



**FINAL REPORT
(PROGRAM: SAVE BIODIVERSITY FOR FUTURE GENERATION)**

**Saving Biodiversity Through the Inclusion of Environmental
Education in the Curriculum of ASEAN High School and
Vocational School: Survey, Validity and Realibility Test**

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(SEAMEO BIOTROP)
2023**

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FOREWORD

We thank God Almighty for the completion of this research proposal. This research is a case study of students' views regarding the importance of saving biodiversity through the inclusion of environmental education and the curriculum of SMA/SMK students in ASEAN.

We would like to thank the Ministry of Education, Culture, Research and Technology of the Republic of Indonesia so that this activity can be carried out correctly and on time. The results of this research are expected to provide input for policymakers, especially the Ministry of Education, Culture, Research and Technology, to improve the student education system in Indonesia and Southeast Asia.

Thus, thank you.

Bogor, 30 March 2023
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1. INTRODUCTION

1.1 Background

Indonesia is a country with rich mega-biodiversity because Indonesia is in a biogeographical position and region. Indonesia has 19 types of natural ecosystems from Sumatra to Papua. These natural ecosystem types are divided into 74 types of vegetation in Indonesia (Kartawinata, 2013). Maluku is one of Indonesia's Wallacea biogeographical areas and part of the Malesia region between Malaysia-West Asia and Australia Pacific. However, Maluku has a wealth of flora and fauna with high character and endemism from the mixing of flora and fauna in the two areas, so the biodiversity and vegetation types in these islands are the highest in the world (Mirmato, 2010). Natural ecosystems in Indonesia include marine, limnic, semi-terrestrial and terrestrial ecosystems, while artificial ecosystems include rice fields, intercropping, dry fields, yards, ponds and ponds. This variation indicates that each ecosystem is rich in biodiversity or diversity of flora and fauna species.

Biodiversity or biodiversity is the diversity of organisms in genomes, individuals, species, populations, and ecotypes that differ from races or species that live in certain habitats, subspecies, community ecosystems and biomes. Those means that biodiversity is a natural resource as a basis for products of sustainable evolution or ecosystem support that is important for human well-being. The loss of biodiversity has serious environmental impacts. Recent environmental issues which have become one of the world's main concerns include the following: (1) environmental degradation, (2) climate change which is disrupting food security, (3) human demand for food increases, (4) agricultural land and forest areas decrease due to land clearing, and (5) emergence of new diseases. This condition is triggered by human behaviour that is less concerned about the deteriorating condition of the natural environment. Another environmental issue is that the quality of the environment is currently declining due to excessive exploitation of nature without regard to its carrying capacity and ecological function. For example, excessive deforestation has resulted in catastrophic floods and landslides, and the use of dynamite for fishing has damaged coral reefs (Setiyani & Nina, 2013). Those have added to a series of unwise human behaviour towards the environment. These issues are being discussed in the formulation of the Sustainable Development Goals (SDGs). The United Nations at the global and regional strategic planning level was attended by more than 150 country leaders at the UN General Assembly in New York on 25 September 2015, where the agreed SDGs consisted of 17 goals which included the 4th SDG (Quality Education), 13 (Action Climate), and 15 (Life in Education) (Hák *et al.*, 2016).

Indonesia's biodiversity is ranked the largest in the world, with 552 conservation areas covering 22 million hectares. However, according to a fisheries observer from Sam Ratulangi University, Rignolda Djamaludin, Indonesia has lost 50% of its mangrove area, and only 20% of its coral reefs are in good condition. LIPI researcher Rosichon Ubaidillah also explained that biodiversity is crucial for humans. All diversity, including plants, animals, microorganisms, and the level of genes, species, and ecosystem, is very important as a support for living systems not yet comprehensive in protecting biodiversity in Indonesia (Team Info Tempo 2021). Human activities cause the decline in biodiversity

in the world. Environmentally damaging human activities are on the rise, destroying the habitats of countless species. According to IPBES, only a quarter of the land area and a third of the ocean are relatively undamaged by human activities (According to Population Matters, 2022). Therefore, SEAMEO BIOTROP seeks to stimulate youth, especially youth in Southeast Asia, to always maintain biodiversity, starting from introducing species to the benefits of these species in the surrounding environment.

According to WHO, students (adolescents) are residents in the age range of 10-19 years, while according to Regulation of the Minister of Health of the Republic of Indonesia Number 25 of 2014, adolescents are residents in the age range of 10-18 years and according to the Population and Family Planning Agency, the age range teenagers are 10-24 years old and unmarried (Diananda, 2018). Based on Fatmawati (2017), the world of youth is a colourful and unique world marked by eight characteristics, namely 1) adolescence as an important period, 2) adolescence as a transitional period, 3) adolescence as a period of change, 4) adolescence as a troubled age, 5) adolescence as a period of searching for identity, 6) adolescence as an age that creates fear, 7) adolescence as an unrealistic period, and 8) adolescence as the threshold of adulthood. In the adolescent period, both the direct and long-term consequences are important. There are periods that are important because of the physical and psychological consequences. The self-identity that adolescents seek is in the form of an attempt to explain who they are, what their role is in society, and whether they are a child or an adult. Diananda (2018) also explained that teenagers also tend to conform, namely the tendency to imitate the attitudes or behaviour of other people. Therefore, it is necessary to have guidance from adults beside them to direct them to the right life by stimulating them through various useful and adventurous activities.

Promoting the importance of preserving or saving biodiversity to adolescents is considered more effective. Seeing the psychological condition of adolescents, it might be easier to accept new information that is their attraction. Of course, to attract the attention of teenagers, SEAMEO BIOTROP must package this promotional activity for save biodiversity with full creativity. not yet comprehensive in protecting biodiversity in Indonesia (Team Info Tempo, 2021). The decline in biodiversity in the world is caused by human activities. Environmentally damaging human activities are on the rise, destroying the habitats of countless species. According to IPBES, only a quarter of the land area and a third of the ocean are relatively undamaged by human activities (According to Population Matters, 2022). Therefore, SEAMEO BIOTROP seeks to stimulate youth, especially youth in Southeast Asia, to always maintain biodiversity, starting from the introduction of species to the benefits of these species in the surrounding environment. Biodiversity promotion activities can be initiated through environmental education. Environmental education in Indonesia aims at forming communities that show concern for the environment and related problems, as well as those who have the knowledge, motivation, commitment, and ability to work, both individually and collectively, in finding alternatives or providing solutions to existing environmental problems and preventing emergence of new problems. Efforts to support environmental education for school members (principals and deputy principals, teachers and education staff, and students) are the need to grow and develop the character of caring for the community towards environmental sustainability. One way is through the inclusion of environmental subjects in science curriculum materials in grade 10 high schools. Plt. The Head of the Center for Data and Information Technology

(Pusdatin) of the Ministry of Education and Culture, Gogot Suharwoto said that students should be given learning according to their needs and competencies (Winaya, 2020).

Improvements in technology and the times in the world were followed by developments in the industrial revolution. Currently, there are 4 signs of the industrial revolution, including: 1) industrial revolution 1.0 which Of course, to attract the attention of teenagers, SEAMEO BIOTROP must package this promotional activity to save biodiversity with full creativity. Still needs to be comprehensive in protecting biodiversity in Indonesia (Team Info Tempo, 2021). Human activities cause the decline in biodiversity in the world. Environmentally damaging human activities are on the rise, destroying the habitats of countless species. According to IPBES, only a quarter of the land area and a third of the ocean are relatively undamaged by human activities (According to Population Matters, 2022). Therefore, SEAMEO BIOTROP seeks to stimulate youth, especially youth in Southeast Asia, to always maintain biodiversity, starting from introducing species to the benefits of these species in the surrounding environment. Biodiversity promotion activities can be initiated through environmental education. Environmental education in Indonesia aims at forming communities that show concern for the environment and related problems, as well as those who have the knowledge, motivation, commitment, and ability to work, both individually and collectively, in finding alternatives or providing solutions to existing environmental problems and preventing the emergence of new problems. Efforts to support environmental education for school members (principals and deputy principals, teachers and education staff, and students) are the need to grow and develop the character of caring for the community towards environmental sustainability. One way is through the inclusion of environmental subjects in science curriculum materials in grade 10 high schools. Plt. The Head of the Center for Data and Information Technology (Pusdatin) of the Ministry of Education and Culture, Gogot Suharwoto, said that students should be given learning according to their needs and competencies (Winaya, 2020).

Occurred in the 18th century, which saw the substitution of humans and animals into steam engines to support production machines, sailing ships, and trains; 2) the industrial revolution 2.0 is characterized by power plants, telephones, cars, planes, lights, telegraph machines, and others; 3) industrial revolution 3.0 in the 20th century was characterized by information technology and the internet, such as Programmable Logic Controllers (PLC) and computer-based automated systems; the development of the industrial revolution 3.0 has been followed by the industrial revolution 4.0. The industrial revolution 4.0 is characterized by an increase in Artificial Intelligence (AI), 3D publishing, Internet of Things (IoT), robotics, quantum computing, genetic modification, and others. The use of technology in environmental education is expected to increase students' attractiveness in providing awareness of environmental conditions. The abundance and richness of biodiversity in Indonesia need to be adequately utilized and supported by the potential of human resources, but this will only be meaningful if there is innovation. Improvements can be made through several aspects, including education, health, way of thinking and work ethic, to bring about changes in various areas of life, especially awareness of environmental conditions. The main factors the key to creating survival and sustainable development are protecting the ecological environment and conserving and preserving biodiversity (Mak, 2014).

1.2 Research Objectives

In general, the study was carried out to promote and increase students' awareness of tropical biodiversity in support of the inclusion of environmental education among senior high school students in ASEAN. The specific objectives of the study are:

- 1) To assess students' awareness of tropical biodiversity,
- 2) To find out the education gap in ASEAN regarding issues biodiversity and the environment,
- 3) To Generate policy recommendations for the inclusion of "biodiversity" educational materials and the use of learning media on the protection of biodiversity through environmental education among senior high schools in Indonesia and ASEAN.

