



# Perspective of Environmental Education in Taiwan: Current Status of Implementation



## ABSTRACT

*Environmental education is becoming an essential subject as the environment changes rapidly with human activities. To protect the environment, several countries implemented environmental education acts. Taiwan is the sixth country in the world that implemented an act for environmental protection and sustainability. This study reports the 20-year journey of development and the pioneer status of environmental education act into practice. The Ministry of Education of Taiwan and Environmental Protection Agency jointly proposed the environmental education programme in 1992 to create awareness the on environment protection and develop knowledge, attitudes, skills and values necessary for improving the environment. The Environmental Protection Agency is responsible for accrediting qualified environmental education institutions to handle environmental education personnel training, curriculum plan and management, provide professional service of environmental education with rich ecology, etc. During 2011 to 2019, 200 students in 17 cities were issued environmental education certificates and became qualified environmental education personnel. The number of environmental education personnel in Taiwan has increased every year after the implementation of the Environmental Education Law. This study also provides suggestions of integrating environmental education into the school curriculum and the establishment of corporate social responsibility towards environmental education.*

**Key words:** *Environmental Education Act, Taiwan, integrated curriculum, Environmental Protection Agency, training*

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## INTRODUCTION

The major changes occurring in nature and human life on earth are due to global warming, which results in a rapid environmental and ecosystem changes (Cutting and Cook 2009). Environmental and ecological changes are not merely environmental issues; they are part of the relationship between, and interdependence of, the environment and human survival. Therefore, full attention of the public to environmental problems using the objectives and methods of education must be drawn. The public must move from passively solving problems after incidents occur in establishing positive ideas, rules, and regulations to ensure that preventive measures and solid activities are implemented, and correct environmental values are developed. As technology and knowledge constantly progress and improve, the influence that humans exert on the environment and the change that they cause create new problems. Therefore, environmental education (EE) is important for citizens' cognitive skills because it ensures that they can take initiative in protecting the environment, be responsible for the environment using solid actions and become members of the global village

of sustainable development. In their promotion of environmental education, schools, institutions, and government departments in Taiwan have developed a variety of regulations and penalties, and hope to encourage citizens to actively participate and practice sustainable development using encouragement and regulations (EPA 2007). This study therefore investigates the 20-year efforts of developing Environmental Education Act (EEA), background, structure, content including the process of developing regulations, the content and status of the implementation, and achievements of environmental education in Taiwan.

## MATERIALS AND METHODS

This study explored the effectiveness of the implementation of environmental education in Taiwan and other countries such as United States of America (USA), Japan, Brazil and South Korea. The data collected from environmental protection department and relevant government agencies. Based on data analysis, this study

proposed some amendments for future implementation of EEA of Taiwan.

## RESULTS AND DISCUSSION

### History of Environmental Education

Environmental education (EE) is the process of exploring the awareness of environmental issues to the public, individuals or communities, and providing deeper knowledge in understanding current global environmental problems (*USEPA 1990*), awareness of the solutions to these problems and inspiration to solve these issues. EE is an emerging field, although it has been around for more than forty years. EE receives significant attention from the public, media and political legislation based on the notions of environment and sustainability. According to *Martin (1975)* 'Environmental education is a process of recognizing values and clarifying concepts in order to develop the skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture, and his biophysical surroundings. EE also entails practice in decision-making and self-formulating of a code of behavior about issues concerning environmental quality'. According to *Kline (2007)*, focus on the environment begun years after World War II. The concept of EE can be traced back at the International Union for the Conservation of Nature (IUCN) Conference in Fontainebleau, Paris, France in October of 1948 (*Disinger 1985*). A major turning point occurred globally in 1972 at the first United Nations Conference on the Human Environment held in Stockholm, Sweden (*Disinger 1985*). The 'Stockholm Declaration of 19' specifically calls for "education in environmental matters, for the younger generation as well as adults" (*UNEP 1972*). After the Stockholm conference, two subsequent events, namely the International Workshop on Environmental Education, held in Belgrade, Yugoslavia in October of 1976 (known as The Belgrade Charter) (*UNESCO-UNEP 1976*) and the first Intergovernmental Conference on Environmental Education held in Tbilisi, Georgia, USSR in October of 1977, become influential for the development of environmental education on global platform (*UNESCO 1977*). The Belgrade Charter describes the goals, objectives, and guiding principles of EE includes the definition of EE (*UNESCO-UNEP 1976*). The intergovernmental conference in Tbilisi brought a declaration that students should be actively involved at all levels in working toward the resolution of environmental problems (*Tbilisi declaration 1977*). The context for environmental education is concern for the quality of the total environment: natural and built technological and social (economic, political, technological, cultural,

historical, moral, aesthetic) and to create new patterns of behavior of individuals, groups and society as a whole towards the environment (*Tbilisi declaration 1977*). Over the years, researchers from all over the globe introduced several disciplines to EE such as sociology, psychology, curriculum studies, environment, natural sciences and social sciences. Favorable conditions for EE were raised through several educational movements such as the nature study movement in 1900, outdoor education movement in 1920, conservation education movement in 1930, ecology education in 1950 and the education for sustainable development movement in 1990. The Tbilisi Declaration from UNESCO-UNEP intergovernmental conference formalized the EE field in many ways. As a result, the United Nations Conference on Environment and Development (UNCED) held at Rio de Janeiro, Brazil in June 1992 made a proposal of 'Promoting education, public awareness and training' in agenda 21 (*UNCED 1992*). However there is a shift in terminology from environmental education to education for sustainable development and conferences were held on this at Johannesburg, South Africa and Bonn, Germany in 2002 and 2009 (*Gough 2013*). To integrate the concept of sustainable development in the education processes and achieve sustainable development, it is necessary to change people's ecological, economic and social perceptions.

