Chapter 13
Environmental Education in China: A Case Study of Four Elementary and Secondary Schools

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Abstract As a country with a fast-growing economy and a large population, China has shown an increasing concern over environmental issues since the 1972 United Nations Conference on the Human Environment. As a result, environmental education (EE) in Chinese elementary and secondary schools has achieved remarkable progress. However, the current effects of environmental damage seem to outweigh the positive effects of decades-long school-based EE initiatives in the country. Based on a survey conducted with four elementary and secondary schools in Nanning – known as the Green City – the present chapter reveals important barriers to the improvement of EE in the Chinese educational system. We conclude our discussion by making several recommendations to address those obstacles identified by participants in our study which are common to other countries as well.

13.1 What Are the Problems?

Since the carrying out of the Opening and Reform Policy in 1978, the Chinese government has loosened its tight control over certain economic activities, including international trade. As a result, China has maintained a high average gross domestic product rate and is recognized as the second-largest economy of the world today (Han 2015). In addition, according to the National Bureau of Statistics (2012), the country's GDP per capita is ranked 100th globally. At the same time, approximately 122 million people live in poverty (National Development and Reform Commission 2012), and the rapid process of industrialization and urbanization has caused increasing depletion of natural resources, thus putting huge pressure on the environment. As a result, any current prospects of sustainability in China are

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daunting. Nevertheless, since the 1990s, education has been recognized as an indispensable and essential approach to raising public awareness toward attaining sustainable development (Han 2015). Accordingly, environmental education (EE) in elementary and secondary schools has received increasing attention in the Chinese educational system, specifically after the release of UN's Agenda 21 (Tang 1994).

The importance of EE in the elementary and secondary education is recognized by the Chinese society and educators through the variety of EE textbooks published and the many training opportunities offered to elementary and secondary teachers. However, these initiatives were not enough to stop the environmental crisis in China. During the last decade, ecosystems have continually degenerated, soil erosion has become serious, the number of endangered species has increased, and many natural wetlands have disappeared. What has happened? Why hasn't school-based EE been able to help alleviate the environmental damage being caused in the country? In order to find out, a survey was conducted with four elementary and secondary schools in Nanning, considered to be the "Green City" of China. It is the capital city of Guangxi Zhuang Autonomous Region, thus being the provincial center of politics, economy, science, technology, education, culture, and health (Nanning Government website 2015). The city also plays an important role in the economic development of Southwest China and is gradually becoming a commercial and communication center for Southeast Asia (Nanning Government website 2015).

The purpose of this chapter is to explore the significance of the results of this EE survey and how they can help inform EE-led initiatives in Chinese schools and internationally.

13.2 A Brief Review of History: EE Policies in China

This section provides context for the various policy reforms implemented in the country over the last four decades and which have influenced the presence of EE in Chinese schools to this day. The roots of modern EE in China began to take hold in the early 1970s and have gone through three periods of development, explained as follows:

13.2.1 The Start-Up Period: 1972–1988

In 1972, the Chinese government sent a delegation to attend the United Nations Conference on the Human Environment held in Sweden. During the following year, China's first National Environmental Protection Conference, held in Beijing, highlighted that universities and colleges should offer environmental protection (EP) programs (Li 2004). Following that conference, Tsinghua University and Peking University set up the first environmental engineering undergraduate and postgraduate degree programs in China, respectively.

In 1978, the Environmental Protection Leading Group of the State Council proposed the integration of EP into the curriculum for elementary and secondary schools. In the following year, the promulgation of the Environmental Protection Law of the People's Republic of China highlighted the importance of disseminating the EP more broadly. The People's Education Press began to incorporate EP into natural science, geography, and chemistry textbooks for elementary and secondary school grades. Promoted by the Chinese Society for Environmental Sciences (CSES), EP pilot projects were carried out in selected schools. Two years later, the CSES expanded their projects to more provinces and cities and started offering EP training workshops for teachers. In the same year, EP was acknowledged as one of China's basic national policies, which contributed to making EE an integral part of its development until 1988.

13.2.2 The Steadily Developing Period: 1989–1995

In 1989, the symposium jointly held by the State Environmental Protection Administration (SEPA) and CSES promoted the systematization, standardization, and regularization of EE in basic education (Li 2003). Participants at this conference recognized the importance of nongovernmental financial support for school-based EE, more training opportunities for teachers, and the production of higher-quality textbooks. In 1992, the State Education Commission (SEC) explicitly required schools to incorporate EE into their curriculum through the policy document "Education is the Foundation for EP," which was put forward at the 1st National Environmental Education Working Conference.

