



2023 SEAMEO-Japan ESD Award

Theme: Promoting Environmental Education through Utilizing Renewable Energy

PART I: DETAILS OF YOUR SCHOOL

1.	Name of your school <u>South Hill School. Incorporated</u>
2.	Full address IPB Road UP College, Los Banos , Laguna
3.	Postcode 4030 4. Country Philippines
5.	School's telephone number (country code+city code+telephone number) 049 523 7219
6.	School's Email Addresssouthhillschool@gmail.com
7.	School website (if available) www.facebook.com/shsi1997
8.	Approximate number of teachers participated in this programme40
9.	Approximate number of students participated in this programme 500

PART II: INFORMATION ABOUT THE SCHOOL'S PROGRAMME

1. Title of the school's programme

Advancing Binary Thinking-WE and Carbon Farming via SPEC: Solar-Powered Enzymatic Composting (ABC via SPEC)

2. Summary of the programme

South Hill has implemented ABC via SPEC to promote binary thinking, distinguishing between compostable and noncompostable for effective solid waste management. The program takes a multifaceted approach, beginning with environmental education to promote the utilization of renewable energy and advocate a circular economy.

The program is a youth-led zero-waste initiative as students take charge in managing both compostable and noncompostable waste streams. For compostable waste, STEM students have developed a Solar-powered Smart Bioreactor System that utilizes Industrial Enzymes and Whey additives, speeding up the composting process effectively. As for noncompostable waste, STEM students facilitate the conversion of plastic waste into base ten blocks manipulatives, which are used for primary math education, employing a greener plastic injection molding process.

Additionally, the South Hillian youth play a key role in promoting carbon farming. The program extends from the school level to households, with a focus on herbs, food, and ornamental plants. Moreover, the initiative reaches the local barangay, engaging farmers in Laguna.

In pursuit of the main goal, science class field trips are organized to explore renewable energy sources. Visits to notable sites such as the Makban Geothermal Power Plant, the Bangui Windmills in Ilocos Norte, and various solar power enterprise technologies deepen students' understanding of sustainable energy practices.

The school further institutionalizes its commitment to SDGs through local and international cooperation and partnerships through conferences and linkages with like-minded institutions, such as Singapore Secondary Schools and Southeast Asian Youth. Furthermore, the school fosters student exchange collaborative projects with partners in South Korea, Singapore, and the United States, creating a platform for knowledge exchange and the development of shared sustainable initiatives.

South Hill School is making great strides in shaping environmentally conscious and responsible leaders of the future, who are equipped to address the pressing challenges of waste management and environmental sustainability.

3. Objectives/goals of the school's programme

- 1. Promote Binary Thinking in Waste Education to facilitate effective solid waste management
- 2. Embed Environmental Education in the very fabric of the school's curriculum, centered on promoting the great value of using Renewable Energy, advocating Circular Economy and advancing community-scale Carbon Farming via SPEC
- 3. Institutionalize SDG-driven Local and International Cooperation and Partnerships to widen the program's reach

1. Promote Binary Thinking in Waste Education to Facilitate Effective Solid Waste Management In the pursuit of effective solid waste management, it is crucial to promote binary thinking in waste education. By encouraging individuals to view waste as either, compostable or noncompostable, they can better understand the importance of proper waste segregation and disposal.

Through binary thinking, South Hill's waste education becomes more accessible and engaging for people of all ages and backgrounds. This approach emphasizes clarity and practicality, making it e a sier for all to adopt sustainable waste management habits. By clearly defining the two categories and explaining their environmental impact, individuals become more mindful of their waste generation and disposal habits, thus reducing their e clogical footprint.

In South Hill, incorporating binary thinking into waste education instills a sense of responsibility and environmental consciousness among students, parents, teachers and the entire community. As the younger generation becomes more aware of the consequences of their waste choices, they are likely to embrace more sustainable practices throughout their lives.

2. Embed Environmental Education in the very fabric of the school's curriculum, centered on promoting the great value of using Renewable Energy, advocating Circular Economy and advancing <u>community-scale Carbon Farming via SPEC</u> To create a lasting and profound impact on the environment, it is crucial to embed environmental education in the very fabric of the school's curriculum. By making it a core component of learning, South Hillians develop a deep understanding of ecological issues and sustainable solutions from an early age.