**Environmental Education Act in USA.** In 1970, the National Science Teachers Association conducted a study and proposed the need of EE programme in the curriculum (*National Science Teachers Association 1970*). In October 1970, the Environmental Education Act become law and established the Office of Environmental Education for the implementation of EEA for 10 years. Later in 1971, the National Association for Environmental Education was formed and renamed as the North American Association for Environmental Education (*Disinger 2001*). Meanwhile, the Journal of Environmental Education started publishing EE materials in 1969 and indicated the necessity of EE (*Stapp et al. 1969*). The Council on Environmental Education (CEE), was formed and developed EE curriculum materials (*Carter 2006*).

The National Environmental Education Act was redeveloped in 1990 under the environmental protection agency (EPA) in order to provide and promote environmental literacy. Subsequently, the EPA established the office of environmental education to implement this programme. Initially, the North American Association for Environmental Education (NAAEE) developed standards for EE (*Simmons 1995*) and later it

became the National Project for Excellence in Environmental Education which provides guidelines for the development and assessment of EE materials and student knowledge on environmental topics (*Carter and Simmons 2010*).

**Environmental Education Act in Japan.** The Central Environment Council proposed legislation in 1999 and the Senate passed the “Act on the Promotion of Environmental Conservation Activities through Environmental Education” in 2003. In Japan, the importance of environmental education was recognized by educators, researchers and policy makers in 1980 (*Chowdhury 2011*), as the environmental problems and conservation issues were globally acknowledged although the environmental education originated in 1960. To create environmental awareness, the Japanese Society of Environmental Education was established in 1990 and conducted several programmes on environmental education with the help of environmental NGOs. Later in 1991, The Ministry of Education, Science, Sports and Culture established a guideline to introduce environmental education in schools throughout the country. “Life environment studies” is a new subject introduced in schools under Environmental education, and teacher-training colleges and research centers for environmental education have been created. The Basic Environment Act, endorsed in 1993 and the law of Environmental Conservation and Environmental Education was enacted in 2003 to promote environmental education (*JSEE 2005*).

**Environmental Education Act in South Korea.** After the World War II, South Korea made significant progress and rapid development in science, education, industry, economy, and technology. During the progress of industrialization and economy, Korea has not focused much on environmental pollution until the beginning of the 1970s. As pollution became serious, Korea started putting efforts to protect the environment (*Park et al. 2003*). Though Korea started the Environmental Protection Charter in 1978, the environmental awareness was limited to a few communities until the mid-1980s. To increase public awareness of environmental issues, the Korean government recognized the importance of environmental education and introduced the EE policy in their national curriculum in 1982. Consequently, the Ministry of Education in South Korea described the EE as one of their contemporary required fields in the 5th National Curriculum in 1987, followed by integration of EE with other subjects in the 4th and 5th national curriculum in 1992 and 1998, respectively. In 1973, the Seoul National University was the first educational institution to establish a

graduate school of environment, and other universities followed in the subsequent years. The Korean Educational Development Institute (KEDI), established in 1972, aimed to conduct research on public education and began research for developing the curriculum of environmental education in 1979 (*Shin 2008*). KEDI conducted several EE programmes along with the Ministry of Education, Ministry of Environment and other private social service organizations. The Ministry of the Environment proposed the “Environmental Education Promotion Act” in December 2002 and passed it in 2008.

**Environmental Education Act in Brazil.** The EEA act bill in Brazil was proposed in 1993 and issued in 1999. The detailed rules and regulations for its implementation were announced in 2002.

Among the countries that implemented Environmental Education policy, United States of America was appeared as proactive in establishing EEA within a year after they recognize the importance of EE. In 1990, the EEA was redeveloped under Environmental Protection Agency as National Environmental Education Act and implemented across the country. The USA ranked as the world’s first country in establishing the EEA and influences the other developing nations in bringing the same act for a sustainable environment. Albeit, both Japan and South Korea recognize the importance of EE same time, but they took more than 20 years in implementing EEA. The basic EE Act in Japan was endorsed in 1993 and enables the Act after a decade, however South Korea implemented the act in six years after the proposal in 2002. Brazil proposed the EE in 1993, soon after the United Nations Conference on Environment and Development at Rio de Janeiro and developed the act in 1999 followed by the implementation in 2002. Although Brazil, Japan and South Korea implemented EEA 10 years later than USA, but they conducted relevant environmental education activities in schools and colleges by introducing it into their curriculum.

Taiwan is the sixth country in the world to implement the law on environmental education. After a comparative analysis of the other five countries mentioned above, its common ground is that the legislative purpose of environmental education is to take environmental education in the direction of sustainable development. The government provides funds to promote environmental education. The legislative norms are aimed at all citizens, and attach importance to the promotion of school environmental education and the cultivation of environmental education professionals. These are worthy of recognition. The difference is that

social environmental education is promoted in different ways. For example, Japan emphasizes the spontaneous participation of various subjects, while the biggest difference in Taiwan is to clearly regulate the object of 4 hours (h) of environmental education each year. In addition, in terms of environmental education places, Japan and Taiwan listed environmental education places in the bill; while Taiwan has clear regulations on funding sources, but Japan, Brazil, and South Korea have no regulations, which will have a great impact on the steady promotion of environmental education.

The aforementioned countries have established environmental education laws along with several other East Asian countries; however, Taiwan is the sixth country to pass such legislation, which manifests Taiwan's close attention to environmental education and its pioneer status in the world.