1.3 Expected Outcomes

Producing publication of study results in Scopus indexed journals (BIOTROPIA), BIOCOURIER and popular magazines (BIODIVERS).

1.4 Benefit of Research

1.4.1. For Subject of Research

This research provides an explanation regarding the importance of protecting and saving biodiversity so that it does not decrease or disappear in number so as not to have a serious impact on the environment in ASEAN through inclusion of biodiversity material in Environmental Education and Curriculum for ASEAN High School/Vocational High School Students.

1.4.2. For Institutions

Providing opportunities for institutions to develop policy recommendations for decision makers regarding the inclusion of "biodiversity" educational materials and the use of learning media on protecting biodiversity through environmental education among high schools in Indonesia/ASEAN.

1.4.3. For Government

Provides an overview of the status of student gaps regarding biodiversity in ASEAN.

2. LITERATURE REVIEW

2.1 Curriculum for Biodiversity Environmental Education in Indonesia

Indonesia is a mega-biodiversity country with opportunities and challenges in providing biodiversity education to conserve and protect Indonesia's biodiversity. Biology education is essential in Indonesia because of its high biodiversity potential. Currently, in Indonesia, education about biodiversity has been included in the high school curriculum with the applicable KTSP and 2013 Curriculum. Learning about biodiversity and conservation aims to increase students' biodiversity literacy by covering literacy, and attitudes dimensions, about biodiversity. Education Unit Level Curriculum (KTSP) at the high school/Madrasah Aliyah level studies biodiversity and its conservation as listed in Competency Standard No. 3, namely understanding the benefits of biodiversity, Basic Competence 3.1. Describe species and ecosystem gene diversity through observational activities, and 3.2. Communicate biodiversity in Indonesia, conservation efforts and utilization of natural resources (Leksono *et al.*, 2013). Meanwhile, the 2013 Curriculum policy has a competency development scheme including attitudes, knowledge, thinking skills, and psychomotor abilities packaged in various lessons (Sarah & Marjono, 2014).

Based on the Regulation of the Ministry of Education and Culture No. 18A 2013 it is stated that environmental education is one of the local content clusters that can be developed by the regions. The curriculum in Indonesia is developed based on competency standards which can be interpreted as a description of the knowledge, attitudes and abilities that students must master after studying certain subjects and basic competencies, which will become the framework for developing other learning documents, developing of competency standards and basic subject competencies using the attitudes, ability, and knowledge model. Meanwhile, based on the decision of the Head of Education Office No. 800/KEP 1222-dikdas/2014, South Tangerang City is one of the cities that implements environmental education as local content at the Elementary School/Madrasah Ibtida'iyah level. The application of environmental education in South Tangerang City is categorized as a monolithic subject, where local governments must develop their curricula to support the success of the topics raised in these subjects. The environmental education topic implemented in South Tangerang City includes some topics such as waste, biodiversity, energy, air, water, soil, and industrial waste. The result of its development is that environmental education can be integrated with the theme raised. Competency achievement is adjusted to the demands of the 2013 Curriculum, which is divided into 4 dimensions: social interaction, knowledge, skills and environmental coverage. Competency achievement is adjusted to the demands of the 2013 Curriculum, which is divided into 4 dimensions such as social interaction, knowledge, skills and environmental coverage (Herlanti, 2016).

2.2 Biodiversity Environmental Education Curriculum in Malaysia

Malaysia is a medium-sized developing country facing a major challenge in separating economic growth from environmental degradation. The root causes of environmental problems are unsustainable patterns of consumption and production.

Environmental quality depends on the level of knowledge, attitudes, values, and community practices. One of the ways and efforts that can be made to achieve this goal is through environmental education. Malaysia has implemented Environmental Education or Pendidikan Lingkungan (PL) since 1986. Elements of environmental education were included in the Malaysian National Pre-School curriculum in 2003. The biggest target in environmental education is to create a society that is knowledgeable about the biophysical environment and related issues, cares about, and can solve problems and is motivated to find related solutions. The content of PL includes three aspects: education related to the environment, education for the environment, and education in the environment (Aini & Laily, 2010). Malaysia is a developing and competitive country in the economic and industrial sectors that strives to provide a comfortable standard for its people to live in. One of the consequences is that the flow of construction is accelerating, but the rapid development has affected future generations due to unplanned degradation of the construction environment (Affendy & Nazirah, 2014).

Currently, public awareness regarding conservation and environmental protection is still low, and there is a lack of understanding and knowledge of environmental issues as well as up-to-date knowledge and information, however, environmental education in Malaysia should be reviewed to ensure that knowledge about environmental protection from every aspect, including law and policy, must be embedded in the new educational syllabus so that it can spur public awareness (Kamaruddin *et al.*, 2019). Environmental education in the form of biodiversity has been introduced to secondary school students in Malaysia through nature and people. Apart from the Ministry of Education, the Ministry of Natural Resources and the Environment is also involved in cultivating positive traits by campaigning for many campaigns and environmental related projects. Based on Khairani *et al.* (2020), students have high knowledge and positive attitudes about biodiversity in coastal cities. Students' knowledge of biodiversity in coastal cities significantly influences their attitude towards the environment. The knowledge of female students is higher than that of male students. Thus, the effectiveness of environmental education in schools can be achieved, and there is no doubt about it.

2.3 Biodiversity Environmental Education Curriculum in Singapore

Singapore is a country located in Southeast Asia with the best economic conditions. The environment in Singapore is the cleanest among other countries in the Southeast Asian region, according to the Environmental Performance Index (EPI). The EPI is part of the United Nations system of work to provide ranking lists for the environmental quality of countries in the world every two years. In 2014, Singapore was the fourth cleanest country in the world. However, over the last two years (2016 – 2018), Singapore's environmental quality has declined to rank 15th in 2016 and continued to decline in 2018 to rank 49th. Three factors cause a decrease in environmental quality in Singapore, including low availability of clean water, low rates of waste recycling, and high air pollution due to industrial growth, causing an imbalance in the ecosystem based on biodiversity and habitat and climate change.

In an effort to deal with this problem, the Government of Singapore has taken various conservation and environmental monitoring measures. One of them is the enactment of laws on the environment to ensure the beauty and cleanliness of the environment in the

Singapore area. In addition, the Government of Singapore has a program called Clean and Green Singapore (CGS), which was introduced to the public on 29 October 2011 through the CGS campaign organized by the National Council (CAN, 2018), with sustainable programs divided into several areas. A Liveable and Endearing Home: Protecting green and blue environments, dynamic and sustainable cities: Governments, communities, and businesses unite to develop infrastructure, programs and jobs that support the movement towards Zero Waste Nation and a leading green economy (Safitri, 2021). The Singapore government has the Singapore Green Plan (SGP) program prepared by the Ministry of Environment to create a green city model with a vision that covers three aspects, namely a city with high public health standards with clean air, water and environment; a city that is conducive and friendly to live in by people who care and have a vested interest in protecting the local and global environment; a city that will become a regional hub for environmental technology. In addition, there is also an area under SGP, namely the implementation of the Convention on Biological Diversity (CBD) program from the nature conservation program. The National Parks Board of Singapore is the national focal point for the CBD as it is the main government.

Body entrusted with the conservation and management of nature in Singapore. The nature conservation branch within Nparks has been assigned responsibility for coordinating the CBD. The historical record of biodiversity in Singapore is an important component of biodiversity monitoring. The role of herbariums, zoological collections, natural history libraries, and archives in biodiversity conservation. There is a main herbarium base in Singapore called the Singapore Botanic Garden (SBG) which contains an extensive collection of old specimens along with a comprehensive library of books and magazines on botany. The SBG's Herbarium serves as an essential reference and lending centre for plant taxonomy research needs in the Singapore region. The School of Biological Sciences (SBS) or the School of Biological Sciences at the National University of Singapore (NUS) maintains a smaller herbarium and a "germplasm bank". Apart from that, there is also a Zoological Reference Collection (ZRC) stored in SBS, starting from the Raffles Museum Collection, which dates from the previous century. The School of Horticulture (SOH) is part of Nparks and is located in the Singapore Botanic Garden (SBG).

The Ministry of Education and Npark are collaborating on several projects. SOH has assisted the KLH Science Unit in developing environmental education worksheets for schools, where each school is involved in a nature reserve in collaboration with the Nature Reserve Management Branch. The school collaborated with the Ministry of Education and provided valuable input for developing environmental conservation worksheets and curricula. The Ministry of Education, with the support of SOH, has regularly prepared and revised environmental education resource books for primary and secondary schools. There is a project called "Adopt A Park", a joint effort between schools and Nparks to promote environmental awareness. Environmental education is also carried out by the Ministry of Environment, the Nature Society of Singapore (NSS) and the Singapore Environment Council (SEC). Activities organized by the NSS include nature walks, chatting, nature trips abroad, operations in natural areas, annual bird competitions, a compilation of lists of different taxonomic groups, and others. SEC's public awareness programs cover many things, from heritage trails to workshops, art exhibitions, and more. Some of the efforts carried out jointly and independently by these organizations include the activities of

Clean and Green Week, Commemoration of World Environment Day and Commemoration of Earth Day (The National Park Board and The Report Drafting Committee, 1997).

2.4 Biodiversity Environmental Education Curriculum in the Philippines

Environmental education in the Philippines was passed in Republic Act No. 9512 of 2008, known as the "National Environmental Education and Awareness Law 2008". This law aims to integrate environmental education at all levels of private and public schools, including daycare centres, elementary schools, high schools, universities (vocational and professional technical), and traditional out-of-school learning systems. Conservation management in protecting natural resources can be carried out effectively based on knowledge gained from education. Implementation of conservation and management projects can be carried out and has been successful from educational and awareness information.

Collecting knowledge gained from education is an essential medium for realizing the success of conservation and management. Today, young people, especially children and adolescents, are the most critical factors that can prevent biodiversity loss and natural resources (Morar & Peterlicean 2012). Applied education from an early age can help improve the insight of the community, children, and adolescents as an effort to take conservation and protection of natural resources. Globally, the potential of biodiversity education in dealing with biodiversity-related issues is highly appreciated. According to Navarro-Perez and Tidball (2012), biodiversity education is only included and discussed in Environmental Education (EE) or Education for Sustainable Development; Sustainable Development Education.

