INTRODUCING A NEW SUBJECT: THE CASE OF ENVIRONMENTAL EDUCATION IN TAIWANESE JUNIOR HIGH SCHOOLS

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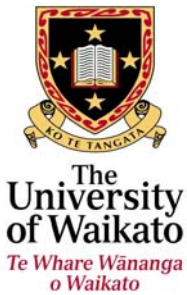

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ABSTRACT

The introduction of environmental education in schools has been the focus of a long campaign worldwide since the late 1960s. The difficulties in teaching environmental education, including the choice of curriculum models, and the obstacles to changing contemporary schooling patterns have been well documented. The traditional process of new subject emergence has been detailed in the literature; whether or not environmental education should or could follow this traditional pattern of subject emergence in schools is the focus of this thesis.

In Taiwan, the introduction of environmental education in junior high schools occurred as part of a nationwide curriculum change in 2002. This research used an interpretive approach to explore the views and practices of staff in three typical Taiwanese junior high schools at this time. The focus of the research was to study what happened at the level of classroom teaching and school development. The research program was designed to interview both administrators and teachers before, during and after the first year (2002 school year) of curriculum implementation in each of the three case study schools. Three rounds of interviews were conducted over a period of three years (Sept. 2001 - June 2004). As well as interviews, national and school documents were collected; and announcements and decisions from the Ministry of Education and schools were documented. Also, because the reform encouraged the development of school-based curriculum, a questionnaire was given to the one school which chose environmental education as their school-based curriculum in order to better understand the emergence of environmental education in this school.

The findings show a paradox in Taiwanese junior high schooling: although each school placed considerable value on environmental education, the data showed that the introduction of environmental education via an infusion strategy during a time of national curriculum change had minimal impact in the three Taiwanese case study schools. A cross-case analysis indicated the reason for this failure was the lack of effectiveness of eleven supporting themes often discussed in the emergence of a new subject: the possibility of gaining external examination credit

and entry to a university department; the prioritising of the subject in school timetabling and programming; the development of a systematic syllabus; the presence of proactive support from central government leadership; the provision of teacher professional development; the inclusion in the informal as well as the formal curriculum in a school; the inclusion of environmental education in non-formal education in society; the presence of clear subject characteristics and definition; the presence of substantial school-based material interests; the gaining of support from an external constituency, especially parents; and the presence of an emergence process that couples internal value evolution with external compulsion. The Taiwanese case studies raised three particular and additional themes for the emergence of environmental education, specifically: the need to set up long-term partnerships with local groups that have an interest in or responsibility for the local environment (e.g. societies, agencies and non-governmental organisations) to achieve local environment involvement; the need for a whole school approach through curriculum integration to achieve the transformative nature of environmental education; and the need to build up a sound cooperative network that includes people at all levels of the education system and society to achieve a national cooperation network. These three particular themes derived from the nature of environmental education as a holistic, integrative and interdisciplinary subject. In summary, the findings not only confirmed the themes important for the emergence of environmental education and other contemporary school subjects, but they also raised particular themes pertinent to the emergence of environmental education. When these three particular themes are not taken into account, the effective emergence of environmental education in contemporary schooling, as exemplified by Taiwanese junior high schools, will be difficult to achieve in mainstream education.

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CHAPTER FOUR: THE IMPLEMENTATION OF ENVIRONMENTAL EDUCATION WORLDWIDE

CHAPTER ONE:
INTRODUCTION AND OVERVIEW

"Schools should teach environmental education because the environment in Taiwan is getting worse and worse … We did not feel so strongly about our environment when we were seeking economic and technical development but later the damaged ozone layer, water pollution, environmental disease, and so on, made us feel that our environment was very important and we should protect nature."

English teacher in Redbrick Junior High School, Taiwan, 2001.

1.1 Environmental Education: Some Personal Concerns

This thesis explores the introduction of environmental education via a national curriculum change in three typical Taiwanese junior high schools. I became much more aware of the issues concerning the environment and the relationship between humans and other organisms on our planet in 1981. It was the time I took an ecology course in the biology department in my university years. However, I never thought of the term 'environmental education', even after being a biology teacher in a junior high school for seven years. I started to become interested in environmental education when it was first taught in a summer school for biology teacher development in 1988, the seventh year of my teaching career, in my mother university, National Taiwan Normal University.