### **The History of Environmental Education Act in Taiwan**

In 1992, the Environmental Protection Agency (EPA) of the Ministry of Education of Taiwan invited experts and scholars to jointly develop the "essentials of environmental education" in hopes that the public would understand and recognize the importance of protecting the environment by means of educational procedures and methods, enhance the concept of protecting the environment using prevention, and actively improve it to generate positive effects (*Liang 2003*). At the same time, this program enables the public to attain the knowledge, attitudes, skills and values necessary for improving the environment by transforming them into practices, committing to ecological conservation and using environmental resources reasonably by adopting an interdisciplinary approach to ensure that humanity develops sustainably (*EPA 2011*).

After 20 years, environmental education policies and measures have been based on the foundation of the "essentials of environmental education," and policies and goals can be divided into four stages which are as follows:

**Stage I (from 1992 to 2002) (draft stage).** In the "five-year middle-term goals for environmental education (from July 1992 to December 1996)," the promotion of legislation on environmental education was clarified. The EPA entrusted Wenyan Qiu and others with conducting "research on the formulation of national environmental education", and the "Environmental Education Act" was drafted in 1993.

**Stage II (from 2002 to July 2004) (stagnation stage).** In stagnation stage, the EPA initiated legislation and many discussions during 2002 to 2004 with "local environmental protection authorities", "experts, scholars and civil servants" and "governmental ministries" to complete the draft. In February 10, 2004, the EPA sent the draft to the Executive Yuan for review and was told that "the EPA may need to reassess whether the Environmental Education Act needs to be legislated separately or as a special amendment of the Basic Environmental Law and to formulate a specific article that fits into the framework of life-long education to determine which is more feasible".

**Stage III (from August 2004 to April 2008) (frustration stage).** In August 2004, the EPA established an ad-hoc group to work on the Environmental Education Act and proposed a bill that was co-signed by legislators. Later, the EPA sent the draft to the Executive Yuan for review again on December 26, 2005, and it was concluded that there was no need for such legislation.

**Stage IV (from May 2008 to present) (legislation stage).** On May 20, 2008 when President Ma Ying-Jeou took office, the Environmental Education Act was listed as a legislative priority. Therefore, the EPA immediately re-initiated the legislative effort for the Environmental Education Act. Then the EPA convened the first conference on the draft of the Environmental Education Act in June 2008, and extensively solicited views from all sectors of society in the hope of formulating an environmental education law that would meet the demand of society as a whole. The EPA again submitted the draft to the Executive Yuan for review on December 8, 2008, and the Executive Yuan convened a review conference on January 5, 2009, in which the EPA first raised the issue of the necessity of legislation to the Education and Advocacy Group of the National Commission on Sustainable Development. The bill was passed during the 3144<sup>th</sup> meeting (May 14, 2009) of the Executive Yuan and mailed to the Legislative Yuan for deliberation on May 20, 2009. Later, the Legislative Yuan sent the draft to the Committee on Social Welfare, Health and Environment for review. The first reading was completed on April 28, 2010, and the second and third readings were completed on May 18, 2010. The bill was passed in the shortest possible length of time. On June 5, 2010, which was World Environment Day, the President announced the Environmental Education Act, which was to be implemented in the following year.

The above history (**Figure 1**) shows that Taiwan has become the sixth nation to issue an Environmental Education Act, which was the result of joint efforts by the



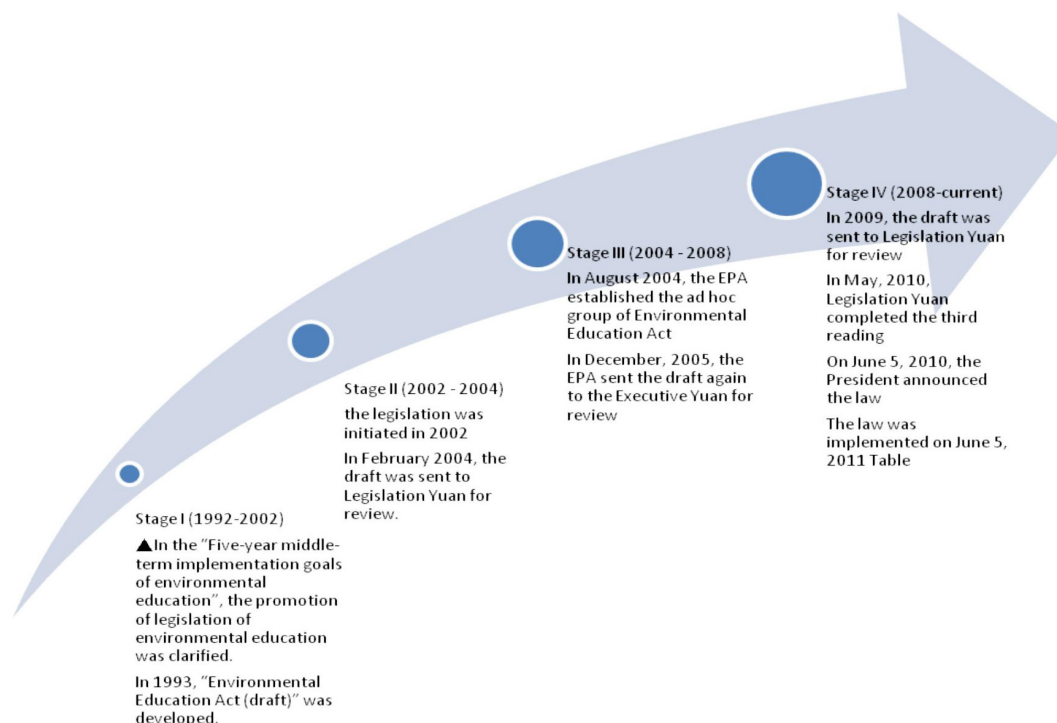


Figure 1. Development history of Environment Education Act in Taiwan .

government, legislative and environmental groups and other groups of citizens. It is important to let the public understand the importance of the environment using legislation and to cherish resources by promoting environmental education to ensure that development is ecologically sustainable.