2.5 Biodiversity Environmental Education Curriculum in Timor Leste

Timor Leste has a Biodiversity Planning Action Strategy National as a frame of reference to conserve biodiversity that will safeguard the country's development in the next two decades. This strategy is closely related to the Strategic Development Plan National Timor Leste (2011–2030) and consistent with the sectoral policy framework in other countries, such as the National Adaptation Action Program for Climate Change (December 2010), national action program to address land degradation (February 2009), plan fisheries and forestry sector. The successful implementation of such strategies involves close coordination between key government directorates related to biodiversity conservation and natural resource management, relevant government economic sectors, and the private sector. It also involves updating the current program and setting priorities for programming and funding. Development Vision Timor Leste in Timor Leste's National Strategic Development Plan (2011–2030) is a 20-year vision that reflects the aspirations of the people of Timor Leste to realize a prosperous and strong country that covers three main areas: social capital, development infrastructure, and economic development. Currently, National Directorate for the Environmental (DNMA) or National Directorate for Environment Timor Leste is leading the way in raising public awareness of the protection and conservation of biodiversity at national and village levels through seminars, workshops for relevant departments, local authorities, academic institutions, schools, and nongovernmental organizations. DNMA has been working to manage biodiversity in the

education system and creating public awareness of biodiversity issues and local species through brochures and pamphlets. As one way to engage communities in protecting and conserving biodiversity both in-situ and ex-situ in field activities, DNMA uses planting activities trees. Various activities are also carried out as an effort to educate both the government and all citizens of Timor Leste to mainstream biodiversity through Environmental Law Socialization activities: distributing brochures/primers explaining Timor Leste's environmental law so that citizens can participate in its implementation and support communities to report environmental crimes to local authorities and broadcast materials which describes Timor Leste's environment on radio and television.

The National Biodiversity Action Plan Strategy on education in Timor Leste is carried out by the Head of the Ministry of Education, who has developed the National Biodiversity Strategy with input from national ministries that will lead the development of modules related to environmental conservation and diversity (coastal ecosystems and their management, focusing on habitat development of species such as mangroves, coral reefs, and seagrasses) to be integrated into an educational or school curriculum. Produce educational materials and audiovisuals about Timor Leste's important and endangered species, value ecosystems, protection and sustainable management of biodiversity, pollution prevention, and proper waste management, to demonstrate primary and secondary schools to promote student appreciation of diversity in Timor Leste's rich biodiversity and ecosystems. Organizing student volunteer organizations (Environmental Youth, Ward Youth Army, Environmental Youth Champion, or other interesting names) in all schools that will take the lead in activities of conservation and advocacy. The school administration must provide financial support or material to this group of volunteers until they can develop a volunteer network for biodiversity across Timor Leste, including boy and girl scouts in this initiative.

2.6 Biodiversity Environmental Education Curriculum in Vietnam

Vietnam is a country located in Southeast Asia with an area of about 330,541 km² and ranks 16th in terms of biodiversity. Vietnam is one of the 10 countries with the highest level of biodiversity in the world with a biodiversity of more than 11,500 animals, more than 21,000 species of plants, and more than 3,000 species of microorganisms. However, the status of biodiversity in Vietnam is currently experiencing a fairly rapid decline in recent years. There are several main causes of biodiversity decline in Vietnam, including illegal exploitation and over-exploitation of resources biological (illegal timber exploitation, poaching and wildlife trade, fishing by unsustainable methods), changes in land use goals and surface water without scientific basis (land use change, groundwater table, water development, and infrastructure development), importation of new varieties and invasive species, pollution, and climate change.

Based on this explanation, precautions are needed to maintain biodiversity in Vietnam with education about nature, biodiversity conservation, and environmental protection in schools. This education and training plays an important role in raising awareness and knowledge of nature conservation and biodiversity for students. The content of environmental education and biodiversity conservation needs to be made as something important and needs to be implemented in common schools. Inclusion methods in national curriculum and research methods can be flexible, but the

evaluation of results must be organized in a way that suits the problem. It is necessary to assist students in acquiring knowledge, self-skills, and students must be able to determine actions in safeguarding the environment and biodiversity. It is necessary to assist students in acquiring knowledge, self-skills, and students must be able to determine actions in safeguarding the environment and biodiversity.

The Ministry of Education and Training in Vietnam has introduced environmental protection education into the education system by integrating it into several subjects and several subjects related to the environmental education curriculum at various levels of education in recent years. The content of environmental education in early childhood education is carried out through special activities of children such as playing, learning, working, and in daily activities. Studies about integration of protection education into elementary schools have been conducted within the framework of project VIE/98/018. The project has developed a number of environmental protection education modules developed from elementary school textbooks. The new elementary school curriculum has been designed and built in line with environmental protection education content in subjects such as mathematics, ethics, nature, social, arts, and training. There are no separate subjects in junior high school education, but environmental protection education has been implemented and integrated into several subjects such as biology, chemistry, geography, and civic education. Several professional schools, colleges and universities, environmental education has been incorporated into learning to be integrated inside intensive modules such as ecotourism, sustainable development education, and educational fields such as geography, biology, citizenship, and chemistry.

There are several principles for selecting educational content about nature conservation and biodiversity into school subjects in Vietnam, including: (1) the content chosen must be consistent with the character of the mind, physiology, and development of students; (2) the selected content must be related to the curriculum and textbooks at the school level, not adding content that can burden the process student learning; (3) it is necessary to establish specific objectives and content of diversity for each level of education, class, and subject; (4) The selected payload shall be simple and close to life; (5) The selected content must be consistent with local socioeconomic and cultural characteristics.

Basic and objective topics of environmental education and biodiversity conservation generally include:

1. Nature conservation and biodiversity
 - The concept of nature conservation and biodiversity
 - The role of nature conservation and biodiversity in the world and biodiversity
 - The state of nature conservation and biodiversity in the world and in Vietnam.
2. The relationship between humans and nature conservation and biodiversity
 - Humans are part of the environment
 - The role of humans in nature and biodiversity conservation
 - Human influence in nature and biodiversity conservation
3. Biodiversity decline

- Declining biodiversity
 - Endangered species
4. Measures for nature and biodiversity conservation
 - Legal provisions on nature and biodiversity conservation
 - Analysis of a number of nature and biodiversity conservation measures
- Internal curriculum teaching forms that integrate nature conservation and biodiversity education in schools, including:
1. Classroom teaching (individual, group, and class)
 2. Teaching outside the classroom (excursions, local surveys, interviews, etc.)
 3. Application of techniques to provide nature and biodiversity conservation education
 4. Application of learning outside the classroom and survey methods (Hoi 2019).

2.7 Biodiversity Environmental Education Curriculum in Cambodia

In general, ASEAN member countries are actively involved in promoting environmental education in the public-private sector, in the formal and non-formal education sectors, and in all levels of formal education. ASEAN countries have developed action programs for environmental education since the First International Conference on environmental education in Belgrade in 1975. Developing countries in Asia have demonstrated a direct link between education and economic growth. One of them is Cambodia, which has high standards for education and is the first country in Southeast Asia to establish a national park. The forest around the Angkor temple complex was designated as a protected forest area in 1925. The Ministry of Environment (KLH) is an agency under the Cambodian government that is responsible for promoting environmental quality, people's welfare, culture, and the national economy. The ministry has a role in motivating and supporting public participation in decision-making on environmental issues and natural resource use.

2. Teaching outside the classroom (excursions, local surveys, interviews, etc.)

As a direct response to ensuring environmental protection, natural resource conservation, and sustainable environmental development, the Ministry of Environment has provided technical capacity strengthening through training courses on nature protection and conservation, environmental policy and law, pollution control/monitoring and inspection, AMDAL, and environmental education. Environmental education in Cambodia has principles that were first incorporated into government policy with the creation of the Ministry of Environment (KLH) in 1993. Currently, the Ministry of Education and Communication and an Inter-Ministry Steering Committee for Environmental Education is being developed.

This committee is responsible for primary, secondary, and further education. Technical and financial assistance for environmental education has been provided directly and indirectly through the government and NGOs since 1993.

2.7. Biodiversity Environmental Education Curriculum in Cambodia Cambodia is a major recipient of donor funding for sustainable development projects and activities ensuring that sustainable

development remains a priority. Education is a core component of sustainable development, environmental education is still developing in Cambodia. The most focused project in environmental education in Cambodia is the Environmental Technical Advisory Program (ETAP). Environmental education in Cambodia consists of formal and non-formal environmental education and environmental education around the Tonle Sap biosphere reserve.

The Ministry of Education, Youth, and Sports has increased the number of environmental topics in the curriculum. Currently, students in grades 9-11 get specialized environmental studies and other courses that further develop environmental topics. The Cambodian curriculum component provides opportunities for environmental education to be integrated into the curriculum. NGOs are working with the government to integrate environmental education into the school curriculum. The environmental education manual has been developed and used cooperatively by the Food and Agriculture Organization, Mlup Baitong, Save Cambodia's Wildlife, and Osmose. A step-by-step guide for school environment clubs has also been developed in schools with special environmental training for supervising teachers and students to participate in its activities.

2.8 Biodiversity Environmental Education Curriculum in Brunei Darussalam

Brunei Darussalam is a country that has an area of 5,765 km², located at 4° North Latitude – 6° North Latitude and 144° East Longitude – 115° East Longitude and has a tropical climate. The temperature in this country is quite high because of its position close to the coast with a relatively low altitude. Daily temperatures in Brunei Darussalam are between 24°C – 30°C with rainfall between 2,500-3,000 mm per year. Brunei Darussalam is committed to maintaining, conserving, developing, and managing biodiversity wisely, including ecological processes, genetic diversity, and habitats for the improvement of social, economic, and community welfare.