At the heart of this curriculum lies the advocacy of the circular economy advancing the importance of reducing, reusing, and recycling resources to minimize waste generation and preserve na tural resources. By understanding the interconnectedness of environmental systems and the consequences of linear consumption patterns, young minds can embrace the circular economy's principles to create a more sustainable future. This is complemented by the comprehensive curricular offering on the science of Renewable Energy across all grade levels.

Additionally, the program focuses on promoting community-scale Carbon Farming through the implementation of Solar Powered Enzymatic Composting. This a pproach encourages students to gras p the significance of regenerative a griculture and carbon sequestration in combating climate change. By empowering communities to engage in carbon farming practices, students also learn the importance of local action in achieving global environmental goals via the utilization of renewable energy.

Furthermore, the integration of hands-on projects and field experiences enrich the learning process and instill a sense of stewardship for the environment. By witnessing the positive impact of circular economy practices and SPEC initiatives firsthand, students are highly motivated to take an a ctive role in promoting sustainable practices both within the communities and on a broader scale. 3. Institutionalize SDG-driven Local and International Cooperation and Partnerships to Widen the Program's Reach

By a ligning the program's objectives with the United Nations' Sustainable Development Goals, the SPEC initiative gains a globally recognized framework for addressing environmental and social challenges. This alignment ensures that efforts are coordinated, efficient, and contribute to a broader, collective impact on the globals ustainability a genda.

Local cooperation and partnerships are equally vital as they foster collaboration among the community stakeholders, such as the local government, and citizens. Moreover, international cooperation and partnerships enable knowledge exchange and best practices sharing between different regions and countries. This global collaboration promotes innovation and helps communities learn from each other's successes and challenges.

Institutionalizing these partnerships ensures the program's continuity and longevity beyond short-term initiatives. It enables stakeholders to work towards common goals in a sustained manner, resulting in a more profound and lasting impact on waste management, environmental education, and overall sustainability.

4. Period of the time when the programme has been started

2014 - Development of Enzymatic Composting (EC) using Industrial Enzymes

2018 - Traditional Enzymatic Composting

2019 - Whey Inoculant Innovation

2021 - Promotion of Environmental Activism through Research, SDG-driven activities and Formulation of Binary Thinking in Waste Education 2021 - Development of SPEC: Solar Powered Enzymatic Composting Bioreactor and Plastic Waste Management Schemes

2022 to present - **A**dvancing **B**inary Thinking-WE and **C**arbon Farming via SPEC: Solar-Powered Enzymatic Composting **(ABC via SPEC)**

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5. Activities (strategies/activities of implementation, and brief information of each activity)

ABC via SPEC innovatively promotes Binary Thinking in Waste Education of South Hill School. It is integrated comprehensively into the school environmental science curriculum, targeting students of all ages to foster a deep understanding of waste classification specifically focusing on differentiating between compostable and non-compostable materials. This environmental education system is designed to instill a strong sense of environmental consciousness, cultivate a good grasp of the science of renewable energy and inculcate responsible waste management practices among all South Hillians.

