

The Practices of Education for Sustainable Development in National Taiwan Normal University

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ABSTRACT

Education for sustainable development (ESD) has been a research focus of the Graduate Institute of Environmental Education in National Taiwan Normal University (NTNU). The implementation of ESD in NTNU can be classified into three directions: conducting researches on ESD, offering general courses of ESD, and carrying out the Sustainable Campus Program to transform a old administration building into a learning center for ESD.

Key words: Education for Sustainable Development (ESD), Sustainable campus Program

Introduction

The Graduate Institute of Environmental Education (GIEE) of National Taiwan Normal University (NTNU) was the first established research institute for environmental education in Taiwan. Although five more EE research institutes have been set up since then, NTNU has always been a leading role in the development of EE in Taiwan. Recently, NTNU was funded by Ministry of Education and Ministry of Interior to build up a learning center of Education for Sustainable development to demonstrate both education innovations and infrastructure renovations of sustainable development in a university campus. The education innovation highlights developing teaching modules, teacher training workshops, and conducting research works for the sustainable campus program; the infrastructure renovations consist of green roof, constructed wetland, alternative energy equipment, and composts.

Conducting research on Education for Sustainable Development

A research team has been made up of researchers from the fields of social studies, geography, biology, health, and environmental education of NTNU to study the contents of ESD of national curriculum framework for primary and junior high schools and to investigate school teachers' understanding of and attitudes toward the concept of sustainable development. Based on these findings, a further study on teachers' skills and appropriate instruction strategies for ESD were proceeded, and then ESD teaching modules for junior high schools were developed and taught in schools by the way of action research to examine the teaching and learning of ESD in real education settings. A study on ESD for high schools has been launched soon after the previous research was finished. This research team intends to establish a comprehensive academic understanding of and application for ESD in Taiwan. Currently, the rational, educational goals, core concepts, instructional methods, curriculum designs, and working sheets of ESD for grade 1 to grade 9 has been developed.

Conducting research on Environmental Education Indicators for governmental sectors

Been an important role of improving EE in Taiwan, the GIEE in NTNU has a responsibility to push government forward. Therefore, a study on developing a set of Environmental Education Indicators to assess the government sectors' achievement on implementing EE in Taiwan has been implemented. Content analysis of national reports, interviews with coordinators of EE in governmental sectors, and surveys on EE researchers and educators were conducted to select and determine 11 EE indicators.

This study has gone through the process of conceptualizing, selecting, and giving operational definitions of environmental education indicators. Its research design includes two stages: the first is to apply document analysis, and interviews to develop the detailed components, evaluation criteria, data collection, and evaluation strategies; and the major focus of the second stage is to use Delphi techniques and questionnaire survey to confirm the validity and reliability of the indicators developed in the first stage.

The result suggests the national EE indicator system could consist of three categories: input, process, and output categories. The input indicators include human resources, material resources, and EE offices. The process category has the indicators of governmental operation, education and training, media & teaching materials, propaganda, research and international cooperation, and awards for EE. The output category contains the indicators of environmental literacy and environmental actions.

The Sustainable Campus Program in NTNU

"Taiwan Sustainable Campus Program", calling for a physical renovation and utility operation of campuses to demonstrate the concept, and meet the requirement, of sustainable development, is now officially a component project in Taiwan Government's "Challenge 2008-National Development Plan". In essence, the Program had aimed to ensure that the future campus, regardless of the scales in size, should, at least, be one that:

- can be participated by all members of interest during the design, construction, and future operation
- has ecological concerns during the construction and operation afterwards
- can respond to the changing needs in future curriculum consisting a wide array of activities
- can serve as a community center for life-long learning, culture-preservation, and shelters during emergency

Having been a leading role and consulting center of Sustainable Campus Program, NTNU decided to create a platform for first-hand teaching and learning experience for sustainability in its campus. A series of efforts have been launched to convert an old administration building and the adjacent school garden into a Sustainable Campus (SC) of NTNU. The major efforts include:

Rainwater Harvesting and Black Water Treatment and Recycling System (reducing drastically the amount of water used from the city water supplying system)

- a. **Constructed Wetland:** treating black water (sewerage) first by the septic tank and followed by a special designed constructed wetland, and the treated water was later used for watering the whole garden.
- b. **Rainwater Harvesting System:** collect the rainwater from the administration building and reuse it for the toilet flushing.

Increasing the Campus Biodiversity

- c. **Increasing and Diversifying the Surrounding Habitat:** establishing constructed wetland and aquatic pond, and the treated water then generated more terrestrial and aquatic habitat to attract more flora and fauna.
- d. **Green Roof (Rooftop Garden) System:** creating a vegetable garden at rooftop to demonstrate the methods of organic farming and the link with urban life while also reduce the building's consumption of electricity for air-conditioning during summer.

Energy Conservation System

- e. **Install Solar Voltaic Panel and Solar Hot-water System** on rooftop to generate electricity and hot water for the building and saving the energy consumption.
- f. **Design and Installed Special-designed Sun-shelf,** block the direct sunlight and reflect natural light into the rooms of the building, decreasing indoor' s lighting energy demand.

Environmental Education and Interpretation System

- g. Open up the facilities to NTNU faculties cross all disciplines as the **platform** for their course teaching for demonstrating the possible ways of sustainable living.
- h. Developed and installed **interpretive media** (including 8 pieces of interpretive panels, one self-guided trail brochure, and a poster) for both the public and school users to improve the university and neighboring community's insight and interest on the site.
- i. An **educational packet** including 4 well designed **ESD teaching modules** by using the sustainable campus site as the base for teaching were developed for enhancing the ESD for students of the primary school level.

Offering ESD General Education Course

To promote university students' awareness of sustainable development, several general courses of environmental education have been offered. A well known course ("Environmental Ethics and Sustainable development") directly related to the concept of sustainable develop has been taught for the past four years. This course always attracts 70-80 students every semester, and hires several teaching assistants to facilitate students learning. The expense of hiring teaching assistants is funded by the Ministry of Education to encourage offering ESD general course.

A curriculum framework of sustainable development for college general education was developed as follows:

Goals for college sustainable development education

- Educating students to be aware of and care about local and world environmental, social, and developmental issues.
- Offering learning opportunities for students to learn awareness, knowledge, values, skills, and action experiences for sustainable development.
- Developing a sustainable development behavior model for individuals and society.

Core concepts of college sustainable development education

- **Environmental ethic:** the meaning of sustainable development, the development of the concepts of environmental conservation and sustainable development, the relationships between people and environment, the relationships among environment, society, and economics under sustainable development.
- **Sustainable environment:** environmental changes, local and world environmental problems, the influences of environmental issues on human daily life, the development of local and world environmental conservation.
- **Sustainable economics:** the changes and development of economical structures, the limitation of natural resources, the energy utilization and economical development, the economical development

and life quality.

- Sustainable society: the changes and development of societal structures, social issues such as poverty, gender, education, aboriginal people..., the development of city and rural areas, world responsibility.

Conclusion

Substantial changes result in phenomenal progress. Both educational innovations (research work and general education) and infrastructure renovations (green roof, wetland, wind and solar power...) have improved teachers and students awareness of, attitudes toward and even participation in the endeavor of ESD. Offering undergraduate courses on sustainable development, developing teaching materials for sustainable development at K-9 level, conducting ESD workshops for elementary and secondary teachers, networking with local NGOs on issues and activities related to sustainable development, and managing educational facilities for demonstration of energy and water conservation, wastewater treatment by man-made wetland, and organic farming on rooftop for students and community will be regular works of NTNU. The university sets her goal to be a sustainable university.