Biodiversity environment is undertaken to provide community support for biodiversity conservation and natural resource strategies. Brunei Darussalam is a country that has an area of 5,765 km². 2.9. Biodiversity Environmental Education Curriculum in Thailand Not only that, the implementation of responsibility for all generations is carried out through modules at the educational level (kindergarten/elementary, junior high, and high school). This program is one of the programs held annually by the Ministry of Education. The program was implemented to guide through brochures and syllabi for students and others involved (instructors/teachers). The government also conducts education training and awareness raising for students and the general public at TBC and MBC such as:

1. Public room discussions and roadshows
2. Training/group discussion/seminars and bazaars
3. Excursions, including scientific projects from BioRIC/forest exploration and scientific competition.
4. Making publications, documentation, posters, brochures, books, and others.
5. Adding diversity curriculum education

2.9 Environmental Education Curriculum in Thailand

Environmental education in Thailand is based on organized efforts to educate about the function of the environment in nature and how humans can manage their attitudes and live in ecosystems for a sustainable life. Environmental education is one of the educational processes to increase public knowledge and awareness of the environment, develop skills and abilities needed to overcome various challenges, to stimulate the attitude, motivation, and commitment to make big decisions and to take responsible actions. The conference on governance related to environmental education in 1977 focused on the role of environmental education in conservation, global environmental enhancement, and the provision of action plans and guidelines for environmental education. The conference explained the role, objectives, and characteristics of environmental education, and provided several objectives and principles of environmental education (Santa et al. 2015).

3.0 Biodiversity Environmental Education Curriculum in Myanmar

Environmental education has government decisions regarding the environment and sustainable development to provide and create a succession of knowledge and support from society (Hla 2001). Environmental education in Myanmar has a positive influence and is related to environmental education from kindergarten to high school. There are 3 components of environmental education, namely environmental knowledge, environmental attitudes and behavior, and the results of environmental education. The formal school curriculum and other educational resources in the environment, and continuing education are very important to be implemented in Myanmar. The curriculum stimulates initiatives by each teacher who guides his students to be more aware of environmental issues (Olusanya 2017).

3.1 Biodiversity Environmental Education Curriculum in Laos

The education sector in Laos is still low in all aspects. The government in Laos has implemented several measures to educate future generations regarding the enrichment of biodiversity and the role of natural resources in maintaining the sustainable livelihoods of local communities in addition to the "The World Around Us" curriculum. Several international organizations have developed comprehensive biodiversity curricula and training for teachers through the Ministry of Education. However, little attention has been paid to schools close to areas of high biodiversity (Hansel et al. 2010).

The environmental education curriculum program in Laos focuses on the "National Laos Biodiversity Strategy and Action Plan 2016 – 2025" by the Lao Ministry of Natural Resources and Environment. The curriculum is implemented from the 4th NBSAP strategy, namely "To Inspire and Support Action Through Communication, Education and Community Awareness".

The goal is to update and introduce diversity in Education, namely:

1. Updating the master curriculum to the National University of Laos (NUoL) and changing the undergraduate curriculum to non-timber forest products

2. Testing the environmental education criteria for SD and SMP/SMA that have been developed by the Water Resources and Environment Company.
3. Students demonstrated positive knowledge gain compared to students' basic knowledge in the first lesson about biodiversity.

3. METODOLOGY

3.1 Research Design

The research design was observational with a cross sectional approach using quantitative and qualitative data. The research was conducted in two stages; the first stage was a quantitative study to obtain research objectives number 1 to 2, the second stage was a qualitative study to obtain research objective number 3.

3.2 Place and Time of Implementation

The research was conducted in Bogor City, Indonesia (1st study case). The research was conducted from January 2023 - April 2023. Furthermore we will do research with ASEAN countries (Malaysia, Singapore, Philippines, Timor Leste, Vietnam, Cambodia, Brunei Darussalam, Thailand, Myanmar, Laos) and involved and cooperated with members of the Governing Board of SEAMEO BIOTROP, SEAMEO RECSAM, SEAQIS (SEAMEO QITEP in Science), and SEAQIL (SEAMEO Qitep in Language).

3.3 Number of samples

The sample required for phase 1 (quantitative) was 100 high school students under the Ministry of Education and Culture in Bogor city. The sample required for stage 2- qualitative were representatives of stakeholders from Education Office, Environment Office, Health Office, Principal, Biology and Environment Teachers in each region.

3.4 Research Stages

3.4.1. Stage 1: Study of literature

The initial stage of the research is a literature study. Data collection was carried out using the literature study method. The literature review will contain sources of information related to the research and will help strengthen existing theories and frame more specific sub-questions to guide research data collection.

The literature review draws from journals, reports, monographs, government documents, dissertations and electronic resources. Primary sources of original work are essential. Secondary sources were found in research reviews, yearbooks, handbooks and professional books that were used in providing context, giving significance to the research, and identifying primary sources.

Literature sources were evaluated using three criteria: (1) credibility, (2) reputation of the source and (3) relevance to research related to the study of "Saving Biodiversity Through the Inclusion of Environmental Education in the Curriculum of ASEAN Level HighSchool/Vocational Students". The mechanism in conducting research study is described in Figure 1.

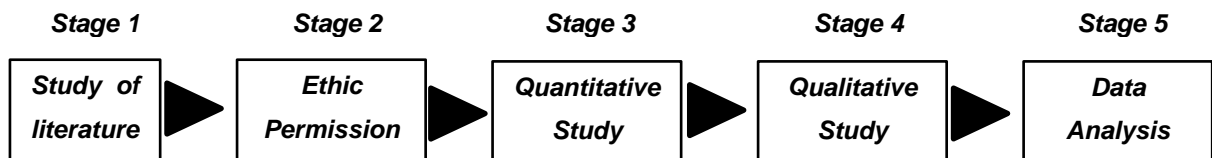


Figure 1. The mechanism in conducting research study is described

Data required at this stage includes a list of relevant schools in Indonesia and Southeast Asia; secondary education targets related to biodiversity and environmental curricula and other supporting data.

3.4.2. Stage 2: Quantitative study

The population is the number of public/private SMA/SMK students in Bogor City. The number of SMA (Public/Private) students is 20,522 people, and the number of SMK (Public/Private) students is 25,148 people in Bogor city (BPS, 2022). The sample is SMA/SMK (Public/Private) students in Bogor city, Indonesia.

The variables to be collected in this stage are related:

- 1) Demographics, including: age, gender, grade level of SMA / SMK students
- 2) General information, biodiversity knowledge, biodiversity in educational settings and the role of SDGs in biodiversity
- 3) Measurement of KAP (Knowledge-Attitude-Practice) (knowledge, attitude and behavior) to determine how deep the students' awareness of the importance of saving biodiversity through the inclusion of environmental education in the curriculum of ASEAN Level SMA / SMK students.

Through this KAP measurement, it can be identified what students already know and do and how students' attitudes in saving biodiversity through the inclusion of environmental education and the curriculum of ASEAN Level SMA / SMK students whether it reflects saving behavior or not.

The results of measuring knowledge, attitude and practice can be used as a reference for decision making in a company or organization. So this study is needed to plan, implement and evaluate a method applied to the community (Zahedi *et al.*, 2014).

3.4.3. Stage 3: Qualitative Study

The key informants were stakeholders from the education sector, sector environment, and health sectors related to saving biodiversity through the inclusion of environmental education and the curriculum of ASEAN Level high school students.

Information to be explored is the suitability of the available curriculum, biodiversity awareness programs for students, and student development activities related to saving biodiversity and the environment.

3.5. Quantitative Study

3.5.1 Metode Pemilihan Sampel Kuantitatif

The sample frame is SMA / SMK students (Public / Private) in Bogor city, Indonesia. The sample size of 100 people was calculated using the Solvin method (Paulus & Ellen, 2016) with the following formula:

$$n = \frac{N}{1 + Ne^2}$$

Description:

n = Total Sample N

N = Total Population

e = (1 - α) error tolerance limit with 90% confidence level

According to BPS (2022), Total population of senior high school students (public/private) in Bogor city = 20,522 people; Total population of senior high school students (public/private) in Bogor city = 25,148 people. Total population of SMA/SMK students = 45,670 people. With confidence level = 90% and margin of error = 10%. Samples will be randomly selected from four schools located in Bogor city. Respondents are private and public SMA/SMK students in Bogor city with inclusion criteria: already learned about biodiversity and environment (grade 10) and able to communicate well.

3.5.2. Quantitative Data Collection Techniques

3.5.2.1 Questionnaire

Quantitative data collection was conducted using a questionnaire. The preparation of the draft questionnaire was carried out in conjunction with the implementation of the "Regional Workshop on the Inclusion of Biodiversity in the Environmental Education Curriculum". The draft questionnaire obtained was then subjected to content and format development. After developing the questionnaire by asking several individuals and experts to read and respond to

the questions to find out their responses regarding the clarity and wording of the questions listed in the questionnaire.

Based on the responses to the questions, revisions are then made to the items that need to be corrected. At this stage, items can be sent to content experts to gather validity evidence. Experts will be asked whether the items match the intended area, whether additional items will be needed to cover the construct (construct underrepresentation), and whether items that are not related to the construct need to be deleted (construct irrelevant variance) (De Leeuw *et al.*, 2004). After the revision, the questionnaire was tested before finally being distributed to respondents.

During the pilot test, the questionnaire setup should be almost the same as the one that will be used in the study, and pilot test respondents should be given space to write comments on individual items and the questionnaire as a whole. The researcher wants to know whether it takes too long to complete, whether the instructions and items are clear, and so on. If there are enough test subjects, reliability estimates can already be calculated, and some indication will be given as to whether there is enough variability in the answers to investigate various relationships. The basis for reviewing the questionnaire was the Pearson validity test and the Cronbach Alpha reliability test.

3.6. Qualitative Study

3.6.1 Qualitative Sample Selection Method

Key informants are stakeholder representatives from various sectors who will be purposively selected. Inclusion criteria: have held a relevant post or position within one year.