I was specifically motivated by one of the courses taught in that summer school, *Environmental Education.* Although the title seemed new to me, the course content actually overlapped with traditional ecology to some extent. I then bought and read Rachel Carson's famous book, *Silent Spring*. It was the book my ecology lecturer strongly recommended I read in 1981, but I did not read it until attending that summer school. The description of the enduring influences of insecticides in the 'Realms of the Soil' impressed me greatly:

> One of the most important things to remember about insecticides in soil is their long persistence, measured not in months but in years … Chlordane has been recovered twelve years after its application, in the amount of 15 per cent of the original quality … The old legend that 'a pound of DDT to the acre is harmless' means nothing if spraying is repeated … With repeated spraying over years the range between trees is from 26 to 60 pounds to the acre, under trees, up to 113 pounds … We must wonder to what extent insecticides are absorbed from contaminated soils and introduced into plant tissues … This very sort of contamination has created endless problems for at least one leading manufacturer of baby foods who has been unwilling to buy any fruits or vegetables on which toxic insecticides have been used (Carson, 1963, p.48-49).

I was not only astonished but moved as well and felt the need to let more people, especially my students, know more about these events. I then realised the significance of the linkage between ecology and education, which could raise the awareness of the public, especially school children, about how to protect and care for our planet. It seemed to me that ecological issues should also be educational issues.

Despite its introduction by educators in 1982 (Tzeng, 1990a), there was no formal education program for environmental education at any level in Taiwan, although in the late 1980s there were one-week and three-week optional workshops for teacher development and for government officers. These tried to encourage the teaching of environmental education at all levels of formal education, and in non-formal education venues such as governmental offices, but it was not mandated. In the textbook-dominated society which is Taiwan, I felt a responsibility after attending that course to place more stress on environmental education in my teaching. One of the reasons for this was that biology textbooks in junior high schools were obviously not up-to-date on environmental issues. Additionally, environmental education was not clearly seen as a school subject and was not in curricula at that time. I decided to explore the possible contribution I could make to environmental education while being a junior high school teacher. What could I do in environmental education to change our home, the Earth, into a sustainable planet for our future generations to live on?

Because of growing public and government concern about environmental degradation in Taiwan during the 1980s, a focus on environmental education was encouraged by the government, especially the Ministry of Education, via a six-year (1991-1996) enhancement project (Ministry of Education, 1990b). This project encouraged each school to establish an Environmental Protection Team at each level of formal education to organise activities relevant to the environment, especially environmental protection, such as garbage classification, recycling, and school grounds greenification. However, in primary, secondary and tertiary education, environmental education did not exist as a school subject at that time, except in the graduate schools of some universities.

Although more and more tertiary educators (from both the formal and non-formal educational sectors) along with enthusiastic teachers put increased effort into the teaching and learning of environmental education, I came to believe more and more strongly that its real practice in schools needed to be extended and developed. Therefore, it occurred to me that the introduction of the *Grade 1-9 Curriculum*, a full-scale curriculum reform begun in 2001, might provide the opportunity perhaps through textbook rewrites and school structural reorganisation to get environmental education securely established into the Taiwanese junior high school curriculum. Because environmental education had become more and more important in Taiwanese society, but there was not much research into how schools were really responding to this issue, I decided it would be relevant and timely to undertake research in this area subsequent to gaining research skills from my Masters of Science Education in 1992. Perhaps, by doing this research, I could make a contribution to help the government understand the situation inside schools as it was influenced by the curriculum change, and to examine whether or not the stated curriculum change goals had been achieved.

1.2 Focus of this Research: The Challenge of Introducing Environmental Education into Taiwanese Junior High Schools

Environmental education has been introduced into school curricula internationally since the 1960s and the curriculum reform movement began globally in the 1980s. Taiwan has been impacted by, and is part of, this wider reform movement to provide the opportunity for environmental education in schools. Before the implementation of the *Grade 1-9 Curriculum*, which began in 2001, subject teachers had taught environmental education in Taiwanese junior high schools within the formal curriculum in a supplementary way. The formal curriculum in Taiwanese junior high education included timetabled periods of academic and non-academic school subjects. The academic (or examinable) subjects were Chinese, English, mathematics, chemistry/physics, biology, earth science, health education, geography, history and civics. Non-academic (or non-examinable) subjects included art, music, home economics and daily techniques (the former was for female and the latter was for male students), boy scout training, guidance

activities, and physical education. On balance, more environmental education was taught in the informal curriculum during time allocated to timetabled non-school subjects and others. Timetabled non-school subjects included computing, self-learning time, class and weekly meetings, and extracurricular activities. Other timetabled activities included cleaning time, homeroom teacher time, lunchtime, nap time, intervals between periods, and earth day or tree planting day. At these times, students engaged in activities which could be described as environmental education; such as garbage classification, recycling, saving water and electricity, and maybe tree planting.

