management operations were also presented to the participants.

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4) Cipondoh water sources

Water is a natural resource that all living things need. However, conservation initiatives significantly impact the quantity (flow discharge) and quality of water resources over a lengthy period. This activity introduces students to the importance of vegetation in regulating the water cycle. It is considered that vegetation plays a vital role in regulating the water cycle. Researchers concur that forests have a substantial role in regulating the water cycle, preserving the sustainability of discharge and water quality in an area (Nugroho et al., 2013; Suryatmojo, 2015).

Taman Kehati Subang is 400 meters above sea level and has various land characteristics ranging from sloping to very steep. Due to the land's situation and location, soil and water conservation methods must be implemented to minimize soil erosion and preserve the water supply for the neighboring population. Considering the circumstances, soil and water conservation practices must be implemented to prevent soil erosion and maintain water supply for the surrounding community. West of the area, areas with extremely steep terrain are used as conservation plots, considering highly steep terrain and locations near Cipondoh springs. In addition, the Taman Kehati region and the surrounding villages have a pivotal role as a recharge area.

5) Conservation plot.

In conservation plots, explanations of soil and water conservation techniques were presented to participants. This includes soil and water conservation techniques (KTA) with vegetative and civil technical methods. The vegetative method is a KTA technique that utilizes vegetation as a controller of the water cycle and ground cover. The civil-technical methods introduced to students are terraces, rorak, infiltration wells, and biopori infiltration holes. Terracing is carried out to cut the slopes to slow down runoff and direct it, so that runoff and erosion can be controlled (Arnáez et al., 2015). Rorak can be defined as dead-end holes of a certain size made in the ground and parallel to the terrace/lengthwise. Rorak serves to trap and absorb water into the soil and accommodate sediments from the tillage field.

In addition, in this post, participants were also introduced to the management of non-timber forest products (NTFPs). Forest management can generally be done using a mixed system of forestry and crops (agroforestry). In this activity, the agroforestry system for forestry and coffee plants was introduced to the participants. The results showed that the agroforestry system could potentially have more diverse and higher yield productivity compared to similar crop patterns (Utomo et al., 2016). Moreover, the agroforestry system has a strategic role in supporting and improving the function of forest areas in degraded areas (Haggar et al., 2019). In addition, agroforestry also plays an essential role in providing water, food, and income simultaneously to the community (van Noordwijk et al., 2016).

Environtmetal Education Evaluation

1) Students' evaluation

The results of student evaluations show that Taman Kehati Subang is considered to have a good carrying capacity to support environmental education activities for school students (Table 1). This result is indicated by the high student assessment of the statement that the Taman Kehati has various types of plants, provides multiple fields of scientific study, and has adequate facilities to support environmental education activities to support student learning activities at school (Appendix 1).

Tabel 1. Students' assessment of environmental education

No	Statement	Mean*
1	The carrying capacity of Taman Kehati for environmental education	4.93
2	Attitude towards a visit to the Taman Kehati	4.85
3	Evaluation of environmental education materials	4.43
4	Satisfaction with the implementation of environmental education	4.87

**scale 1 - 5*

In general, students evaluate environmental education activities in Taman Kehati positively, namely by assessing the material presented in

environmental education activities (Table 1). By participating in environmental education at Taman Kehati, students assess that the material presented is easy to understand, relates to everyday life, and can be applied in daily life practices (Appendix 1). The results of this activity align with research conducted by several previous researchers who stated that environmental education activities could increase knowledge, understanding, and practice of environmentally friendly environmental management (Liu et al., 2020; Oliver & Adkins, 2020).

Furthermore, the evaluation results of student activities showed that students were satisfied and very satisfied with environmental education activities at the Taman Kehati (Table 1). After participating in this activity, students thought that they were willing to recommend Taman Kehati to their friends at school to learn about environmental management. Moreover, the students assessed that they were interested in revisiting the Taman Kehati in the future (Appendix 1).

2) Teachers' evaluations of environmental education

The results of the evaluation of activities by accompanying teachers show that environmental education at Taman Kehati is fun, provides new experiences, and increases students' knowledge of environmentally friendly natural resource management patterns. Furthermore, environmental education supports student learning activities in schools

Table 2. Teachers' evaluations of environmental education

No	Statement	Mean*
1	Visiting Taman Kehati is fun	4.5
2	Visiting Taman Kehati gives students a new experience of natural resource management	4.5
3	Visiting the Kehati Park increases students' knowledge of natural resource management	4.5
4	Visiting Taman Kehati helps students understand ways of good environmental management	4.5
5	Visiting Taman Kehati supports student learning activities at school	4.0

**scale 1 - 5*

CONCLUSION

Environmental education at the Subang Kehati Park is carried out by delivering materials, practices, and games. The materials presented included organic cultivation, biodiversity conservation, nurseries and composting, Cipondoh water sources, and soil and water conservation.

Students are very satisfied with the environmental education activities at the Subang Conservation Park. The evaluation of the implementation of the activities showed that students considered the Kehati Park to have various types of plants and were very suitable to support environmental education activities in schools. Furthermore, students assessed that visiting Taman Kehati provided a new experience that could increase knowledge about environmentally friendly natural resource management. Submission of material with a combination of field visits, practice, and games makes the material presented easy to understand and can be practiced every day. Based on the results of the activities, it can be concluded that students and teachers generally consider that Taman Kehati can support the integration of learning in schools and environmental education.

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