3.6.2. Qualitative Data Collection Techniques

3.6.2.1 Interview

Qualitative data is collected through interviews. In order to provide honest answers to questions, respondents should feel comfortable with the interviewer. Before asking specific questions, the interviewer should briefly explain the purpose of the interview and ask if the respondent has any questions or concerns. The questions should then be answered as indicated on the interview schedule. As the subject answers the questions, the interviewer needs to record the answers. Recording is usually done by tape recording or digital recording and/or by taking written notes. The recorded answers can be analyzed by several experts and used for reliability measurement.

3.7. Data Analysis Method

The data will be managed and statistically processed using SPSS 23. Multivariate analysis using logistic regression will be performed to determine the main (dominant) factors

influencing the status of students' awareness on saving biodiversity through the inclusion in the environmental education of high school and vocational students curriculum at ASEAN Level. Qualitative data will be transcribed from the recorded group discussions. Item codes of related variables will be generated and then analyzed.

4. RESULT

Table 1. KAP (Knowledge-Attitude-Practice) Dimension of Biodiversity Inclusion Validity and Reliability Findings

No.	Question Code	Result of Validity Test				Result of Reliability Test	
		Pearson Correlation	Sig. (2-tailed)	N	Status	Cronbach's Alpha if Item Deleted	Status
1	c1.1	.641*	0.046*	10	Valid	0.740	Reliable
2	c1.2	-0.124	0.733	10	Invalid	0.750	Reliable
3	c1.3	0.503	0.139	10	Invalid	0.744	Reliable
4	c1.4	.652*	0.041*	10	Valid	0.743	Reliable
5	c1.5	.742*	0.014*	10	Valid	0.742	Reliable
6	c1.6	.648*	0.043*	10	Valid	0.743	Reliable
7	c1.7	0.430	0.215	10	Invalid	0.744	Reliable
8	c1.8	.716*	0.020*	10	Valid	0.742	Reliable
9	c1.9	0.555	0.096	10	Invalid	0.742	Reliable
10	c1.10	0.495	0.146	10	Invalid	0.746	Reliable
11	c1.11	0.547	0.102	10	Invalid	0.744	Reliable
12	c1.12	.816**	0.004**	10	Valid	0.741	Reliable
13	c1.13	0.260	0.468	10	Invalid	0.747	Reliable
14	c1.14	0.260	0.468	10	Invalid	0.747	Reliable
15	c1.15	0.496	0.145	10	Invalid	0.745	Reliable
16	c1.16	0.327	0.356	10	Invalid	0.745	Reliable
17	c1.17	0.585	0.076	10	Invalid	0.743	Reliable
18	c2.1	.765**	0.010**	10	Valid	0.740	Reliable
19	c2.2	-0.014	0.970	10	Invalid	0.749	Reliable
20	c2.3	0.548	0.101	10	Invalid	0.744	Reliable
21	c2.4	0.499	0.142	10	Invalid	0.744	Reliable
22	c2.5	0.499	0.142	10	Invalid	0.744	Reliable
23	c2.6	.648*	0.043*	10	Valid	0.743	Reliable
24	c2.7	0.445	0.198	10	Invalid	0.745	Reliable
25	c2.8	.716*	0.020*	10	Valid	0.742	Reliable
26	c2.9	0.495	0.146	10	Invalid	0.746	Reliable
27	c2.10	0.314	0.376	10	Invalid	0.747	Reliable
28	c2.11	.898**	0.000**	10	Valid	0.740	Reliable
29	c2.12	0.586	0.075	10	Invalid	0.743	Reliable
30	c2.13	0.320	0.367	10	Invalid	0.746	Reliable

31	c2.14	0.430	0.215	10	Invalid	0.745	Reliable
32	c2.15	0.379	0.280	10	Invalid	0.747	Reliable
33	c2.16	0.235	0.513	10	Invalid	0.747	Reliable
34	c2.17	0.610	0.061	10	Invalid	0.741	Reliable
35	c3.1	.860**	0.001**	10	Valid	0.736	Reliable
36	c3.2	.800**	0.005**	10	Valid	0.740	Reliable
37	c3.3	0.610	0.061	10	Invalid	0.743	Reliable
38	c3.4	.799**	0.006**	10	Valid	0.739	Reliable
39	c3.5	.916**	0.000**	10	Valid	0.740	Reliable
40	c3.6	.652*	0.041*	10	Valid	0.742	Reliable
41	c3.7	0.405	0.246	10	Invalid	0.745	Reliable
42	c3.8	.716*	0.020*	10	Valid	0.742	Reliable
43	c3.9	0.495	0.146	10	Invalid	0.746	Reliable
44	c3.10	0.314	0.376	10	Invalid	0.747	Reliable
45	c3.11	.763*	0.010*	10	Valid	0.742	Reliable
46	c3.12	.817**	0.004**	10	Valid	0.739	Reliable
47	c3.13	.763*	0.010*	10	Valid	0.742	Reliable
48	c3.14	0.427	0.219	10	Invalid	0.745	Reliable
49	c3.15	.655*	0.040*	10	Valid	0.744	Reliable
50	c3.16	0.425	0.221	10	Invalid	0.744	Reliable
51	c317	0.593	0.071	10	Invalid	0.744	Reliable

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Valid: significant level 1%, $r_{hitung} > r_{table}$ (0.765); significant level 5%, $r_{hitung} > r_{table}$ (0.632)

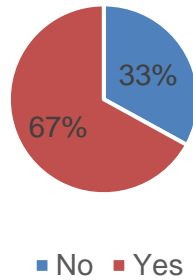
Cronbach's Alpha: 0.748

Table 2. Result of KAP (Knowledge-Attitude-Practice) Dimension of Biodiversity Inclusion Analysis

Status	Parameter	Group	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Knowledge	Low	27	27.0	27.0	27.0
		Middle	19	19.0	19.0	46.0
		High	54	54.0	54.0	100.0
		Total	100	100.0	100.0	
Valid	Attitude	Low	40	40.0	40.0	40.0
		Middle	24	24.0	24.0	64.0
		High	36	36.0	36.0	100.0
		Total	100	100.0	100.0	
Valid	Practice	Low	37	37.0	37.0	37.0
		Middle	27	27.0	27.0	64.0
		High	36	36.0	36.0	100.0
		Total	100	100.0	100.0	

The results of the analysis of questions related to the general information presented in the data below:

B11. Do you know the concept of biodiversity?



B12. Factors causing biodiversity loss (checkboxes)?

(1)	Loss of habitat	19%
(2)	Pollution of water, soil, and air	23%
(3)	Climate change	17%
(4)	Seawater heating	3%
(5)	Ocean acidification	2%
(6)	The emergence of disease	5%
(7)	Exploitation of flora and fauna	16%
(8)	Migratory / invasive species	4%
(9)	Agricultural and forest industrialization	10%
(10)	Other: Honesty	1%

B13. The benefits of preserving biodiversity?

(1)	Improve air and water quality	25%
(2)	Climate or micro climate control	17%
(3)	Pest and disease control	17%
(4)	Pollination and other mechanisms that support food production	18%
(5)	Source of drugs/additional herbal/medicinal plants	11%
(6)	Flood control/Disaster prevention & mitigation	5%
(7)	Recreational value	7%
(8)	Other:	0%

B14. Efforts that can be obtained after saving biodiversity?

(1)	Conservation of natural resources	20%
(2)	Habitat restoration	13%
(3)	Prevent water, soil, and air pollution	22%
(4)	Ban the entry of invasive species	6%
(5)	Promoting the importance of biodiversity in society	23%
(6)	Using local/threatened/endangered species	5%
(7)	Using local/threatened/endangered species	11%
(8)	Other: Throw garbage in its place	1%

B15. Academic disciplines that can contribute to save biodiversity?

(1)	Natural and applied sciences	45%
(2)	Social sciences	23%
(3)	Humanities	5%
(4)	Business	3%
(5)	Educational Science	24%
(6)	Others: mini research project	5%

B16. Efforts that have been made to protect the biodiversity in your

(1)	Nature reserve/nature conservation area	23%
(2)	Zoo	10%
(3)	Conservation through Plant Breeding	11%
(4)	The industrialization of animals	2%
(5)	Botanical garden (Flower garden)	13%
(6)	Environmental restoration (landscape, species, genetics)	6%
(7)	Prevent the entry of invasive species	3%
(8)	Protecting endangered animals and plants	20%
(9)	Application of the biodiversity curriculum in the educational environment	12%
(10)	Other: make rules in pest pollution	1%

B17. Responsible group for protecting the biodiversity in your

(1)	Government	21%
(2)	Private sector	9%
(3)	International Organization	14%
(4)	College/university student/ lecturers	13%
(5)	Schools/students/teachers	12%
(6)	Local community	16%
(7)	Non-Government Organization (NGO)	12%
(8)	Other: myself, families, everybody, public, private company	4%

B18. Efforts you can easily do to save biodiversity?

(1) Promoting biodiversity on social media	21%
(2) Promoting biodiversity in the school environment	16%
(3) Promoting biodiversity in the local community	16%
(4) Become a volunteer to protect biodiversity	12%
(5) Keeping the environment clean	19%
(6) Integrating biodiversity materials into the environmental education curriculum in schools	9%
(7) Developing Educational boards and signs on environmental protection	6%
(8) Other: improve regulations on environmental pollution	1%

B21. Where did you learn about biodiversity?

(1) Formal education	23%
(2) Training/webinars	12%
(3) Surrounding environment	13%
(4) Books or magazines	9%
(5) Articles or news on the internet	18%
(6) Family	6%
(7) Online media (YouTube, e-book, e-journal, e-module)	19%
(8) Other: Tiktok, find myself	1%

B22. Phenomena that raise your awareness of the importance of biodiversity?

(1) The absence of a fish from the river	16%
(2) The lack of insects and other wild lives (fireflies, birds, butterflies, etc.)	14%
(3) Homogenous forest/mono culture forest	6%
(4) Harvest failures due to climate disturbance	20%
(5) Reducing the diversity of animals in the zoo	18%
(6) Natural Disaster (tsunami, landslides, forest fires, heat waves, floods, tornadoes, climate change, etc)	25%
(7) Online media (YouTube, e-book, e-journal, e-module)	2%

B23. The level of formal education that is important to teach the concept of biodiversity?