Taiwan's Environmental Education Act is intended to promote environmental education, which will encourage the general public to understand the interdependent relationship among individuals, society and the environment. Further, it aims to enhance the environmental ethics and responsibility of the entire population to maintain an ecological balance, encourage respect for life, promote social justice, cultivate communities of environmentally aware citizens and promote environmental learning so that the country's development is sustainable. To achieve these objectives, this Act has been legislated. The Environmental Education Act consists of 26 items in six articles, for a total of 17 detailed regulations (*EPA 2011a*) (**Table 1**).

#### **Establishment of related regulations for environmental education**

To promote environmental education, the EPA has developed certain relevant regulations: management and use of environmental education funds; certification and management practices of environmental education institutions; certification and management practices of

educational facilities; detailed implementation of and regulations for environmental education; certification of and approaches to managing environmental education personnel; provisions on rewards for environmental education facilities; provisions on rewards for national environmental education.

The EPA also developed relevant administrative rules, such as: essentials of the establishment of a National Environmental Education Council, standards for time spent on the environmental lessons required, description of the standard penalties and essentials of implementing environments for the lessons required to support the implementation of the Environmental Education Act (*EPA 1999*).

#### **Certification and management of environmental education personnel, institutions and facilities.**

According to Item 10 of the Environmental Education Act, the certification practices for institutions and personnel involved in the environmental education of the central authorities and the central competent authorities are as follows:

**Environmental education institutions.** the central authorities regulate the quantification, evaluation, validity period and revocation of the certification, the standard fee for it and compliance with managerial and other practices.

Table 1. Detailed structure of Environmental Education Act in Taiwan (source: *EPA 2011a*).

	Article	Items	Content outline	Purpose
<b>Environmental Education Act</b>	Article one: principles	1-4	1. Legislative purpose 2. Competent authorities 3. Definitions 4. Objects of environmental education	Improvement of the system of institutions for environmental education
	Article two: policies on environmental education	5-7	1. Formulation of principles guiding environmental education 2. Development of national environmental education programs 3. Development of local environmental education programs	
	Article three: responsibilities of environmental education institutions	8-17	1. Funding 2. Funding uses 3. Certification of personnel, institutions and facilities and locations for environmental education 4. Responsibilities and rights of environmental education authorities 5. The Council for Environmental Education	Stabilization and strengthening of funds for environmental education and establishment of institutions for environmental education
	Article four: promotion and encouragement	18-22	1. Personnel for promoting environmental education are designated 2. All staff, teachers and students are required to participate in 4h of environmental education per year 3. Civil organizations are encouraged to use available space to establish facilities for environmental education 4. Environmental education personnel who have achieved excellence are rewarded	Promotion of environmental education for the general public
	Article five: penalties	23-24	1. Conditions and hours of environmental lessons 2. Those who are unable to attend can postpone the lessons once	Those who break the law must attend environmental lessons
	Article six: addendum	25-26	1. Detailed implementation regulations 2. To be implemented one year after issue	Full preparation for the implementation of environmental education

**Personnel in environmental education.** Personnel are certified according to their education, experience, specialty, recommendation, examination or training. The central authorities regulate the validity period, cancellation, revocation and management of such certification and other practices of compliance.

**Environmental education facilities and places.** According to Article 14, the central authorities and the central competent authorities at all levels shall integrate environmental education facilities and resources with

distinctive features, provide space or buildings to set up environmental education facilities, establish complete environmental education professional services, information and resources (*EPA 2011b*).

Environmental education institutions and environmental education personnel should be reported to the central authorities for archival purposes. Environmental education in Taiwan can be performed by qualified environmental education personnel in locations and at institutions with environmental education

curricula; they are to instruct the general public to improve public awareness of environmental protection through education.

### The implementation status of environmental education in Taiwan

According to Item 19 of the Environmental Education Act, agencies (organizations) and schools should implement environmental education programs, and the staff, teachers, and students should attend four hours environmental education by December 31 each year and complete a report. The other feature of item 19 is the selection of qualified environmental education institutions, environmental education personnel and environmental education facilities and sites by the government. These three actions play an important function in the implementation of the four-hour environmental education. The environmental education institutions and environmental education facilities and sites have to be evaluated by the competent government authorities to certify eligibility and those seeking for environmental education training must go to these centers. The government will issue certificate of environmental education personnel for those who successfully complete the training. The members of various organizations may also take any kind of activity (**Table 2**) in any designated place or facility for four-hour as required by the EEA. After certification, the personnel may also recruit through

the environmental education facility to train other people (**Figure 2**).

Since the implementation of the Environmental Education Act on June 5, 2011, various programs and activities have been designed to help the general public further perceive and understand the importance of environmental education and to arouse national awareness of environmental protection.

Statistics on the types of activities indicate that the static-type activities (courses, seminars, lecture, online learning, watching movies, etc.) are less than the dynamic-type activities (experience, internships, outdoor learning activities, participation, practice, etc.) (**Table 3**). The difference in the types of activity used in environmental education was insignificant, and it hopes that such education would provide the general public with a correct understanding and experience with environmental protection. The data further indicates that as long as the theme is environmental education and the participants are given correct directions, any form activity is doable. In the four-hour course on environment education from 2011 to 2019, it was also found that the proportion of seminars and internships over the past nine years were the least and showed no significant improvement. This data could be useful for future implementation of environmental education and enhancement of diversified course learning.