As a consequence of this low level of teaching and learning of environmental education, educators, especially those based at the Graduate Institute of Environmental Education in National Taiwan Normal University (NTNU) and National Taipei University of Education (NTUE), suggested that government departments, particularly the Ministry of Education, incorporate environmental education into the official school curriculum so that it would be taught properly. Yet it seemed that the crowded curriculum, as it was perceived not only by school administrators and teachers but parents and tertiary educators as well, did not allow for inclusion of environmental education.

The curriculum reform in 2001, therefore, provided an opportunity to teach environmental education within the Taiwanese school curriculum. During the 1999 National Annual Conference of Environmental Education in Taipei, educators (Guan-Zheng Yang and Zi-Chau Jang from NTNU, and Pey-Zheng Chen from NTUE) believed that the era of environmental education would come with the curriculum reform. In their view, the ten core competencies (see Appendix 2) of the *Grade 1-9 Curriculum* encapsulated the essence of environmental education. For example, the tenth core competence (independent thinking and problem-solving) of the *Grade 1-9 Curriculum* is a very important requirement for one of the learning stage competence indicators of environmental education. This competence indicator for environmental education (see 5-3-4 in Appendix 4) is that the student will "be able to organise a team with peers in order to learn and to plan how to solve environmental issues through democratic and autonomic process."

When the structure of the *Grade 1-9 Curriculum* was announced, it became known that environmental education was to be one of the six *Important Issues* (along with information technology education, gender education, career development education, human rights education and home economics education). The *Issues* needed to be taught in an infusion way (That is, subject teachers independently teach something relevant to the *Issue* without cross-subject linkage in their subject teaching) during the so-called Area Learning Periods for the seven learning areas: Language Arts, Health and Physical Education, Social Studies, Arts and Humanities, Science and Technology, Mathematics, and Integrative Activities. They could also be taught independently via Alternative Learning Periods which constitute the Flexible Curriculum that occupies 20% (or less) of the teaching time per week, or per school year. This requirement of *Issues* infusion makes it obligatory to teach environmental education in the Taiwanese school curriculum. Thus, my research aim was as follows:

> **To explore the implementation of environmental education in junior high schools within the context of the national curriculum reform in Taiwan.**

A key challenge to the introduction of environmental education in Taiwanese junior high schools would be how to overcome the very limited time available (one thirtieth of the teaching time per week or per school year) to achieve its successful implementation.

1.3 The Thesis and the Research Issues

This thesis seeks to observe and analyse the process of the implementation of environmental education during the first three years of curriculum change associated with the implementation of the new Taiwanese national curriculum (*Grade 1-9 Curriculum*) in junior high schools. It seeks to document the influence of the new national curriculum on teachers' views and practices as they implement environmental education in their schools. In addition, it seeks to find feasible possibilities to enhance the implementation of environmental education in Taiwanese junior high schools. Taking a broader perspective, it seeks to consider

the implications of the implementation process for environmental education as part of curriculum thinking generally.

As I have explained, environmental education in the *Grade 1-9 Curriculum* is one of six *Important Issues* specified in the new curriculum document. These are positioned as cross-curricular themes that should be infused into all compulsory seven learning areas. Environmental education is therefore not positioned as a school subject in the same way as the seven learning areas. However, in this thesis, for the sake of convenience I use the term 'subject' to describe environmental education, although I recognise that it is not a subject in the same sense as the learning areas.

Because the *Grade 1-9 Curriculum* is compulsory in Taiwan, every primary and junior high school was required to adjust its teaching, learning, and system structure, to cope with the curriculum reform. Both teachers and administrators needed to adapt to the reform and make adjustments in their beliefs, attitudes and actions. Therefore, I decided to observe, record and analyse what really happened in environmental education inside schools before (prior to Sept. 2002), during (Sept. 2002-June 2003) and after (Sept. 2003-June 2004) the first year of the curriculum implementation (the 2002 school year in 2002/03) at the junior high level. I would explore the influences of the *Guidelines of Environmental Education* on school staff. In addition, I would explore teachers' views about the *Grade 1-9 Curriculum* at large, because the introduction of environmental education occurred within the framework of its implementation.