(1) Kindergarten	8%
(2) Elementary school / primary school	16%
(3) Middle high school / middle school	23%
(4) High school / secondary school	30%
(5) College / university student	22%
(6) Other: environment of community	2%

B24. The level of formal and non-formal education that is important to teach environmental concepts?

(1)	Kindergarten	9%
(2)	Elementary school / primary school	17%
(3)	Middle high school / middle school	17%
(4)	High school / secondary school	18%
(5)	College/University student	16%
(6)	Boarding School	8%
(7)	Communities	14%
(8)	Other:	0%

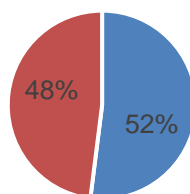
B25. Factors that cause a lack of understanding of the concept of biodiversity in formal and non formal education?

(1)	Insufficient of lessons on biodiversity	34%
(2)	Insufficient resources (facility/fund)	10%
(3)	Incompetent teacher	8%
(4)	Insufficient learning media	19%
(5)	Lack of student interest	28%
(6)	Other:	0%

B26. The most preferred learning media for studying biodiversity??

(1)	On-site / classroom learning	13%
(2)	Online platforms (video conferencing) / remote learning	10%
(3)	52	32%
(4)	Electronic learning module (e-book)	5%
(5)	Video games	17%
(6)	Magazine/Newspaper	4%
(7)	Story Telling	18%
(8)	Other: Outbond, funny games	1%

B31. You know and understand the 17 Sustainable Development Goals (SDGs)?



■ No ■ Yes

B32. The most preferred learning media for studying biodiversity?

(1)	Goals 1: No poverty	2%
(2)	Goals 2: No poverty	3%
(3)	Goals 3: Good Health and Well-Being	10%
(4)	Goals 4: Quality Education	5%
(5)	Goals 5: Gender Equality	2%
(6)	Goals 6: Clean Water and Sanitation	13%
(7)	Goals 7: Affordable and Clean Energy	11%
(8)	Goals 8: Decent Work and Economic Growth	3%
(9)	Goals 9: Industry, Innovations, and Infrastructure	3%
(10)	Goals 10: Reduce Inequality	1%
(11)	Goals 11: Sustainable Cities and Communities	1%
(12)	Goals 12: Responsible Consumption and Production	5%
(13)	Goals 13: Climate Action	10%
(14)	Goals 14: Life Below Water	13%
(15)	Goals 15: Life On Land	13%
(16)	Goals 16: Peace, Justice, and Strong Institution	3%
(17)	Goals 17: Partnership for The Goals	2%
(18)	Other: Don't know	1%

B33. The level of formal education that is important to teach about the concep of 17 Sustainable Development Goals (SDGs)?

(1)	Kindergarten	2%
(2)	Elementary school / primary school	7%
(3)	Middle high school / middle school	25%
(4)	High school / secondary school	35%
(5)	College/University student	31%
(8)	Other:	0%

5. DISCUSSION

Quantitative data collection was carried out using a questionnaire. The preparation of the draft questionnaire was carried out simultaneously with the implementation of “Regional Workshop on The Inclusion of Biodiversity in the Environmental Education Curriculum” which was held at SEAMEO BIOTROP, Bogor, Indonesia on 01-03 August in 2022. This workshop was attended by more than 126 participants from Indonesia, Cambodia, Malaysia, and Philippines. The participants consisted of 8% came from Governance, 9% from Research agencies, 43% from Schools, 35% University and 5% from private companies. Furthermore, content and format development was carried out on the draft questionnaire that had been obtained. During trials, the questionnaire setup should be similar to that used in the study, and respondents should be given space to write comments about the questionnaire. We want to know if it's taking too long to complete if the clues and items are clear, and so on. If there are enough test subjects, reliability estimates can be calculated, and some indication of whether there is variability in answers to investigate various relationships. The basis of the questionnaire review used the Pearson validity test and the Cronbach Alpha reliability test (Table 1). Before conducting

a survey for 100 respondents, the questionnaire as a measuring tool was tested for 10 respondents (N=10). The criteria for testing validity refer to Janna & Herianto (2021), as follows:

- H0 is accepted if $r \text{ count} > r \text{ table}$ (the measuring instrument used is valid or valid)
- H0 is rejected if $r \text{ statistic} \leq r \text{ table}$. (measuring tool used is invalid)

While the criteria for reliability testing refer to Sujarweni (2014), namely:

- H0 is accepted if the Cronbach's Alpha value is > 0.60 , (the measuring instrument used is reliable or can be trusted)
- H0 is rejected if Cronbach's Alpha value < 0.60 . (measuring tool used is invalid)

The results of data analysis in Table 1. show that from 51 questions related to KAP (Knowledge, Attitude, and Practice), only 20 questions were valid (significant level 1%, if $r \text{ count} > r \text{ table}$ (0.765); significant level 5%, if $r \text{ count} > r \text{ table}$ (0.632). Meanwhile, the reliability test results (Table 1) stated that all 51 questions were reliable and consistent because the value of Cronbach's Alpha was $0.748 > 0.60$. Sujarweni (2014) stated that the basis for deciding the reliability test is that if the value of Cronbach's Alpha > 0.60 , the questionnaire is declared reliable or consistent. Based on these results, we eliminated invalid questions in order to obtain 20 valid and reliable questions that will be used for future KAP measurements.

Based on the KAP measurement result, the separate provision of biodiversity and environment materials is considered ineffective because only 54 students had knowledge, 40 students had an attitude, and 37 students had practised saving biodiversity linked to environmental issues. Saving biodiversity in early education by including biodiversity in environmental education in the curriculum of High school or vocational students at the ASEAN level is critical. This is supported by Karpudewan and Ismail (2007) who reported that the current biodiversity crisis requires increased understanding and awareness of ecological concepts. There were no answers to questions on general information that reach more than or equal to 50%. A summary of the responses from 100 respondents regarding available data can be seen as below:

1. 67% answered that they already knew about the concept of biodiversity
2. 23% answered that pollution of water, soil, and water is a factor that causes biodiversity loss
3. 25% answered that the benefit of preserving biodiversity is to improve water and water quality
4. 23% answered that the efforts that can be obtained after saving biodiversity were promoting the importance of biodiversity in society
5. 23% answered that academic disciplines which can contribute to save biodiversity are Natural and applied sciences
6. 23% answered that the efforts that have been made to protect the biodiversity in your country were Nature reserve/nature conservation area
7. 21% answered that the government has the responsibility to protect the biodiversity

8. 21% answered that promoting biodiversity on social media is a straightforward effort to save biodiversity
9. 23% answered that they learned about biodiversity in formal education
10. 25% answered that Natural Disasters (tsunamis, landslides, forest fires, heat waves, floods, tornadoes, climate change, etc.) as Phenomena that raise their awareness of the importance of biodiversity
11. 30% answered that High School/vocational school as a level of formal education that is important to teach about the concept of biodiversity
12. 18% answered that High school / secondary school as a level of formal and non-formal education that is important to teach environmental concepts
13. 34% answered that Insufficient lessons on biodiversity were the factor that caused a lack of understanding of the concept of biodiversity in formal and non-formal
14. 32% answered that the most preferred learning media for studying biodiversity is Practical or field activities
15. 52% answered that respondents know and understand about the 17 Sustainable Development Goals (SDGs)
16. 13% answered that the most preferred learning media for studying biodiversity are (1) Goals 6: Clean Water and Sanitation, (2) Goals 14: Life Below Water and (3) Goals 15: Life On Land
17. 35% answered that High school / secondary school is The level of formal education that is important to teach about the concept of the 17 Sustainable Development Goals (SDGs)

Qualitative data was collected through in-depth interviews with relevant stakeholders such as the Environment Agency and the Health Office in Bogor City, Indonesia. The results of the in-depth interviews stated that the Bogor City Environmental Service supported the inclusion of biodiversity materials enriched with environmental materials in the High school and Vocational school curriculum under the Ministry of Education, Culture-Research and Technology. According to the Bogor City Environment Agency, Biodiversity has an important role. Biodiversity includes all living things, from the visible to the invisible. Not only knowledge but concern for biological wealth is also necessary. It must be instilled early on or below the High School or Vocational School.

According to the Bogor City Environment Agency, there are already programs at the Environment Agency related to efforts to conserve biodiversity, for example, hygiene programs such as waste management. Air quality and air quality measurements were carried out. In addition, some programs involve students in protecting the environment through the Adiwiyata School program. Adiwiyata School is a school that cares about a healthy environment. With the Adiwiyata program, it is hoped that all the people around the school will realize how important it is to protect the environment.

Ethics education is also essential to be instilled from an early age. Similar to the Department of the Environment, the Bogor City Health Service, Indonesia, supports the introduction of biodiversity knowledge in the the High school and Vocational school curriculum because it can be an effort to increase knowledge among students. The environment is a factor causing health problems, including health services that are not accessible to the public. One of the organizational structures in the Health Office is the

group in the field of environmental health which handles various matters related to environmental quality. Health workers specifically deal with the environment called "Sanitarians". Adolescents' concern so far is in efforts to control biodiversity loss, which is around 40%. What is currently focused on is how to prevent the environment from causing disease. The physical, chemical and biological environment can cause health problems, so it needs to be managed properly. Teenagers need to be given knowledge so they know what to do about biodiversity loss, at least for themselves. The government needs to provide facilities and infrastructure to support biodiversity sustainability, such as educational parks, watersheds (DAS), and dams. Research institutions need to explore areas prone to damage and the potential and ideas for appropriate technology regarding sustainability.

Conclusion

1. The fact that the student's awareness on biodiversity knowledge and conservation is still low to moderate, but they are very concerns to climate change and natural disasters. Therefore, it is crucial to introduce the biodiversity conservation to mitigate the climate resilience and natural disaster for sustainable development.
2. Research results could be adopted for initiating the inclusion of biodiversity curriculum in high school, with some modifications according to the country, school levels, and local language.
3. It is the time for new generation (high school), as future leaders, to have better understanding on the role of biodiversity conservation for their future.