Table 2. Four hours activity of Environmental Education (source: EPA 2011a).

Type of activity	Content
Course	According to Item 19 of Environmental Education Act, the persons who participate in programs and courses that meet the goals of environmental education are referred as "environmental education participants".
Lecture	The approved lesson on an environmental topic organized for participants in environmental education programs.
Seminar	A themed discussion in which at least one party reaches a conclusion or solution.
Online learning	Gaining knowledge and information provided by educators and learners through the Internet. It is also referred as "the certification system for online learning."
Experience	Environmental education locations are provided for environmental education participants or activities that are designed for them to experience and take part in.
Internship	An actual experience or a learning process on a specific environmental issue at a certain period of time that enables the participants to understand the issue deeply.
Outdoor learning activity	An outdoor environmental education location that contain environmental education resources and facilities for learning activity.
Visit	The organizers of an environmental education program bring participants to a specific environmental education institution and facility.
Watching a movie	An appropriate movie with environmental protection and natural conservation themes is selected for the environmental education participants to watch to help them perceive the importance of environmental protection and the beauty of nature.
Practice	A facility designed by the organizers of environmental education activities at which participants learn a specific environmental skill or develop an ability, or perform an actual operation and gain experience.

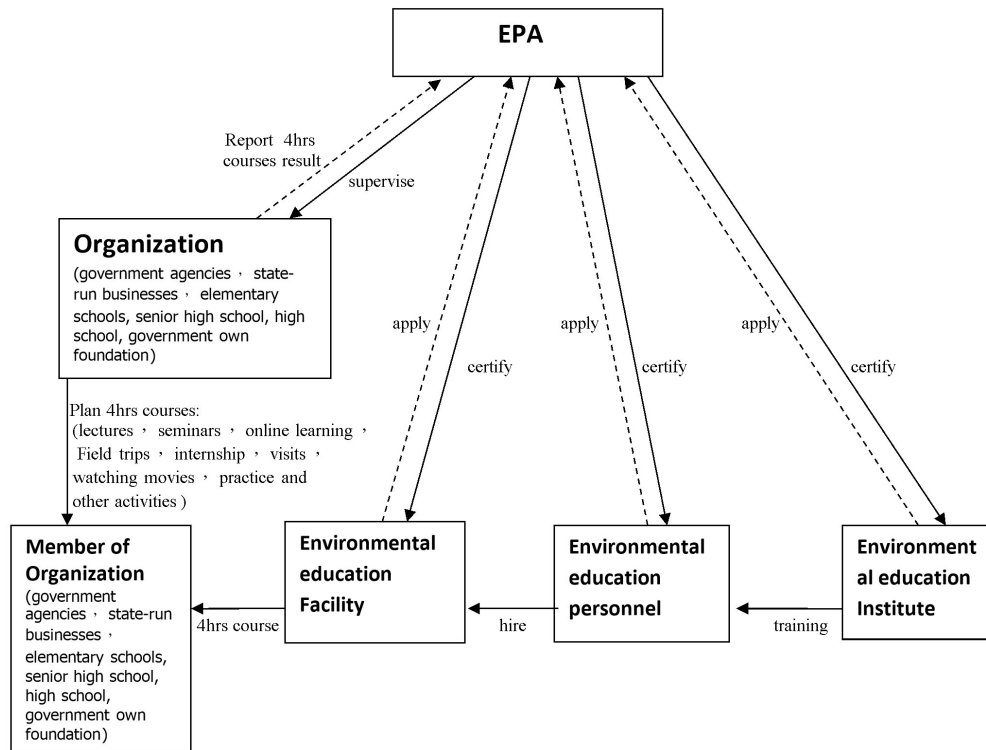


Figure 2. The procedures for implementation and certification of environmental education in Taiwan.

Table 3. Type of four-hours course conducted in Taiwan from 2011 to 2019 (source: *EPA 2011b-2019*).

Type of activities	Year								
	2011	2012	2013	2014	2015	2016	2017	2018	2019
Courses	18.00	15.10	14.91	15.00	11.79	10.72	10.82	10.08	9.52
Lecture	11.00	10.56	9.07	9.00	9.54	8.92	8.24	9.35	8.95
Seminars	1.00	0.95	0.69	1.00	0.70	0.76	0.72	0.66	0.78
Online learning	3.00	2.80	3.71	4.00	6.29	7.98	8.69	3.82	8.07
Experience	10.00	10.26	14.21	14.00	16.72	16.76	16.42	19.21	19.51
Internships	1.00	0.43	0.38	1.00	0.86	1.10	0.96	1.12	1.16
Outdoor learning activities	3.00	5.87	5.83	6.00	6.50	7.26	7.83	8.98	9.11
Visit	16.00	16.67	7.34	7.00	7.85	7.74	6.45	-	-
Watching movies	10.00	9.88	9.23	9.00	9.91	9.42	9.87	9.67	9.17
Practice	14.00	15.54	17.36	17.00	21.25	22.79	23.16	27.67	26.07
Other	13.00	3.24	17.26	1.00	8.58	6.54	6.85	9.49	7.66
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

According to the provision of Item 19 of the Environmental Education Act, agencies, public enterprises, elementary and middle schools, and corporate foundations that receive more than 50% of their funding from the government must complete an environmental education plan by January 31<sup>st</sup> every year. It introduces environmental education, and all employees, teachers and students must attend at least four hours of environmental education by December 31<sup>st</sup> annually. By the following January 31<sup>st</sup>, the achievements of the environmental education program must be reported to the central competent authorities through the online

reporting system. Regarding the certification of environmental education personnel, the municipalities (the cities of New Taipei, Taipei, Taichung, Tainan, Kaohsiung, Taoyuan) received a total of 5,040 certifications, which accounts for 60% of the certifications issued in Taiwan and indicates that they hold the majority of certifications for EPA (**Table 4**); Kinmen and Lianjiang counties, which are located in the outer islands, need to improve to bridge the gap. With respect to environmental education institutions, New Taipei City had 832 certified environmental education personnel but have only one certified environmental education institutions; hence



Table 4. Number of environmental education certificates issued at different location of Taiwan in 2019 (Source: EPA 2019).