In 1994, 2 years after the first United Nations Conference on Environment and Development in Rio de Janeiro, the Chinese government issued "China's Agenda 21: White Paper on China's Population, Environment and Development in the 21st Century." It claimed that sustainable development (SD) was a top priority in China's development and reform agenda (Han 2015). This policy document was also viewed as a fundamental in guiding China's social and economic development (State Council 1994).

13.2.3 The Flourishing Period: 1996 – Present

In 1996, China initiated the National Environmental Publicity and Education Program (1996–2010), which served to connect EE with the quality education agenda (Han 2015) and laid the foundations for a nationwide EE program. The state-supported Green School initiative was launched in the same period to encourage schools at all levels throughout China to get involved in EE. In order to promote the development of Green Schools, the Ministry of Education (MOE) awarded a national commendation to Green Schools in 2000 and presented this recognition to

National Green Schools every 2 years. In 1997, the MOE established the nationwide Environmental Educators' Initiative (EEI) in collaboration with the World Wildlife Fund (WWF) and British Petroleum.

The year 2003 was exciting for EE in China due to the issuance of the first guiding policy on EE by the MOE, "Guidelines for Implementing Environmental Education in Elementary and Secondary Schools," which drew from the experience of EEI. The Guidelines marked the increasing importance of education for environment and sustainability in Chinese elementary and secondary education system and have greatly promoted the integration of EE into specific school programs. As a result, the MOE was thus awarded the Gifts to the Earth by WWF in 2003. In the same year, the Chinese government put forward the Scientific Outlook on Development (SOD), recognized as an important theoretical guidance for developing EE in the nation. It states:

> To conduct sustainable development, China shall foster a harmony between man and nature, tackle problems inherent in economic construction, population growth, resource utilization and environmental protection, and push society onto a path toward civilized development featuring growing production, an affluent lifestyle and a sound ecosystem. (China Daily 2007)

In 2011, the National Environmental Publicity and Education Program (2011–2015) encouraged the establishment of social practice bases in collaboration of schools with botanic gardens, science parks, museums, laboratories of academic institutions, nongovernmental EP organizations, and the like. Two years later, 80 national-level bases were approved by the MOE. These have greatly changed the EE landscape, developed students' environmental literacy, fostered their awareness of and concern about ecological civilization and SD, and created new patterns to provide students with opportunities to acquire the knowledge, values, attitudes, commitments, and skills needed to protect and improve the environment.

Over the past four decades, the Chinese government's efforts to make EE an integral part of elementary and secondary education through its national curriculum framework is clear through the development of new strategies for the design and implementation of EE instructional materials for both elementary and secondary education system. Although a nationwide, multilevel, and multiform EE system has been established, it has been influenced by international initiatives that are insensitive to the local contexts where it has been implemented. We therefore conducted a survey with students and teachers to examine the problems of implementing EE in the educational system at two elementary (grades 4–6) and two secondary (grades 7–9) schools in Nanning, also called The Green City because of its abundance of plants. The student questionnaire included three categories for examination (environmental knowledge, environmental awareness, and environmental education), while the teachers' questionnaire contained two categories (environmental awareness and teaching methodologies).

13.3 Background of the Study

Three research questions guided our study: Can current EE teaching methodologies within the elementary and secondary schools improve children's environmental awareness? Has the current EE system within the elementary and secondary schools been evaluated by the government effectively? Are EE programs within the elementary and secondary schools fully supported by the government?

In total, 1200 student questionnaires were distributed: 300 questionnaires to each school. 216 questionnaires were fully completed and returned, representing a response rate of 18%. Of those that returned the survey, 121 participants were elementary students (56.0%), while 95 were secondary students (44.0%). Males comprised 44.9% of our sample.

We distributed 120 teacher questionnaires in these four schools. Forty questionnaires were fully completed and returned, representing a response rate of 33.3%. Nineteen elementary teachers completed and returned their survey (47.5%), while 21 secondary returned the survey (52.5%). Male teacher participants comprised 15% of our sample. The average teaching tenure within the school was 12.8 years. Thirty-three participants (82.5%) indicated they held a bachelor degree, whereas only four participants (10%) possessed a teaching diploma. Three teachers (7.5%) held a master's degree. Based on teachers work experiences and tenure, they are ranked in three different levels (junior professional title, intermediate professional title, and senior professional title) by China's Ministry of Education. Twenty-seven participants (67.5%) reported they had an intermediate professional title. Ten participants (25%) held a junior professional title, and three participants (7.5%) obtained a senior professional title in the survey.