- I. Environmental Education Approaches
 - A. In-class Earth Preservation Discussions, Binary Thinking Indoctrination (Binary Thinking in Waste Education Paradigm Shift TALKS) and Environmental Protection Learning Activities
 - 1. Composting Science Forum/ Information Campaign
 - 2. Plastic Management Forum/ Info Camp
 - B. School-wide Environmental Education for Sustainability (Zero Waste Management Seminar and Facility-building)
 - C. Science Class and Field Trips on Renewable Energy
 - 1. Focus on Renewable Science
 - 2. Field Trips
 - a. Makban Geothermal Power Plant
 - b. Bangui Windmills in Ilocos Norte, Windmill-powered Irrigation System Gourmet Farms
 - c. Solar Power Enterprise Technologies
 - D. Socio-scientific Talks Promoting Environmental Activism, Student Agency and Scientific Argumentation
- II. Youth-led Zero-waste Program heavily subscribes to the principles of Circular Economy
- A. Compostable STEM students developed a Solar Powered Intelligent Bioreactor System that accelerated the composting process using Industrial Enzymes and Whey additive
 - 1. Youth-led Promotion of Carbon Farming
 - a.School level
 - b. Household Herb, Food and Ornamental
 - c. Local Barangay Farmers in Putho-Tuntungin Los Banos Laguna
 - d. International South Korea Bucheon Youth Center and
 - Singapore Secondary Schools
 - Carbon Farming and its Promotion via Social Media
 - a. Planting b. Composting
 - B. Non-Compostable STEM students facilitate the conversion of Plastic Wastes into Base ten Blocks Manipulatives for Primary Math Education via a Greener Plastic Injection Molding Process.
- III. Institutionalizing SDG-driven Local and International Cooperation and Partnerships
 - Conferences and Linkages Singapore Secondary Schools, Southeast Asian Youth
 - 1. Youth led talks school level (Sci TALKS environmental activism)
 - 2. Conferences South Hill students participated as special guest International Speakers
 - a. Secondary Schools in Singapore (Student Speakers on Enzymatic Composting : Kyla Banaag, Althea Angela Pablo and Manuel Rosal)
 b. ASEAN Youth Summit: (Environmental Protection Plenary Speakers: Kyla Banaag, Wyztan Amante and Sophia Bermudez)
 - Student Exchange Collaborative Projects Korea (San UL Lin Bucheon Youth Center), Singapore (Kranji Secondary School), SEF- UN-United States

6. Teaching and learning approaches/strategies that the school has integrated into the programme

- I. Science Classes K-12
 - A. Environment-Connectedness B. Renewable Energy
- II. Education for Sustainability special classes where students are given the opportunities to design innovative solutions
 - A. Advocating/fundraising B. Discrepant/Socio-scientific Systems Thinking /Campaign-building Talks Collaborative Youth Partnerships: Virtual and Face to Face Carbon Farming Collaborations
- III. Collaborative Youth Partnerships: Virtual and Face to Face Carbon Farming Collaborations
 IV. Other Creative Mechanisms: Interactive Digital Info Campaign, Soil Health Station Nature Walk, Plant Identification Field Study
- V. Carbon Farming Practices promoting carbon farming is essential for mitigating climate change and sequestering carbon dioxide from the atmosphere. Each carbon farming approach and combining multiple strategies create synergistic effects and enhance the overall carbon sequestration potential of a landscape.

A. *Carbon Farming – Planting:* Organizing carbon farming via planting, promoting the use of composts to everyone, with local farmers, organizations, and individuals interested in the adoption of regenerative agricultural practices that enhance carbon sequestration. Recognition is given to those who demonstrate the most innovative and successful carbon farming techniques.

B. *Carbon Farming Education and Workshops in school and community:* Conducting workshops and training programs to educate South Hillians, community members, farmers and agricultural communities about the benefits of carbon farming and how to implement these practices effectively, empowering them with knowledge and resources to adopt regenerative methods.

C. Carbon Farming Demonstration - Establishing carbon farming demonstration sites on public and private lands. These sites can serve as living examples of successful carbon farming practices, inspiring others to replicate them and showcasing the positive impact on the environment.

D. *Community Engagement:* Engaging local communities in carbon farming initiatives by raising awareness about the importance of sustainable agriculture and its positive impacts on the environment. Encouraging participation and support from community members to foster a sense of ownership and responsibility for these efforts.

E. Promoting Agroforestry Greener Principles: Encouraging the community to plant trees and perennial crops in combination with traditional agricultural practices emphasizing that trees capture and store carbon, while their root systems contribute to improved soil structure and carbon sequestration. Promoting the following to farmers via Social Media Campaign: Cover Cropping: Planting cover crops, such as legumes and grasses. Cover crops add organic matter to the soil, prevent erosion, and enhance carbon storage. No-Till Farming: Reducing or eliminating tillage practices, which disturb the soil and release carbon into the atmosphere. No-till farming helps retain soil carbon and improves soil health. F. Composting and Mulching: Composting organic waste and using mulch on ands can increase soil carbon levels. These practices also improve soil moisture retention and nutrient availability.

7. Engagement with the community and sharing of school practices to the community

South Hill is involved in collaborating with other institutions in implementing the program and in continued coordination with the local government officials, environmental experts and leaders, barangay chairs and the whole community.