Name of city and county		No. of certificate issued			four-hour course Completion rate (%)
		Environmental education personnel	Environmental education institutions	Environmental education facilities	
Urban area	New Taipei City	832	1	14	100
	Taipei City	813	5	21	100
	Taichung City	898	3	17	100
	Tainan City	708	3	14	100
	Kaohsiung City	1072	3	17	100
	Taoyuan City	717	3	16	100
Rural areas	Yilan County	295	1	11	100
	Hsinchu County	177	0	6	100
	Miaoli County	281	1	10	100
	Changhua County	316	2	7	100
	Nantou County	231	0	12	100
	Yunlin County	262	0	9	100
	Chiayi County	196	0	5	100
	Pingtung County	399	1	8	100
	Taitung County	88	0	6	100
	Hualien County	180	1	5	100
	Penghu County	26	0	3	100
	Keelung City	132	1	3	100
	Hsinchu City	174	1	4	100
	Chiayi City	159	1	1	100
	Kinmen County	89	0	4	100
	Lianjiang County	11	0	0	100
	Total	8051	27	192	100

efforts should be made on this. In eight counties and cities in Taiwan, there were no environmental education institutions, which need to be improved. In New Taipei city, Yunlin county, Miaoli county, Pingtung county, Hualien city, Keelung city, Hsinchu city and Chiayi city, there was only one environmental education institution each, and there were none in Hsinchu, Nantou county, Yunlin county, Chiayi county, Penghu, Kinmen and Lienchiang counties. Therefore, in terms of establishing environmental education institutions, there is still significant room for improvement.

In the four-hour environmental education course, its main core structure is the environmental education institutions, environmental education personnel and environmental education facilities and places. Therefore, since the enactment of the Environmental Education

Legislation in 2011, the Government has been actively reviewing environmental education institutions so that they can train environmental educators and carry out environmental education courses at qualified environmental education facilities and places. From 2011 to 2019, the Government actively reviewed the qualified units and personnel and a significant positive growth was indicated in environmental education personnel training start from 2011 to 2019 (**Table 5**). This trend proves that the Government of Taiwan actively promotes environmental education and further improvement through the relevant certified personnel is aimed.

Statistics reflect the number of students in elementary and middle schools per certified environmental educator, per certified environmental education location and per certified environmental education facility in 2019

Table 5. No. of environmental education certificate issued in Taiwan from 2011 to 2019 (Source: EPA 2011b-2019).

Type of activities	Year								
	2011	2012	2013	2014	2015	2016	2017	2018	2019
Environmental education institutions	0	11	16	22	25	28	29	29	29
Environmental education facilities	2	51	77	99	119	139	156	177	192
Environmental education personnel	206	951	2578	3275	4468	5403	6222	7279	8051

(Table 6); these show vast differences in the number of environmental education personnel, locations and facilities, and if the data were extended to the government and relevant affiliated entities, the inadequacy of such environmental education related issues would be highlighted.

Regarding the environmental education personnel, the number of students per qualified environmental educator was the highest in Pingtung county (763 students) and the lowest in Kinmen county (65 students). In Chiayi city, the number was 2019, and 17 counties or cities had over 200, which indicates a serious shortage of qualified environmental education personnel. This is an urgent need to train more qualified personnel using all educational channels.

With respect to environmental education facilities, the number of students per facility or location was even more discouraging. For example, there was only one facility in Chiayi city, which accommodated up to 42,705 students; the facilities in Taoyuan city and Kaohsiung city each needed to accommodate 16,000 students, and the rest of the cities or counties needed to accommodate up to tens of thousands of students, which

severely overburdened all the facilities. The problems were very serious for students in elementary and middle school, not to mention the general public.

Children in the metropolitan area have not had a better environment for environmental education, because environmental education institutions and facilities cannot keep up with such high numbers of children (for example one facility per 26,838 students in New Taipei city) (Table 6). The number of students allocated per one facility in rural county Nantou was 4,194 and the difference between these two counties was 6 times. This suggests that it is not necessarily true that living in the metropolitan area will be more favorable to learn environmental education.

In terms of the available statistics, the training of environmental education personnel in each city and county should focus on diversified channels and expand the approaches used; in addition to the personnel qualifications described in the Environmental Education Act, it is necessary to adopt other approaches to increase the number of environmental education personnel gradually. Regarding environmental education facilities, it is necessary to increase the number of facilities in each

Table 6. One certified environmental education personnel and facility per number of student at different location of Taiwan in 2019 (Source: EPA 2019).