Seven teachers taught grade four (17.5%), the same being true for grade six. Five participants were found to teach each of the following grades: five, seven, and nine (12.5% each). The other 11 respondents were from grade eight, which represented the highest respondent percentage (27.5%). Regarding the teaching subjects, Chinese comprised 32.5%, followed by mathematics (22.5%), English (17.5%), art (7.5%), history (7.5%), physics (5%), and geography, chemistry, and politics (2.5% each). Twenty-eight participants (70%) reported they had not taken any preservice EE training before beginning to teach. Meanwhile, 25 (62.5%) participants indicated they had not received any in-service EE training (Table 13.1).

The two paper-based survey questionnaires were designed by the Sino-Canadian Comparative Environmental Research Unit of Guangxi University. The student questionnaire included three variables: environmental knowledge ($\alpha = 0.63$), environmental awareness ($\alpha = 0.68$), and environmental education ($\alpha = 0.64$). The teacher questionnaire contained two variables: environmental awareness ($\alpha = 0.71$) and teaching methodologies ($\alpha = 0.85$).

Included in the teacher survey, three open-ended questions were provided in order to explore concerns for EE development in the future within the educational system. For example, What are and will be the biggest problems for teaching EE in China? In order to improve EE instruction in elementary and secondary schools, what teaching methodologies should teachers focus on? We also asked participants to provide recommendations for promoting EE in the elementary and secondary schools.

Table 13.1 Number of participants from each school

School code	Students questionnaires distributed	Number of respondents	Response rate	Teachers questionnaires distributed	Number of respondents	Response rate
Elementary 1	300	61	20.3%	30	8	26.7%
Elementary 2	300	60	20.0%	30	11	36.7%
Secondary 3	300	55	18.3%	30	10	33.3%
Secondary 4	300	40	13.3%	30	11	36.7%
Total	1200	216	18.0%	120	40	33.3%

In 1976, the Belgrade Charter declared significant educational efforts were required to improve life and protect the environment. At Tbilisi, the UNESCO endeavored to expand on the efforts made in Belgrade with the development of new EE categories (The Tbilisi Declaration 1978):

- Awareness: to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems
- Knowledge: to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems
- Attitudes: to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection
- Skills: to help social groups and individuals acquire the skills for identifying and solving environmental problems
- Participation: to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems

These categories were used to organize the responses received from students and teachers.

13.3.1 Awareness

A majority of the student respondents (60.7%) reported they were moderately satisfied with their current school environment, while few students were ambivalent with the environment. They also reported to moderately pay attention to media information related to environmental protection. For example, 60% of participants stated that they attempt to save water in their daily lives while 40% indicated they did not pay attention to this issue. The majority (76.7%) claimed that environmental protection is very important and must be protected by everyone right now. However, these the same individuals claimed that they would throw away used paper, bottles, or

empty lunch boxes in a public place if they could not find a trash can and while nobody was watching.

In the case of teachers, a majority of them (62.3%) reported that their environmental awareness was at moderate level. They strongly agreed that EE taught in schools is the essential, comprehensive, and effective path to solve environmental issues in China. They also strongly agreed that China's new curriculum reform should improve students' environmental awareness, by integrating EE into the curricula of elementary and secondary school programs.

13.3.2 Knowledge

Most of participants (83.6%) knew the exact date of the World Environment Day and understood that using biodegradable plastic bags could reduce white pollution. Many of participants (52.2%) recognized that people's attitude toward environmental protection is closely related to the level of environmental pollution. Therefore, they pointed out the bicycle was the friendliest transport for our environment. As for teachers, they showed limited knowledge about EE; most of whom (96.4%) indicated that EE is mainly related to natural environment protection.

13.3.3 Attitudes

Results of the student survey reveal that the participants had fewer concerns and low motivation to find out what the main global environmental problems are. While climate change was a main environmental issue that concerned most of the participants, they weren't noticeably concerned about air pollution, water pollution, and/or noise pollution. They demonstrated low motivation to understand issues around waste disposal problems (classification of waste, waste recycling, and reuse), land desertification, droughts and floods, and biodiversity damage to name a few examples.

82.8% of teacher participants disagreed that introducing EE to elementary and secondary schools would negatively affect current Chinese curriculum of education and influence students' high school entrance examination. However, the same participants purported that EE is of little relevance to the courses they were teaching at the time of the study.