The technological aspect of the program is in direct consultation with agricultural engineers, agriculturalists, biotechnologists and field-scientists to verify that the concepts and processes applied are in accordance to the standards of the in-field professionals.

The following are the main subprograms of ABC via SPEC that are for the community: 1. Collaboration with Putho-Tuntungin local (barangay), 2. Carbon Farming Volunteer Program, 3. Conference/Seminars on Enzymatic Composting and Carbon Farming 4. International Partnerships (ASEAN Youth, Kranji Secondary School and Bucheon Youth Center, South Korea). SHSI also seeks help from media platforms such as networks and social media to promote the importance and benefits of carbon farming via enzymatic composting in creating self-sufficient citizens and food-secure communities.

ABC via SPEC aims to make the local communities not only actively participate in the social enterprise but to stay committed in doing this project for a long time. This will give the barangays an opportunity to involve everyone in the community to deeply connect and stay pledged to sustainability.

Enzymatic composting mainly helps the soil in holding or sequestering carbon dioxide. In addition to emission reductions, compost replenishes exhausted farm soils by replacing trace minerals and organic material, reduces soil erosion and helps prevent storm water run-off. Enzymatic composting is one recycling process that effectively reduces greenhouse gases and helps mitigate climate change. As shared with communities, small and medium enterprises, this enzymatic composting technology is a profitable endeavor. The program has value for money and is sustainable for it will eventually pay for itself. This program further aims to inspire and reach urban and rural communities where the most solid waste is created (urban) and where compost products have a market niche (rural) to foster a win-win relationship between the two communities.

Tapping public and private institutions, the project is in the process of engaging the stakeholders of solid waste management at the grassroots level. The young peoples' engagement in the community ensures sustained efforts towards change behavior in the community as students grow up to be community leaders. The young generation will come to see the impact of solid waste on climate and land pollution and they will also perceive that the means to drive a change in direction against the declining status of landfill management is within their capacities. Thus far, solid waste management is brushed off as a service that a government must perform for its people. It is therefore an improvement to education quality when communities and future leaders are enabled to not only correct solid waste management practices but also to save and to profit from it through higher agricultural productivity. Most importantly, the young people are able to apply their innovation power to advance new technological solutions and sustainable actions facilitating the uptake of renewables, energy efficiency and clean greener solutions.

8. Monitoring and evaluation mechanisms

A comprehensive monitoring framework was developed to keep track of the environmental and socioeconomic outcomes of the program, including the following: (1) carbon sequestration, (2) soil health, (3) agricultural productivity, and (4) overall engagement of the community. All data collected are assessed and analyzed as an evaluation of the effectiveness of the program. Moreover, this provides aid in identifying the challenges faced during the implementation and in making necessary adjustments to maximize the impact of the program.

The Environmental Monitoring Scheme of the program has the following three mechanisms: (1) Management Performance Indicators (MPI)-covering budgetary requirements, percentage component mechanisms target achieved, number of complaints from the public and community members and percentage of participation level; (2) Operational Performance Indicator (OPI)-on compost yield and quality and corresponding equivalent decrease in carbon emissions, number of manipulative materials produced, number of volunteers participating in composting, carbon farming and all other subprograms; and (3)Environmental Conditions Indicators (ECI)-school wide and community audit of program practices' environmental impacts. Other Monitoring and Evaluation Mechanisms; 1) Enzymatic Composting -Technical evaluation of quality, yield percentage and pathogen analysis of compost product with UPLB Biotech and 2) Plastic Injection Molding Process - Production of Base-ten blocks with DOST MIRDC. 3) ABC via SPEC Fb page –on reach, likes and share 4) Commitment to carbon farming - annual monitoring and monthly assessment.

9. Measurable achievement of the school's programme to students, teachers, parents, and wider community

The entire school populace actively participates in ABC via SPEC, each significantly contributes to the success of meeting the objectives of the program. Since 2014, South Hill School, Incorporated is known in the community as a school that fosters a deep connection with the environment by repurposing solid wastes through numerous programs in enzymatic composting and sustainable farming. South Hill won numerous distinctions for its exemplary contributions on enzymatic composting and innovative farming. This includes awards from the Government of Canada and the Philippine Department of Science and Technology Young Innovator's Program. As a social enterprise addressing agricultural challenges and food insecurity, the innovative enzymatic composting technology developed by the students has been given relevant distinctions by a number of local and global institutions.