1.4 Overview of the Thesis

Given the research aim of this thesis, I not only needed to look at the Taiwanese context but also to review the history of education, curriculum change, and environmental education in Taiwan and internationally. Thus, Chapter Two describes in detail not only the background of Taiwan, including its environment, population, economy and environmental protection issues, but also education in general and educational reform in particular. In addition, the history of the introduction of environmental education from an international perspective then

into Taiwan and Taiwanese schools is a focus for this chapter. Finally, the emerging research questions for this thesis are considered.

Chapter Three describes curriculum issues, such as the definition and theory of curriculum, curriculum change and curriculum implementation. Because environmental education was introduced into the Taiwanese school curriculum officially as one of the six *Important Issues* (to be infused into the seven learning areas), the main focus of this chapter is to review the history of the emergence of a new subject in schools. The aim is to compare the characteristics of environmental education as a new component in the *Grade 1-9 Curriculum* with the themes of other contemporary school subjects like Chinese, English, mathematics, science and social studies.

Chapter Four first elucidates the nature of environmental education and its curriculum models including theoretical frameworks, implementation models, and the barriers to its being incorporated into school curricula. Secondly, the chapter reviews the implementation of environmental education globally and regionally. Thirdly, the paradigm shift entailed in adapting environmental education is discussed. Finally, another research question for this thesis is developed. This chapter concludes by introducing the four research questions for this thesis.

Chapter Five, methodology, introduces and explains the reasons for choosing an interpretive approach and for using case studies to understand the inevitable uncertainties and confusions during curriculum implementation. It then describes the data-gathering methods and some overall considerations in this research. Finally, the research program is delineated in detail - the process and methods used in this study.

Case studies contribute to Chapter Six by narrating teachers' and administrators' experiences in three typical Taiwanese junior high schools before, during and after the first year of curriculum implementation. The focus is on the issues of the *Grade 1-9 Curriculum* in general, and environmental education in particular.

Chapter Seven documents the role and place of environmental education in the pre-reform school curricula. It presents the influence of the introduction of environmental education on school curricula, and finally describes the impact of the new national curriculum on teacher views and practices in environmental education. Because environmental education was implemented as part of the curriculum change, school staff responses towards the curriculum change, especially the issues of curriculum integration and school-based curriculum, are discussed.

Chapter Eight discusses crucial themes in curriculum change for the introduction of the new subject of environmental education. Eleven themes are found to be crucial for the emergence of any new subject during curriculum change in addition to three additional themes identified as particularly crucial for environmental education. The argument in this chapter is that environmental education is significantly different from other school subjects in its features and pattern of emergence.

Chapter Nine draws conclusions about the introduction of environmental education and the 2001 curriculum reform in Taiwan. It then addresses implications for curriculum change generally, and for environmental education in Taiwan in particular. Finally, this chapter sets out recommendations for the introduction of environmental education in school education at large, and Taiwan in particular.

CHAPTER TWO:
THE TAIWANESE CONTEXT

"Ylhas Formosa!!" (What a Beautiful Island, Formosa!!) by Portuguese Explorer, A.D. 1557
Da-Shyue Chern (2000) in *The Development History of Taiwan*, p. 52.

2.1 Introduction

Chapter Two outlines some of the background of Taiwan (Formosa), with special emphasis on educational reform and school environmental education. It briefly describes the physical and social context, reviews Chinese traditional education assertions and environmental attitudes, and then introduces the recent educational reform and curriculum reform initiated in 2001. Threading through this is the history of environmental education in Taiwan and its schools.

Specifically, section 2.2 briefly reviews the geography, population, economy, and environmental issues and protection in Taiwan. Section 2.3 first gives a profile of Chinese educational traditions and attitudes towards the environment, and then describes the educational situation in Taiwan before 2001. It also elucidates the background and characteristics, and offers a critique of the curriculum reform in 2001.

Section 2.4 depicts the history of the introduction of environmental education into Taiwan generally, and into schools particularly. It then presents the emerging research questions for this thesis. The chapter closes with section 2.5, which is a summary of the practices of environmental education in Taiwanese junior high schools before the curriculum reform. The proposal is made that because environmental education had a low status in the curriculum reform, an investigation into the effectiveness of its introduction is necessary.

2.2 Background Description of Taiwan

2.2.1 Introduction

This section describes the physical background of Taiwan on the issues of geography, population, economy, and environmental status and protection in order to give a general understanding of the environment in Taiwan.