13.3.4 Skills

The results also displayed that the participants lack basic skills to identify and solve environmental problems. Most of participants (96.7%) reported that they normally received environmental information via traditional media including newspaper,

broadcast, and television. The participants also indicated they generally gained relevant skills through EE activities in their schools, such as environmental knowledge competitions. Many of the respondents (62.6%) reported that classroom teaching, the Internet, or influence from others was not a main path to gain environmental skills.

The vast majority of teachers (94.3%) strongly agreed with the statement: "every elementary and secondary school teacher should understand the principles, contents and methods of environmental education." However, most of them claimed they knew little about the content of the "Guidelines for the Implementation of Environmental Education in Elementary and Secondary Schools." They also pointed out that it was necessary to include EE in the teachers' continuing education courses in the future.

13.3.5 Participation

Seventy-seven percent of participants stated that the most effective way to implement EE is through specific activities (e.g., tree planting). Many participants (91.7%) asserted that the best way to promote EE would be offering specific EE courses. Likewise, teaching environmental knowledge through different courses, watching green videos, having environmental education seminars, or visiting garbage treatment station would be beneficial. However, most only took EE courses, rarely participating in other activities. They also maintained that offering EE courses would not add weight to their studies in school. Currently, most teachers causally teach environmental knowledge to students resulting in less demonstrated interest in EE activities in schools for the respondents.

Many participants (86.5%) also reported that they often presented environmental knowledge in their teachings. However, the participants admit that they rarely provided extra teaching activities related to EE nor did they self-study EE materials or discuss EE issues with other subject teachers. They also never took students to complete specific environmental activities including visiting other environmental organizations.

Similar to the results of student survey, most of teacher participants (96.3%) considered the best way to promote EE in schools would be to offer EE courses and visiting environmental organizations. It was apparent that school administration placed a high premium on EE. At the end of the teacher survey, three open-ended questions were presented to the participants. The most frequent answers to the questions are summarized as follows:

What are and will be the biggest problems for teaching EE in China?

1. Students do not have enough environmental awareness.
2. EE courses and practices are unrelated, because many things are empty talks.
3. There is an urgent need to connect EE and teaching materials.
4. Currently there are huge difficulties in organizing EE activities after school.
5. Teachers have not been trained systematically in the implementation of EE.

In order to improve EE instruction in elementary and secondary schools, what teaching methodologies should teachers focus on?

1. Visiting and studying from environmental organizations.
2. Providing professional development opportunities.
3. Providing environmental education seminars.
4. Participating in EE activities with students after school.

Provide recommendations for promoting EE in the elementary and secondary schools.

1. Offering a regular EE course in elementary and secondary school.
2. Teaching and integrating environmental knowledge through different subjects.
3. Teachers and students need to participate in green activities regularly after school.
4. Strengthening the relationship between environmental courses and practices.
5. Ensuring government funding and resources support exist.

13.4 Tactics to the Improvement of EE in Chinese Schools (and in Other Similar Countries)?

The results of this study indicate EE in Chinese elementary and secondary schools has achieved progress, yet there are some barriers to the further improvement of EE. In order for Chinese elementary and secondary schools to implement EE more effectively, several changes must be made; otherwise, EE will remain an unimportant concept occasionally included in the school curricula.

13.4.1 Training of Teachers

Teacher plays a leading role in introducing/instructing EE in elementary and secondary schools. The EE knowledge and understanding of a teacher are critical to the realization of EE goals for our students. Our study shows that most teachers found themselves inadequately prepared to teach EE in their classrooms; therefore there is an urgent need to promote training of teachers to better prepare them to teach EE in their classrooms.

Teachers who have received preservice or in-service training spend significantly more class time devoted to EE than those who have not received any training (Lane et al. 1995). There is no doubt that even the best curricula and textbooks are no substitute for teachers who fully understand the goals and objectives of EE. Hence, both preservice and in-service training programs should be carried out for teachers and educational administrations based on some of the strategies listed below:

– Although the government has issued a series of documents about the benefits of implementing EE in elementary and secondary schools, teachers rarely read them. Thus, the training of teachers should help to facilitate teachers' accessibility to these official documents.

– Teachers need to be provided with more opportunities to update their knowledge on environmental-related issues. This could be offered through participation in professional development workshops (Norman and Yeshodhara 2008).
– EE in China is still perceived more as science education than as an interdisciplinary field. Indeed, training for teachers in China has focused on content knowledge alone, which "does not ensure that teachers will have the ability to integrate environmental topics into a wide variety of disciplines" (Carter 2013, p.115). Hence, there should be more emphasis on environmental topics for teachers of social studies to help them improve their understanding of implementing EE in an integrated fashion.