Led by the students, ABC via SPEC, is a community-scale carbon farming program which includes training students, farmers, and volunteers through workshops and seminars. The project is creating smart solar-powered enzymatic composting bioreactors, a post-harvest facility for compost product handling and a carbon farming scheme which restore degraded soils, enhance crop production and even mitigate adverse effects of climate change. The quality nutritious produce is being given back to the school community, trained farmers and residents, ensuring food availability and accessibility. Carbon farming is cyclical in promoting stability of food security in the community.

The program is embedded in the school curriculum as a zero-waste scheme of turning one's trash into everyone's treasure. This ensures the programs wide reach of creating a self-sufficient youth and environmentally-aware citizens that will work together to enhance food security and address malnutrition in the community. The SHSI students are trained agriculturalists and are driven to impart relevant skills and knowledge on carbon farming and enzymatic-composting-based agriculture to other students and the rest of the entire community. This action in itself is envisioned that they will be able to help alleviate malnutrition through a long-term approach of repurposing wastes for sustainable carbon farming education to youth, farmers, and volunteers.

Reducing the composting time from three months to 16 days, this youth-led program addresses malnutrition and food security by bringing out the farmer in everyone. Such technique of redefining trash as things of value, brings awareness that there is no such thing as trash. The program is innovative since it works on the premise that another person's trash is another person's treasure. It seeks to make everyone a stakeholder: everyone's trash is everyone's treasure. It invests in the participation of all citizens to guarantee sustainability of good practices. The project positions itself as profitable to engage communities to support, practice and sustain the technology. The program seriously takes its goal of inculcating among community members the core environmental values in different community-service endeavors related to environmental preservation, such as cyclical carbon farming and enzymatic composting-based agriculture.

The program is one with the government in responding to the call for action to reduce waste, reverse the cycle of pollution and help in reducing its toxic impact on human health and ecology. The program was created as well to promote volunteerism and to train everyone to become selfless global citizens – stewards of Going Green, and protector of the environment.

10. Plan for future

The main end goal of ABC via SPEC is to reach Zero Waste. Hence, as plan for future, it is essential that WE work together in developing a Zero Waste Community.

To build this community, we are to leverage leading concepts in lighter foot print, circular economy, local production, greener buildings and renewable energy. So how do we get there? Here are our priority actions in the future:

- 1. Build, build, build a farm of Solar-Powered Enzymatic Composting Bioreactors.
- 2. Sustain, expand and nurture the 'reach' of the program, locally and internationally,

through stronger partnerships and collaborations.

3. Continue the research and development aspect of the program, both on the compostable and non-compostable streams. We also intend to accelerate the adoption of carbon farming practices, continue fostering a culture of sustainability, and contribute significantly to the global efforts to combat climate change by implementing these creative approaches:

4. Carbon Farming Apps and Technology: Develop smartphone apps and digital tools that assist farmers in tracking and optimizing their carbon farming efforts. These apps could provide real-time data on soil health, carbon sequestration rates, and best practices for enhancing sustainability.

5. Art and Media Campaigns: Launch art exhibitions, documentaries, and media campaigns that raise awareness about the importance of carbon farming and its potential to combat climate change. Use creative storytelling to connect with a broader audience.

6. Carbon Farming Eco-Tourism: Promote eco-tourism programs that allow visitors to experience carbon farming practices firsthand. This could include farm stays, guided tours, and immersive experiences that showcase the positive environmental impact of carbon farming.

7. Research and Development: Investing in research and development to improve carbon farming methods and technologies. Encouraging innovation in areas such as cover cropping, agroforestry, rotational grazing, and no-till farming thereby enhancing carbon sequestration potential and overall agricultural productivity.

8. Policy Support: Advocating for policies that support and prioritize carbon farming. This may include incentives, regulations, and funding that promote sustainable agriculture and incentivize carbon sequestration efforts.

9. Financial Literacy for Farmers: Provide financial literacy training for farmers to help them understand the economic benefits and long-term value of carbon farming. Demonstrating the potential financial returns can incentivize greater adoption of sustainable practices.