City and county		No. of students (Elementary+ Junior high+ Senior high)	No. of environmental education personnel issued	One environmental personnel/ No. of students	No. of certified environmental education facilities	One environmental education facility / No. of students
Urban area	New Taipei City	375,734	832	1/451	14	1/26,838
	Taipei City	279,698	813	1/344	21	1/13,319
	Taichung City	329,753	898	1/367	17	1/19,397
	Tainan City	191,051	708	1/270	14	1/13,646
	Kaohsiung City	276,682	1,072	1/258	17	1/16,275
	Taoyuan City	263,996	717	1/368	16	1/16,499
Rural areas	Yilan County	50,458	295	1/171	11	1/4,587
	Hsinchu County	66,800	177	1/377	6	1/11,133
	Miaoli County	59,515	281	1/212	10	1/5,952
	Changhua County	135,957	316	1/430	7	1/19,422
	Nantou County	50,333	231	1/218	12	1/4,194
	Yunlin County	70,243	262	1/268	9	1/7,804
	Chiayi County	56,054	196	1/286	5	1/11,210
	Pingtung County	75,570	399	1/763	8	1/9,446
	Taitung County	13,234	88	1/150	6	1/2,205
	Hualien County	34,380	180	1/191	5	1/6876
	Penghu County	8,155	26	1/313	3	1/2,718
	Keelung City	27,142	132	1/206	3	1/9,047
	Hsinchu City	44,368	174	1/255	4	1/11,092
	Chiayi City	42,705	159	1/269	1	1/42,705
	Kinmen County	5,799	89	1/65	4	1/1450
	Lianjiang County	987	11	1/90	0	0
	Total	2,479,839	8,051	1/308	192	1/12,916

country and city. These facilities must be used efficiently in a diversified and cross-cutting way through original relations and transportation convenience to ensure full use and, more importantly, that the general public has easy access to environmental education facilities so that they appreciate the importance of environmental education.

Since the enactment of the Taiwan Environmental Education Law in 2011, counties and cities have conducted environmental education-related activities in accordance with the Environmental Education Law and the relevant regulations of the Environmental Protection Agency. The implementation results have been improved year by year in terms of quantity and quality. The number of environmental education institutions, environmental education places, and environmental education personnel in the six municipalities in Taiwan has grown substantially. For example, Taipei City has five environmental education institutions by 2019; the number of environmental education facilities has reached 21 from 2011 to 2019. The number of environmental education personnel has reached 813 from 146 in 2011 to 2019. New Taipei City's environmental education personnel went from 138 in 2011 to 832 in 2019. Kaohsiung's environmental education personnel went from 64 in 2011 to 1,072 in 2019. The above-mentioned counties and cities are presented in a way of substantial accountability, which shows that the local government has a very positive cooperation and makes the promotion of environmental education smoother.

Environmental education not only emphasizes environmental issues, but also allows the general public to truly understand and cherish the environment through the process of education and to take initiative, and perform concrete actions to protect the environment so that it can be recovered or preserved and can coexist with human society. The trend of environmental education development in Taiwan is described in the following sections.

### **Environmental education will be integrated into the school curriculum**

Currently, Item 19 of the Environmental Education Act makes it clear that the government departments, public enterprises, elementary and middle schools and foundations that receive more than 50% of their funding from the government must develop an environmental education plan by January 31 every year to promote environmental education, while returning employees, teachers and students must attend at least 4h of environmental education by December 31 every

year. The majority of participants only completed the mandated four hours of learning, which mostly took the form of extracurricular activities. In the future, the four or more hours of learning time should be planned and integrated into the common curriculum or textbook so that students develop a full understanding of the true meaning and value of environmental education from the perspectives of knowledge, context and understanding (Eames et al 2008).

### **An integrated system of environmental education will be promoted**

According to the provisions of the Environmental Education Act in the school system, environmental education is limited to elementary and middle schools. It does not extend to higher education, which creates a gap within the educational system. Therefore, an integrated system of environmental education from preschool through college or higher education should be developed to ensure that environmental education is provided at different stages.

### **Environmental education facilities and institutions will be expanded**

Environmental education only has been implemented for more than nine years, the facilities, institutions and personnel of environmental education largely improved. This helped the promoters of environmental education, whether they are schools or civil organizations, physical facilities or human resources, face less difficulties in implementing ideas for environmental education as concrete activities (Table 5).

### **Corporate social responsibility (CSR) will be established**

The Environmental Education Act does not explicitly provide the content of environmental education that must be used by enterprises, and there is no mandate for enterprises to implement environmental education. With respect to the environmental protection regulations, enterprises are required to comply with legal norms in the disposal of various types of waste, such as air pollution, noise and wastewater. The government needs to ensure that enterprises pay attention to their social responsibilities, implement essential environmental education and carefully view the environment and the protection of the earth as a pivotal point, so that during the production process, enterprises actively research and develop non-polluting products instead of passively complying with environmental regulations. Starting with

the immeasurable value of people and the environment, enterprises perform concrete actions and make achievements as they fulfil their responsibilities to pursue profit and protect the environment (Zhang 2000).

### **Environmental education will be promoted as education for all**

From the provision of the four-hour of environmental education in the Environmental Education Act, it is clear that the focus are mainly those who work in government departments and those who are in the educational system; specific activities in social systems and private entities are not explicitly regulated. Therefore, policies must keep pace with the Environmental Education Act; otherwise, environmental education will become merely a slogan. It should mobilize members of society to participate together, to understand the importance and necessity of environmental education, and to care for the environment and protect the earth together (Lucas 1979). The proportion of local government education funds or the penalty for violation of environmental protection laws and regulations should be increased in order to get a share from those funds for promotion of environmental education.

### **CONCLUSIONS AND RECOMMENDATIONS**

The environmental education act in Taiwan took 20 years to implement since it proposed 1992 under the policy 'essentials of environmental education'. Taiwan is the 6th country implemented EEA in the world. The EEA of Taiwan consists of 26 items in six articles, for a total of 17 detailed regulations. The certification practices for institutions and personnel involved in the EE of the central authorities and the central competent authorities are categorized as EE institutions, Personnel in EE and EE facilities and places. Four hours training of the course through various activities was designed for Government employees and primary and secondary school students to implement EE. The results indicate that the certified personnel in EE depend on location and also there is a shortage of environment education personnel. The training of EE personnel in each city and county should focus on diversified channels and expand the approaches described in the EEA in order to increase the number of EE personnel gradually. The number of EE facilities in each county and city should also increase in view of transportation convenience and easy access for effective implementation of EE. To understand completely the importance of EE, it should be incorporated in school curriculum and should also be extended to higher education aside from primary and secondary schools. The government has to establish corporate social

responsibility programme to ensure that enterprises pay attention to implement essential environmental education and protection regulations during the production process and develop non-polluting products. Since the number of EE personnel in Taiwan has increased every year after the implementation of the EE Law, each EE implementation unit must maintain a certain proportion of EE personnel to implement the EE plan successfully by utilizing the government's subsidies.