Recommendations (if applicable)

1. It is necessary to increase the competences of teachers in inclusion of biodiversity conservation in their curriculum by conducting training of trainers at SEAMEO BIOTROP.
2. Develop more interactive social media for biodiversity conservation and natural disaster campaigns as learning media and learning materials with regards to learning outcome (LO) for each subject in high school.
3. Educate the teachers and students on biodiversity conservations and bio-prospection through agro-eco-edu-tourism.
4. Networks among the ASEAN Countries in biodiversity inclusion in high school will strengthen and accelerate the achievement of Sustainable Development Goals, especially Goal Number 4, and therefore it is necessary to conduct official collaboration among the partners.

REFERENCES

- Affendy, M.O., Nazirah, Z.A. (2014). Konsep dan praktik kesadaran lingkungan masalah di awal proyek konstruksi melalui fase manajemen nilai. In: *Seminar Internasional Pascasarjana Ilmu Sosial (SSPIS).Universiti Sains Malaysia*, 26 November 173.
- Aini, M., & Laily, P. (2010). Preparedness of Malaysian pre-school educators for environmental education. *Pertanika Journal of Social Sciences & Humanities*, 18(2), 271-283.
- Badan Pusat Statistik (BPS). (2022). Kota Bogor Dalam Rangka Bogor Municipality In Figures 2022. Bogor(ID): BPS Kota Bogor.
- De Leeuw, E., Borgers, N., & Smits, A. (2004). Pretesting questionnaires for children and adolescents. *Methods for testing and evaluating survey questionnaires*, 409-429.
- Diananda, A. (2018). Psikologi remaja dan permasalahannya. *Istighna* 1(1): 116 – 133.
- Fatmawati, R. (2017). Memahami psikologi remaja. *Jurnal Reforma* 4(2): 55 – 65.
- Hák, T., Janoušková, S., & Moldan, B. (2016). Sustainable development goals: A need for relevant indicators. *Ecological indicators*, 60, 565-573.
- Hansel, T., Phimmavong, S., Phengsopha, K., Phompila, C., & Homduangpachan, K. (2010). Developing and Implementing a Mobile Conservation Education Unit for Rural Primary School Children in Lao PDR. *Applied Environmental Education & Communication*, 9: 96-103.
- Herlanti, Y. (2016). Pengembangan kurikulum pendidikan lingkungan di kota tangerang selatan: bagaimana mengintegrasikan deklarasi tbilisi dalam kurikulum. In: *Proceeding Biology Education Conference: Biology, Science, Enviromental, and Learning* (Vol. 13, No. 1, pp. 52-57).
- Hla, H.W. (2001). Environmental Awareness and Environmental Education in Myanmar. *Social Education*, vol. 65, no. 2, Mar. 2001, p. 98.
- Hoi, P. T. T. (2019). Integrating Nature Conservation and Biodiversity Education in Teaching in General schools in Vietnam. *Journal of Physics: Conference Series*, 1340 (1).
- Kamaruddin, H., Othman, N., Sum, S.M., Rahim, N.Z.A. (2019). *Environmental Education in Malaysia: Past, Present and Future*. In: *The European Proceedings of Social and Behavioural Sciences*.
- Khairani, A.Z., Kipli, M., Shamsuddin, H. (2020). *High school students knowledge and its influence on attitude towards biodiversity at waterfront cities in Malaysia*. *Universal Journal of Education Research*, 8(1), 83-88.
- Kartawinata, K. 2013. *Diversitas Ekosistem Alami Indonesia*. Ungkapan singkat dengan sajian foto dan gambar. Jakarta (ID): LIPI Press & Yayasan Obor Indonesia.
- Leksono, S. M., Rustaman, N., & Redjeki, S. (2013). Kemampuan profesional guru biologi dalam memahami dan merancang model pembelajaran konservasi biodiversitas di SMA. *Cakrawala Pendidikan*, 3(3), 408-419.
- Mak, O. T. (2014). Study of the Teaching of Biodiversity as a General Undergraduate Course in a University of Taiwan. *International Journal of Bioscience, Biochemistry and Bioinformatics*, 4(3), 146-149. DOI: 10.7763/IJBBB.2014.V4.328.
- Ministry of Education and Culture Republic of Indonesia. (2020). *Kemendikbud giatkan pembelajaran berbasis teknologi*. [Internet]. [Downloaded 2022 July 02]. Available

- in : <https://www.kemdikbud.go.id/main/blog/2020/02/kemendikbud-giatkan-pembelajaran-berbasis-teknologi>.
- Mirmanto, E. (2010). Komposisi flora dan struktur hutan alami di Pulau Ternate, Maluku Utara. *Jurnal Biologi Indonesia*, 6(3), 341-351.
- National Biodiversity Working Group. (2015). The National Biodiversity Strategy and Action Plan of Timor-Leste (2011 – 2020).
- Navarro-Perez, M., Tidball, K.G. (2012). Challenges of biodiversity education: a review of education strategies for biodiversity education. *International Electronic Journal of Environmental Education*. 2 (1).
- Olusanya, A.K. (2017). Kontekstualisasi Dewasa Muda tentang Masalah Lingkungan dan Keberlanjutan: Sebuah Kritis Isu untuk Intervensi Pendidikan Lingkungan. *Jurnal Pendidikan di Wilayah Laut Hitam*, 3 (1).
- Paulus A, P., & Ellen G, T. (2016). Faktor-faktor yang mempengaruhi harga cabai rawit di Kota Manado. *Agri-Sosioekonomi*, 12(2), 105-120.
- Population Matters. (2022). Biodiversity. [Internet]. [diunduh pada : 2022 Apr 15]. Tersedia pada : https://populationmatters.org/the-facts/biodiversity?gclid=Cj0KCQjwr-SSBhC9ARIsANhzu14uT_3T5lv3tOfhQQHhY4krFOJ2hJoP9rV960ql85TXqTZxC-IroiQaAkunEALw_wcB.
- Safitri, E. Penurunan Peringkat Kualitas Lingkungan Singapura pada Tahun 2018.
- Santa, Y., Wongpho, B., Chankong, U. (2015). Development of a Learning Activity Management Model with the Community Learning Sources for Environmental Education. *International Forum of Teaching and Studies*, 11(1-2)
- Setiyani, N. (2013). *Pendidikan Karakter Peduli Lingkungan Melalui Program "Green Environment" Di SMP Alam Ar-Ridho* (Doctoral dissertation, Doctoral dissertation, Universitas Negeri Semarang).
- Tim Info Tempo. (2021). Keanekaragaman hayati Indonesia kian terancam. [Internet]. [diunduh pada 2022 Apr 15]. Tersedia pada: <https://koran.tempo.co/read/info-tempo/465925/keanekaragaman-hayati-indonesia-kian-terancam>
- Utama IGBR. (2016). Teknik sampling dan penentuan jumlah sampel. Bali (ID): Research Gate. DOI:10.13140/RG.2.1.5187.0808
- Winaya, I. M. A. (2020). Pengembangan Nilai-nilai Karakter Anak pada Pembelajaran Jarak Jauh di Masa Pandemi Covid-19 dengan Berbantu Lembar Kerja Siswa Berbasis Proyek. *Jurnal Pendidikan Kewarganegaraan Undiksha*, 8(3), 124-135.
- Zahedi, L., Sizemore, E., Malcolm, S., Grossniklaus, E., & Nwosu, O. (2014). Knowledge, attitudes and practices regarding cervical cancer and screening among Haitian health care workers. *International journal of environmental research and public health*, 11(11), 11541-11552.

APPENDIX

APPENDIX 1

INFORMED CONSENT

I the undersigned:

Name : _____
Address : _____
Place and Date of Birth : _____
Age : _____years old
Grade : _____
Name of School : _____
Phone Number/Email : _____

After hearing an explanation of the study entitled:

“SAVING BIODIVERSITY THROUGH THE INCLUSION OF ENVIRONMENTAL
EDUCATION IN THE CURRICULUM OF ASEAN HIGH SCHOOL AND
VOCATIONAL SCHOOL”

Compiled by:
Research Coordinator : Risa Rosita, S.Si., M.Si.
Institution : SEAMEO BIOTROP
Address : Jl. Raya Tajur KM. 6 Bogor, Jawa Barat, Indonesia
Phone Number : (+62) 81280464270

I hereby declare my willingness to participate as a research subject and agree to take part in this survey according to the required data.

Thus this statement is made with full awareness without any coercion from anyone.

Who makes the statement (Student),

Witness (Teacher Class),

APPENDIX 2

SURVEY ON BIODIVERSITY

A. BIODATA

1. Name :
2. School :
3. Nationality :
4. Grade :
5. Gender : Male Female
6. Age :

B. GENERAL INFORMATION

B.1. Part 1 - Biodiversity Knowledge

Questionnaire Instructions

Put a checkmark on one or more questions in the column of choice statements that you think are the most correct. You can fill in your own opinion in the "other" box!

