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Research Artikel

**ENVIRONMENTAL EDUCATION TOOLS IN BOGOR BOTANIC GARDENS FOR  
PUBLIC EDUCATION ON BIODIVERSITY CONSERVATION**

**PERANGKAT PENDIDIKAN LINGKUNGAN DI KEBUN RAYA BOGOR SEBAGAI UPAYA  
PENYADARTAHUAN MASYARAKAT TERHADAP KONSERVASI BIODIVERSITAS**

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**Abstrak**

Sejak diresmikan pada tanggal 18 Mei 1817, konservasi, penelitian, dan pendidikan, dan telah menjadi kompetensi inti Kebun Raya Bogor (KRB). Kebun botani ini kini menjadi destinasi bagi sekitar 1,2 juta orang pengunjung per tahunnya, namun kurang dari 10% menunjukkan kunjungan dengan motivasi edukasional. Oleh karena itu dilakukan identifikasi serta evaluasi keragaman dan karakteristik perangkat pembelajaran yang mendukung pendidikan lingkungan di KRB. Hasil observasi yang dilakukan menunjukkan bahwa topik pendidikan lingkungan dan perangkat pembelajaran di KRB sudah cukup banyak namun konten dan pendekatannya perlu diperbaiki. Topik yang mengangkat trend isu konservasi dan lingkungan sebagian sudah diakomodir sejalan dengan visi dan misi KRB. Perangkat pembelajaran berupa material interpretasi seluruhnya berpotensi meningkatkan pengetahuan pengunjung, namun masih sedikit yang berpotensi membangun perilaku positif terhadap lingkungan. Upaya-upaya mengintegrasikan teknologi ke dalam perangkat pembelajaran tercatat telah dilakukan, yaitu dengan membangun aplikasi mobile informasi dan navigasi untuk wisata mandiri. Perangkat lainnya yang dikembangkan adalah rute-rute tematik dan fasilitas terbaru ruang pendidikan lingkungan bernama Ecodome.

**Kata Kunci:** interpretasi; Kebun Raya Bogor; keanekaragaman tumbuhan; konservasi; pendidikan lingkungan

**Abstract**

Since its establishment on 18<sup>th</sup> May 1817, conservation, research, and education, have become core competence of Bogor Botanic Gardens (BBG). The Gardens become a valuable destination showed by about 1.2 million visitors annually, but only less than 10% of those with educational visitation. Therefore, an identification and evaluation of variety and characteristics of education tools supporting environmental education in BBG is carried out in this study. The study showed that topics and tools applied in BBG is quite various but their content and approach have to be improved. Topics highlighted trending conservation and environmental issues have been incorporated in education programs and activities, in line with BBG's vision and mission. All the educational tools in terms of interpretative materials are potential to improve visitor's knowledge. However there are only a few can generate positive behaviour towards environment. Efforts in integrating technology into educational tools were observed, such as mobile application for self-guided tour. Other tools are thematic routes and a newly established education room called Ecodome. These tools support one of Global Strategy for Plant Conservation (GSPC) target and objective in terms of education and awareness about plant diversity, environment, its role in sustainable livelihoods and importance to all life on Earth.

**Keywords:** Bogor Botanic Gardens; conservation; environmental education; interpretation; plant diversity

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## INTRODUCTION

Botanic gardens have been widely known as very important resources for environmental education because their complex representation on biodiversity (Sanders et al, 2018) which have multifunction roles in conservation, research, display, and environmental education (Wyse-Jackson & Sutherland, 2000). In botanic gardens, variety of those scientific elements can be incorporated to public space, such ecological literacy, environmental awareness and sensitiveness as well (Tal, 2004). When wildlife and plants in their habitats are continuing to decline in diversity and population –even hard to find, botanic gardens appear as powerful learning resource. Therefore, botanic gardens has become more recognized as leading institutions in terms of conservation and environmental education, which have great potential to generate people awareness toward biodiversity conservation.

In the journey of their development, botanic gardens has changed globally, in terms of diversity of collection displays for conservation, research, education, and tourism purposes. This changes can be found in some botanic gardens throughout the world, can even be very different from previous displays (Villagra-Islas, 2011). Displays and information media in botanic gardens are part of interpretative media, which is very important to notice because the information content has to deliver conservation messages to public. Biodiversity conservation will not be successfully achieved without environmental education program.

Regarding to importance of education program in botanic gardens, Botanic Gardens Conservation International (BGCI) released a guidance to environmental education for botanic gardens wide world in 1994, and today it is still applicable and relevant to apply (Botanic Gardens Conservation International, 1994). This guidance refers also to the UNESCO's direction through Tbilisi Declaration in 1977 assigning three objectives and five components of environmental education at all levels and in both formal and non-formal education. All the components involve awareness and sensitiveness, knowledge and

understanding, behavior, skills, and participation to operational level (UNESCO, 1978).