### **REFERENCES**

- Carter, R. 2006. Listening to the soloists in the choir: A study of the life experience of exemplary K-12 environmental educators. Ph.D. Dissertation. Northern Illinois University, DeKalb, Illinois.
- Carter, R.L. et al. 2010. The History and Philosophy of Environmental Education, The Inclusion of Environmental Education in Science Teacher Education, Springer Netherlands, 13 pp.
- Chowdhury, M.A. 2011. "Environmental Education in Bangladesh and Japan: A Comparative Assessment." *The Journal of Nagasaki University of Foreign Studies* 15:143-164.
- Cutting, R. and Cook, R. 2009. "The world environmental education congress 2007: A critical appraisal" *Environmental Education Research* 15(2): 177-187.
- Disinger, J.F. 2001. "K-12 education and the environment: Perspectives, expectations, and practice" *The Journal of Environmental Education* 33(1): 4 -11.
- Disinger, J.F. 1985. "What research says: Environmental education's definitional problem". *School Science and Mathematics* 85(1): 59-68.
- Eames, C., Cowie, B., and Bolstad, R. 2008. "An evaluation of characteristics of environmental education practice in New Zealand schools" *Environmental Education Research* 14(1): 35-51.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 1999. Republic of China: National Environmental Protection Program.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2007. Retrospects and Prospects for Environmental Protection in the Last 20 Years. Taipei City.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2011a. Environmental Education Act.



- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2011b. White Paper on Environmental Education in Taiwan.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2012. White Paper on Environmental Education in Taiwan.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2013. White Paper on Environmental Education in Taiwan.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2014. White Paper on Environmental Education in Taiwan.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2015. White Paper on Environmental Education in Taiwan.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2016. White Paper on Environmental Education in Taiwan.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2017. White Paper on Environmental Education in Taiwan.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2018. White Paper on Environmental Education in Taiwan.
- EPA The Environmental Protection Agency of the Administrative Yuan of the Republic of China. 2019. White Paper on Environmental Education in Taiwan.
- Gough, A. 2013. The emergence of environmental education research. International Handbook of Research on Environmental Education. Routledge Press. 13 pp.
- JSEE The Japanese Society of Environmental Education. 2005. <http://www.jsoc.jp/oldver/english/index.html>. Accessed on 22 April 2020.
- Ho Shin K. 2008. Development of Environmental Education in the Korean Kindergarten Context. Ph.D. Dissertation. University of Victoria, British Columbia, Canada.
- Kline, B. 2007. First along the river: A brief history of the U.S. environmental movement (3rd Ed.). Lanham, MD: Rowman & Littlefield.
- Liang, M.H. 2003. Collation of the promotion of and disputes on legislation for environmental education. Paper presented at 2003 Environmental Education Symposium. March 2003.
- Lucas, A.M. 1979. Environment and environmental education: Conceptual issues and curriculum interpretation. Ph.D. Dissertation. The Ohio State University, Columbus, Ohio.
- Martin, G. C. 1975. "A review of objectives for environmental education." In: Insights into environmental education (eds. G. Martin and K. Wheeler). Edinburgh, UK, Oliver & Boyd. pp. 21.
- National Science Teachers Association. 2003. NSTA position statement: Environmental education. <http://www.nsta.org/about/positions/environmental.aspx>, accessed on 22 April, 2020.
- Park, T.Y., Jung, Y.H., Choi, S.J., Choi, D.H., Lee, D.Y., and Noe, K.L. 2003. Introduction of environmental education. Seoul, Korea
- Simmons, D. 1995. The NAAEE standards project: Papers on the development of environmental education standards. Troy, OH: North American Association for Environmental Education.
- Stapp, W., Havlick, S., Bennett, D., Bryan, W., Jr., Fulton, J., MacGregor, J. 1969. "The concept of environmental education" *The Journal of Environmental Education* 1(1): 30–31.
- Tbilisi Declaration, Intergovernmental conference on Environmental Education, October 14-26, 1977. <http://resources.spaces3.com/a30712b7-da01-43c2-9ff0-b66e85b8c428.pdf>, accessed on August 22, 2016.
- UNEP. 1972. Stockholm declaration on the human environment. United Nations Conference on the Human Environment, Stockholm, Sweden, 1972. New York: United Nations Environment Programme.
- UNESCO. 1977. Trends in environmental education. Paris: United Nations Educational, Scientific and Cultural Organization.
- UNESCO-UNEP. 1976. The Belgrade Charter. Connect: UNESCO-UNEP Environmental Education Newsletter, 1(1): 1–2.
- United Nations Conference on Environment and Development (UNCED), Environment and sustainable development, Rio de Janeiro, 3-14 June 1992. <http://www.un.org/geninfo/bp/enviro.html>, accessed on August 12, 2016
- USEPA. What is Environmental education, <https://www.epa.gov/education/what-environmental-education>, accessed on 22 April 2020.
- Zhang, Z. C. 2000. A comparative study of environmental education laws of the world. MS.c. Thesis. National Taiwan Normal University.