10. Scaling up Best Practices: Identify and promote successful carbon farming case studies and best practices. Sharing success stories and providing practical guidance can inspire other farmers and community members to implement similar strategies on their land.

11. Soil Carbon Monitoring: Regularly monitoring soil carbon levels to assess the effectiveness of carbon farming practices and make informed adjustments as needed.

ABC via SPEC developed two new and important technological systems: 1. Solar-powered Enzymatic Composting bioreactor and 2. Process of transforming plastic waste into educational tools via plastic injection molding. In relation to this, the following steps will be taken:

12. Technology Transfer- the learnings will be shared to other local schools and institutions.

13. Create and build social enterprises to promote the technologies expansively.

11. Interrelationship of the school's programme with other Sustainable Development Goals

The ABC via SPEC program is closely linked with other SDGs such as 2, 3, 4,7,11,12,13, 15and 17. At the core of the program is the enzymatic composting which restores the natural, healthy, life-giving characteristic of the soil. As we share this technology with the community, it makes food growing more robust without harming the environment and even provides mechanisms that help diminish the impacts of climate change. As we use enzymatic compost in planting, we are making our community safe, and sustainable. The transformation of plastic wastes into mathematical manipulatives facilitates circular economy, mitigation of climate crises challenges. Overarching these efforts is educating our students and community on the difference our local efforts are making on mitigating our global problems.

SD Goal 2: The heart of the program, enzymatic composting, facilitates an innovative sustainable farming practice that produces high percentage yield nutrient-rich compost that has been proven to be an effective organic fertilizer resulting to a highly remarkable agricultural yield. Thus, the innovative acceleration of composting via the enzymatic process facilitates the attainment of food security.

SD Goal 3: The program aims to build a nurseries and plant as many herbs, food crops, ornamentals and trees that essentially helps in building a cleaner and greener environment and in promoting Going Green.

SD Goal 4: The program facilitates the production of math manipulatives aiming to level up the mathematical skills by providing access to such innovative educational tools to every young learner.

SD Goal 7: The program promotes the utilization of renewable energy sources such as the main feature of the Automated Intelligent Solar Powered Enzymatic Composting SPEC Bioreactor, the solar panel system.

SD Goal 11: The program serves as a catalyst in mobilizing communities in facing various forms of environmental challenges in managing rapid urbanization—from ensuring good air quality to confronting the environmental impact of municipal congestion with significantly reduced vulnerability to risks.

SD Goal 12: The program facilitates the production of math manipulatives aiming to level up the mathematical skills of every young learner.

SD Goal 13: The good practice of enzymatic composting minimizes greenhouse gas emissions and the use of compost provides numerous greenhouse gas benefits both directly through sustained excellent soil health, reduced soil loss, increased water infiltration and storage.

SD Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss. Thus, widely practicing enzymatic composting would result to a return of nutrient back to the soil consequently yielding a highly productive land. In its small way, ABC via SPEC would contribute greatly in managing forests. It aims to contribute greatly in promoting sustainable agriculture, reforestation, sustainable harvest and trade.

SD Goal 17: The program facilitates the merging of international collaborations and partnership between and among the youth, experts, and community leaders

This project shall inspire more sustainable actions within the school and the local community by equipping them with knowledge about the project's composting process, climate action, and innovative farming. As the program educates the citizens of Los Baños about enzymatic composting and the preservation of carbon, this shall create self-sufficient individuals that are able to produce their own food for consumption. Additionally, the whole community will be more mindful on the use of plastic and will develop greater awareness on its effects to the environment. Moreover, this program shall spark movement within the community and raise awareness regarding pressing environmental issues and the need for collective action towards its mitigation, which shall pave the way to the community's prosperity, social harmony, and sustainability.

Link(s) to the information of school's programme in social media Facebook www.facebook.com/profile.php?id=61550367953877

7 Youtube https://youtu.be/NjzFGuFR_Mq

12. Photos related to the activity/programme



SPEC: Solar-Powered Enzymatic Composting Bioreactor designed, fabricated and optimized by young South Hillian Innovators



Using Solar Energy as an alternative to energy-requiring centrifugation process in drying pre-cleaned plastic waste





International Partnership in Advancing Carbon Farming via Composting



ABC via SPEC: Everyone's Trash is Everyone's Treasure