In Indonesia, role of botanic gardens in research, conservation, education, tourism, and ecosystem services has been strengthened by a presidential decree (Pemerintah Republik Indonesia, 2011), where all the roles have been conducting by Bogor Botanic Gardens (KRB). In the educational role, KRB has had an environmental education program since 1990 although in optional demand and not well-structured.

KRB then strengthened its educational role, including through networking and BGCI support both in educational programs and learning tools. With total visitor numbers more than 1.2 million annually (Table 1), KRB is very potential to support the success of environmental education in Indonesia, especially in implementing Target 14 of the Global Strategy for Plant Conservation/GSPC (Sharrock, 2011; CBD, 2012) as well as Sustainable Development Goals (Leicht et al., 2018).

Increasing knowledge about biodiversity conservation is often the goal of environmental education programs in botanic gardens, assuming that increasing knowledge can generate positive environmental behavior (Williams et al., 2015).

Environmental education facilities used in botanic gardens worldwide besides their landscape and scenery are learning tools in the form of interpretation materials, in the form of live interpretations, printed materials, exhibitions, and site-specific interpretations (Botanic Gardens Conservation International, 1994).

Gratzfeld (2016) classifies the types of interpretations into face-to-face interpretation approaches where facilitators and visitors can directly interact, and non-personal interpretations that are static. As part of the environmental education program, interpretation is an essential element because without this interpretation media, botanic gardens are just ordinary attractive parks (Botanic Gardens Conservation International, 1994).

Making interpretation material requires special consideration in content and design because it must build strong relationships between visitors, plants, and environmental issues raised (Villagra-Islas, 2011). Learning tools or interpretation materials need to be designed and evaluated, in line with the vision and mission of the botanic garden (BGCI, 1994; Richardson, 2008). This can be applied in botanic gardens including several approaches: face-to-face interpretation, and non-personal interpretation (Gratzfeld, 2016), following the objectives of the environmental education implementation by evaluating outcome characteristics in the form of increased knowledge, awareness and skills, formation of attitudes, intentions, and positive behaviour, as well as pleasure (UNESCO, 1978). To achieve this outcome, several characteristics of environmental education programs based on world best practices have been investigated by Stern et al. (2014).

With the aim to identify topics, characteristics of topic variations, and potential outcomes of biological and environmental learning tools for biodiversity conservation in botanic gardens, this study was conducted at the Bogor Botanic gardens (KRB). The results of this study are expected to be feedback for KRB management in evaluating environmental education programs so that an increase in variety, quality of learning tools, and expansion of the scope of environmental education for visitors can also be done.

## METHOD

This research was conducted descriptively and qualitatively, by taking an inventory of topics and learning tools that have been applied since the last five years (2014-2018) at the Bogor Botanic gardens, the Center for Plant and Botanical Conservation Research - Indonesian Institute of Sciences.

Other collected documents are data on the number of visitors to see trends in the number of visitors and the purpose of their visits, as well as efforts made to expand the scope of environmental education.

## RESULTS AND DISCUSSIONS

### Identification of Environmental Education Topics

The results of an inventory of topics and learning tools on biology and environment practices at KRB in 2014-2018 are presented in Table 2. The diversity of environmental education topics is moderately varied although does not represent global issues such as climate change, energy, new and renewable energy (EBT), and environmental pollution yet.

The role of KRB in mitigating climate change, water reservoirs, and the potential to provide material for EBT, has not been the focus of the topic or its interpretation activities, as is also the case in several developing countries (Akinyoyenu et al., 2017). Topics that involve the trend of global issues such as water issues, sustainable use, distribution of biological resources or biogeography, or waste management, are still given based on visitor requests prior to arrival, or in the form of an annual event calendar, not in a regular topic given routinely or campaigned continuously in KRB region. However, efforts to increase the variety of environmental education topics at KRB have been carried out, including the launching of a mobile application, and the addition of events (Tabel 3).

The mobile application on an Android-based smartphone was launched by KRB in April 2018 on the Play Store under the name "JAWARA", stands for "Jelajah, Belajar, dan Wisata di Kebun Raya Indonesia" or exploring, learning, and touring at the Indonesian Botanic Gardens. Based on the JAWARA application dashboard data on the Play Store, since its launching until April 2019 there were 1,461 downloads which fluctuated per month and reached the highest number of downloads in June-July to coincide with the holiday period (Figure 1).

The JAWARA application mainly displays brief information about a number of species that are unique, interesting, endemic, or rare. To support the information, the mobile apps featured some points of interest such as historic buildings, thematic parks and public facilities, with real time navigation, not

only in the Bogor Botanic gardens but also in the Cibodas Botanic gardens, Purwodadi, and Eka Karya Bali. Visitors can get both information and exploration of the garden without a guide (self-guided tour). To ensure phone signal availability, KRB cooperates with partners to provide dozens of free Wifi points for visitors so that the use of the JAWARA application is not constrained by the signal.