The training of teachers is of great importance to promote EE in Chinese elementary and secondary schools. Hence, more time and effort are needed to better prepare/qualify teachers in this area.

13.4.2 Approaches to EE

The government has been promoting the integration of EE into the curriculum of various subjects and encouraging the implementation of the content and topics of EE through various activities. However, according to our study, most teachers mainly implemented EE through discussion by examining pictures and watching videos on environmental issues. It appears that such an approach has failed to effectively improve students' environmental knowledge and attitudes. Therefore, it is important to develop teachers' ability to adopt inquiry-based approaches that involve "investigation of differing viewpoints and value positions, discussions and debates" (Hanchet 2010, p. 107) in classrooms as well as provide opportunities for observation, experiments, and field trips in order to foster a "shift from a primarily passive approach towards a more interactive teaching strategies" (Hanchet 2010, p. 105). In addition, to increase the knowledge and attitudes of students, the approach to teaching must place greater emphasis on three levels of activities (Hines et al. 1986):

– The content of EE activities must provide students with the ecological knowledge that will allow them to make ecological sound decisions with respect to environmental issues.
– A conceptual awareness should be raised with regard to how individual and collective behaviors influence the relationship between quality of life and quality of environment.
– Development of action plans by students to provide them with the opportunity to implement those plans, if so they choose.

13.4.3 Strengthening Government Support

Our study indicates that a better teaching environment for EE in elementary and secondary schools requires further support from the government. In the review of the development of EE in Chinese elementary and secondary schools, it is apparent that the MOE has been playing a leading role in promoting EE in the basic education system. To further improve the development and generalization of EE in the context of elementary and secondary schools, the MOE should promote the continuous inclusion and emphasis of EE in the national curriculum. However, EE initiatives ought not to rely solely on the MOE-led initiatives. Indeed, governments at all levels can also play their prominent roles in making EE more successful (Yusof 1999). Possible actions from the various levels of governments include:

- Formulating laws and regulations on EE in elementary and secondary schools that explicitly indicate the goals, objectives, principles, teaching content, training for educators, teaching equipment and facilities, responsibilities of the administrations, funding, etc.
- Providing increasing financial support, which could be used to facilitate knowledge mobility between scientists and school teachers
- Working in collaboration with environmental organizations and teachers' associations to create guidelines for teacher training programs in EE
- Promoting EE publicity for the general public, which would help to create a sound EE-facilitating environment

13.4.4 Evaluation of School Performance

Our study indicates that the standardization of school-based EE calls for developing a more comprehensive evaluation system on the implementation of EE in schools. This evaluation system could include the following components: analysis of the level of organization and management of EE programs, frequency and quality of in-class and extracurricular classes offered, and publication of material resources based on the results obtained from the previous categories.

13.4.5 Evaluation of Student Performance

Our study shows that despite years of efforts to foster a shift away from the long-existing testing-oriented education system, exams are still the major evaluation form for assessing the performance of students in Chinese elementary and secondary schools. It is obvious that tests alone focusing on students' memorization of environmental knowledge could never serve as a good way to evaluate students' environmental performance including attitude and perception. A more effective

evaluation system for EE needs to be developed. We would propose some of the evaluation methods to couple with traditional tests as listed below:

– Environmental projects could be employed to evaluate comprehensiveness and depth of the research and discussion, credibility of the arguments presented, and students' demonstrated proficiency in finding and using appropriate information.
– Writing assessments could be used to evaluate organization, accuracy, clarity, logic, and degree of understanding reflected.

The government and schools should work together to develop a more effective evaluation system to evaluate students' environmental performance around attitude, knowledge, and skill.

It is hoped that future reports will contain outstanding examples that reflect China's ongoing and continuous commitment of EE in the educational system as well as efforts and initiatives made by China to the world environment improvement and its own national sustainable development. More importantly, we believe that other countries can benefit from the discussion taken up here.

Questions

Discussion questions that could help instructors and students to engage in meaningful conversation about the ideas presented in this chapter.

1. Describe how the environmental education policies in China have developed since the 1970s and how they compare to policy development in your country
2. Discuss with your classmates how environmental education in Chinese elementary and secondary schools is similar to and differs from that in your country
3. Considering environmental education programmes in your country, provide two suggestions on improving environmental education programmes in Chinese elementary and secondary schools. Discuss with your classmates the challenges of implementing your suggestions
4. The five objectives of environmental education as outlined in the Tbilisi Declaration were provided in this chapter. Examine each objective and discuss how it has been implemented in your country. Based on your responses, summarize where you think the Tbilisi Declaration should go 40 plus years later

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