1. Do you know the concept of biodiversity?
 - a. Yes
 - b. No
2. Factors causing biodiversity loss (checkboxes)?
 1. Loss of habitat
 2. Pollution of water, soil, and air
 3. Climate change
 4. Seawater heating
 5. Ocean acidification
 6. The emergence of disease
 7. Exploitation of flora and fauna
 8. Migratory / invasive species
 9. Agricultural and forest industrialization
 10. Other:
3. The benefits of preserving biodiversity?
 1. Improve air and water quality
 2. Climate or micro climate control
 3. Pest and disease control
 4. Pollination and other mechanisms that support food production

5. Source of drugs/additional herbal/medicinal plants
6. Flood control/Disaster prevention & mitigation
7. Recreational value
8. Other:

4. Efforts that can be obtained after saving biodiversity?

1. Conservation of natural resources
2. Habitat restoration
3. Prevent water, soil, and air pollution
4. Ban the entry of invasive species
5. Promoting the importance of biodiversity in society
6. Using local/threatened/endangered species
7. Enriching the collection of useful plants/herbs
8. Other:

5. Academic disciplines that can contribute to saving biodiversity

1. Natural and applied sciences (Biology, chemistry, computer science, engineering, geology, mathematics, physics, medicine)
2. Social sciences (Anthropology, geography, law, political science, psychology, sociology)
3. Humanities (Art, history, languages, literature, music, philosophy, religion, theater)
4. Business (Accounting, economics, finance, management, marketing, tourism)
5. Educational Science (civics, biology, chemistry, etc)
6. Others:

6. Efforts that have been made to protect the biodiversity in your country

1. Nature reserve/nature conservation area
2. Zoo
3. Conservation through Plant Breeding
4. The industrialization of animals
5. Botanical garden (Flower garden)
6. Environmental restoration (landscape, species, genetics)
7. Prevent the entry of invasive species
8. Protecting endangered animals and plants
9. Application of the biodiversity curriculum in the educational environment
10. Other:

7. Group responsible for protecting the biodiversity in your country

1. Government
2. Private sector
3. International Organization

4. College/university student/ lecturers
5. Schools/students/teachers
6. Local community
7. Non-Government Organization (NGO)
8. Other:

8. Efforts you can easily do to save biodiversity

1. Promoting biodiversity on social media
2. Promoting biodiversity in the school environment
3. Promoting biodiversity in the local community
4. Become a volunteer to protect biodiversity
5. Keeping the environment clean
6. Integrating biodiversity materials into the environmental education curriculum in schools
7. Developing Educational boards and signs on environmental protection
8. Other:

B.2. Part 2 - Biodiversity in Educational Environment

1. Where did you learn about biodiversity?

1. Formal education
2. Training/webinars
3. Surrounding environment
4. Books or magazines
5. Articles or news on the internet
6. Family
7. Online media (YouTube, e-book, e-journal, e-module)
8. Other:

2. Phenomena that raise your awareness of the importance of biodiversity

1. The absence of a fish from the river
2. The lack of insects and other wild lives (fireflies, birds, butterflies, etc.)
3. Homogenous forest/mono culture forest
4. Harvest failures due to climate disturbance
5. Reducing the diversity of animals in the zoo
6. Natural Disaster (tsunami, landslides, forest fires, heat waves, floods, tornadoes, climate change, etc)
7. Other:

3. The level of formal education that is important to teach the concept of biodiversity

1. Kindergarten
2. Elementary school / primary school
3. Middle high school / middle school

4. High school / secondary school
 5. College / university student
 6. Other:
4. The level of formal and non-formal education that is important to teach environmental concepts
1. Kindergarten
 2. Elementary school / primary school
 3. Middle high school / middle school
 4. High school / secondary school
 5. College/University student
 6. Boarding School
 7. Communities
 8. Other:
5. Factors that cause a lack of understanding of the concept of biodiversity in formal and non-formal education
1. Insufficient of lessons on biodiversity
 2. Insufficient resources (facility/fund)
 3. Incompetent teacher
 4. Insufficient learning media
 5. Lack of student interest
 6. Other:
6. The most preferred learning media for studying biodiversity
1. On-site / classroom learning
 2. Online platforms (video conferencing) / remote learning
 3. Practical or field activities
 4. Electronic learning module (e-book)
 5. Video games
 6. Magazine/Newspaper
 7. Story Telling
 8. Other:

B.3. Part 3 - Role of SDGs in Biodiversity

1. You know and understand the 17 Sustainable Development Goals (SDGs)
 - a. Yes
 - b. No
2. Sustainable Development Goals (SDGs) that related to biodiversity

1. Goals 1: No poverty
2. Goals 2: Zero Hunger
3. Goals 3: Good Health and Well-Being
4. Goals 4: Quality Education
5. Goals 5: Gender Equality
6. Goals 6: Clean Water and Sanitation
7. Goals 7: Affordable and Clean Energy
8. Goals 8: Decent Work and Economic Growth
9. Goals 9: Industry, Innovations, and Infrastructure
10. Goals 10: Reduce Inequality
11. Goals 11: Sustainable Cities and Communities
12. Goals 12: Responsible Consumption and Production
13. Goals 13: Climate Action
14. Goals 14: Life Below Water
15. Goals 15: Life On Land
16. Goals 16: Peace, Justice, and Strong Institution
17. Goals 17: Partnership for The Goals
18. Other: Don't know

3. The level of formal education that is important to teach about the concept of 17 Sustainable Development Goals (SDGs)

1. Kindergarten
2. Elementary school / primary school
3. Middle high school / middle school
4. High school / secondary school
5. College / university student
6. Other:

C. KAP (KNOWLEDGE-ATTITUDE-PRACTICE)

Questionnaire Instructions (*Petunjuk Pengisian Kuisisioner*)

1. Answer your agreement on the following **statements** in the range of values from 1 to 4 as follows by giving a cross (x) on the correct answer

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

C.1. Part 1 - Knowledge Relate to Biodiversity

1. I know that my country has high biodiversity

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

2. I know that the biodiversity curriculum is essential to orient in schools

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree
3. I know that the environmental curriculum is essential to orient in schools
1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree
4. I know that the Sustainable Development Goals (SDGs) are essential for preserving biodiversity
1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree
5. I know that I have a concern about biodiversity
1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree
6. I know if saving biodiversity is done through the inclusion of Environmental Education in the Curriculum for High School / Vocational High School Students could give benefits
1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

C.2. Part 2 - Attitude Relates to Biodiversity

1. I believe that my country has high biodiversity
1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree
2. I believe that the Sustainable Development Goals (SDGs) are essential for preserving biodiversity
1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree
3. I believe that I have a concern about biodiversity
1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree
4. I believe one way to save biodiversity can be done through the inclusion of environmental education in high school/vocational school curricula
1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

C.3. Part 3 – Practice Relates to Biodiversity

1. I ensure that my country has high biodiversity
1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

2. I ensure biodiversity has advantages.

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

3. I ensure that the biodiversity curriculum is essential to orient in schools

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

4. I ensure that the environmental curriculum is essential to orient in schools

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

5. I ensure that the Sustainable Development Goals (SDGs) are essential for preserving biodiversity

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

6. I ensure that I have a concern about biodiversity

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

7. I ensure one way to save biodiversity can be done through the inclusion of environmental education in high school/vocational school curricula

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

8. I ensure if saving biodiversity is done through the inclusion of Environmental Education in the Curriculum for High School / Vocational High School Students could give benefits

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

9. I ensure that studying biodiversity must involve the role of the environment directly

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

10. I ensure educators (teachers) already have a good expertise to teach the concept of biodiversity and the environment in schools

1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree

-Thank you for your participation-

-Terimakasih atas partisipasinya-

APPENDIX 3



Figure 2. Biodiversity research (survey activities)



Figure 3. Preparation of a draft questionnaire on “Regional Workshop on The Inclusion of Biodiversity in the Environmental Education Curriculum” which was held at SEAMEO BIOTROP, Bogor, Indonesia on 01-03 August in 2022

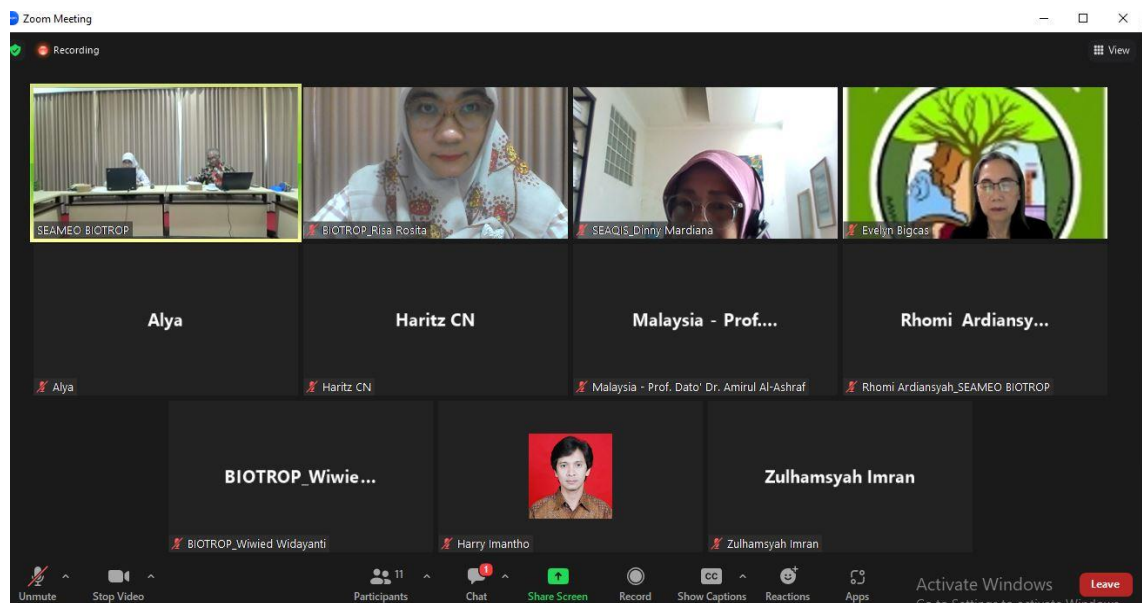


Figure 4. External meeting with stakeholders (SEAMEO BIOTROP, GB Member Malaysia (Prof. Dato Dr. Amirul Al-Ashraf Abdullah, Mindanao University State (MSU) Philippines, SEAMEO SEAQIS (Dr. Dinny Mardiana, M.Si.), Bogor, Indonesia 23 February 2023



Figure 5. External meeting with stakeholders (SEAMEO BIOTROP, Embassy of the Republic Indonesia (Prof Firdaus) in Kuala Lumpur, Malaysia 07 Maret 2023



Figure 6. External meeting with stakeholders (SEAMEO BIOTROP, Universiti Sains Malaysia in Penang, Malaysia 10 Maret 2023



Figure 7. Presentation of research study in CPRN SUMMIT congress on March 2023 Penang, Malaysia