Events within the framework of the environmental education program at KRB are mostly carried out occasionally, following environmental-related commemorative days such as Earth Day, Biodiversity Day, National Tree Day, National Waste Care Day, and Loving National Plants and Wildlife Day (Tabel 3). Thus the topic raised in the event is also relevant to the national or global environmental day.

### **Characteristics of Learning Devices**

Learning tools or interpretation materials applied in botanic gardens include several approaches: face-to-face interpretation, and non-personal interpretation (Gratzfeld, 2016), where the concept and content of interpretation must be in line with the mission statement of the botanic garden itself (Richardson, 2008). Media interpretation as one of the learning tools at KRB has more or less applied these approaches (Table 2). Face-to-face interpretation is done through tour-guiding, workshops and training, presentations, and talk shows; while non-personal interaction is implemented through the installation of interpretation boards, display posters/ banners, leaflets, manuals, labels of plant names, thematic paths, and interpretations that integrate technology, namely applications on mobile phones.

JAWARA application has become an important milestone in the integration of digital technology into educational programs at KRB. This achievement was very much encouraged, following the 4.0 Industrial Revolution policy. Integrating digital technology into education programs in botanic gardens is about balance, which is the balance between traditional learning and new format learning (Carabott, 2014).

The existence of special facilities that accommodate indoor activities equipped with environmental education-containing displays are also needs to be considered, especially when short time-duration of visit take place. Special facilities known as visitor education centers, are proven capable to update visitor knowledge (He & Chen, 2012). At KRB, this facility is available, namely the Pusat Informasi Perkebunanrayaan (PIP), which is equipped with an audio-visual room to play films or listen to presentations and demonstrations from environmental education facilitators.

The addition of the Ecodome green building as an educational facility is likely adding the attractive value of educational activities because of its location adjacent to a visitor's favourite lawn. This new feature was a special site to conduct KRB's annual events and education programs.

### **Potential achievement of environmental education outcomes**

Although not examined through surveys of changes in end-user behaviour, the observed environmental education programs or activities in KRB are entirely have the potential to increase visitor knowledge (Table 4). The environmental education activities in KRB need to be improved in terms of their content and message-delivery methods, because of the very limited trend or environmental issue to address, and the sense involved as well. Only specific activities involving all five senses can potentially fulfill all expected outcome criteria. This simple observation can be used as an evaluation material to reform the approach so that visitors can bring, understand and apply the messages conveyed in their daily lives.

### **Implication to Environmental Education Programs in KRB**

Based on the indirect observation towards visitor activities by reviewing numbers of visitor categories, people had relatively low interest in educational programs at KRB. This finding was experienced not only in KRB but also in other botanic gardens in the world, including Mt. Coottha in Australia (Ballantyne et al., 2008). The main reason for visiting KRB is to get pleasure/

recreation, not to get information and knowledge from KRB.

This finding is a great challenge for KRB to introduce more educational programs that focus on biodiversity conservation - as KRB's core competency - and design, develop and promote the program to the community. Conservation messages need to be delivered in an interesting way starting from the KRB entrance. This can be done, for example, by installing provocative signages, or distributing leaflets about interesting facts of nature, or providing clues to which route or points of interest are most recommended for visitors in experiencing the botanic gardens.

Ballantyne *et al* (2008) also stressed the need to accommodate educational content for visitors on the first visit and repeat visits. First-time visitors can appreciate interpretation boards and other interpretive activities including informal presentations, but their needs will be different on subsequent visits, which can involve more specific activities such as through art lessons, fairy tales, even music concerts, butterfly observations, and bird watching. In another words, connections with visitors must still be maintained strongly but dynamic.

This explorative research provides an overview and enlightenment to the environmental education program at KRB. Environmental education material resources that exist in KRB are already rich and extraordinary. However, the richness need to be much explored, packaged and widely promoted to provide take home messages that is easily understood and remembered by visitors. Further studies are needed to find out how activities or models of interpretation are effectively understood by KRB visitors; how to measure the impact of environmental education on visitors' understanding, attitudes and behaviour regarding biodiversity conservation; how visitors can learn from visiting activities; and how the messages brought from KRB can be transmitted to the surrounding communities. These studies are important to conduct so that the KRB management is able to measure the success of their education program that enables collective understanding and awareness about the importance of biodiversity

conservation to save life on earth in a sustainable manner. This, in line with Williams *et al.* (2015), very much depends on the capacity of the botanic garden itself in measuring and communicating its impact on the environmental education program.

## CONCLUSION

Bogor Botanic Gardens has implemented a variety of activities and learning tools to educate public related to biodiversity conservation, but it still needs to be expanded and varied in scope following environmental issues. Characteristics of programs and activities need to be improved not only to increase knowledge but also to changes in positive attitudes and environmentally friendly behaviors.

Although this research has not reached the stage of determining the impact of educational programs on visitor behaviour, with a high number of visitors per year, KRB has great potential to increase people's knowledge and attitudes towards biodiversity conservation. Further studies and developments are needed to evaluate the program in maximizing the benefits of environmental education to improve environmentally friendly attitudes and behaviour of communities.

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