2.2.2 Geography and population

Geography

The region of Taiwan (see Fig 2.1) is located in the western Pacific Ocean and south-eastern Asia between E119°-123° and N21°-26°. Taiwan's area is 36,006 square kilometres and comprises 79 islands that include Taiwan proper, the Penghu Islands, Green Island, Orchid Island, and Tiaoyutai Islets (Directorate General of Budget, 2003). Taiwan is separated from China by the Taiwan Strait, which is about 220 km at its widest point and 130 km at its narrowest.

Fig 2.1 Map of Taiwan Region

Taiwan is an island 394 km long and 144 km wide at its widest point and shaped like a tobacco leaf. The Central Range runs from the northeast corner to the southern tip of the island, and slopes gently to a broad and fertile plain in the west. In the east, the mountains descend precipitously to the Pacific Ocean. The island's uplands are so extensive that only about one third of Taiwan is plains which contain the concentrated communities, farming activities and industries.

Because of its location, Taiwan has an oceanic and subtropical monsoon climate with diverse and abundant plant and animal species ranging from subtropical to alpine. The mountains are mostly forested, with some minerals, chiefly coal, at the northern end. Most rivers flow easterly or westerly, are short and steep, especially on the eastern side of the island, and become torrential during heavy rainstorms, carrying heavy loads of mud and silt. The riverbeds tend to be wide and shallow, making them difficult to manage and develop as water resources. The shorelines are fairly straight and good natural harbours are few in number. Off the southern end of the island lie small areas of coral reefs which have built up along the island's shores.

Population

The flatland is scattered more on the west than the east side of Taiwan and therefore much more population is clustered in urban areas in the west. The population in Taiwan is 22.5 million, as of 2002, with a density of 622 persons/km^2 (Directorate General of Budget, 2003), which is second only to Bangladesh. Ninety eight percent of the population is Han, while 2% are indigenous people (11 tribes living in both mountain and urban areas) and others.

Although the population and its density in Taiwan grew quickly in recent decades, the annual rate of increase has decreased since the 1980s. According to the *Statistical Yearbook of the Republic of China 2003*, the population annual rate of increase was 1.8 - 2.2 in the 1970s, 1.0 - 1.9 in the 1980s, and 0.75-1.2 in the 1990s (Directorate General of Budget, 2003). In 2002, the population annual rate of increase was only 0.5. In addition, the index of aging (8.7 in 1973; 44.2 in 2002) and the median age (20.3 in 1973; 33.1 in 2002) show an upward trend that indicates Taiwan is becoming an aged society with a high density population.

2.2.3 Economy and environmental issues

Economy

In the early stages, the Taiwanese economy was mainly agriculturally based; 90% of exports were agriculture or food related. In the 1960s, 1970s and early 1980s Taiwan's economy experienced very rapid growth. Its economic structure shifted from agricultural exports to light manufacturing in the 1960s and 70s; and to high technology and chemical product exports in the 1980s and 90s. With the move to a free market economy in the 1980s, electronics and the information technology industry, along with services and tourism, became leading components of the economy in Taiwan. Currently forestry, fishing, mining and livestock are minor parts of the economy, although production is higher than previous decades. These various economic developments have created problems with environmental degradation.

Environmental Issues

After more than a decade of initiatives to minimise pollution, the *Environmental White Paper 2003* (Ni, 2003) listed the accumulated days of PSI (Pollutants Standards Index) >100 for air pollution in 2002 as around 3% due to pollution from factories and motorbikes/automobiles. As to water pollution, of the 50 most important rivers, 62% were non-polluted, 12% were slightly polluted, 12% were medium polluted and 14% were severely polluted due to domestic, livestock and industrial effluent. Seven out of twenty one of the main reservoirs were eutrophic due to pollution from pesticides and chemical fertilisers used in agriculture. The accumulated percentage for noise beyond the environmental standard was 25% for the uncountable automobiles/motorbikes and construction. In addition, a daily average of nearly 20,000 tons of household garbage was collected in Taiwan in 2001, with each person producing just under one kilogram per day. According to the Industrial Waste Control Centre, the industrial waste generated from factories and hospitals in Taiwan in 2001 totalled over 20 million tons, which included nearly two million tons of hazardous waste.

As to the land use, the land for construction, transportation and water conservancy has doubled in the last 30 years, while the land for arable use and forestry has reduced by 5.8% and 5.5% respectively (Ni, 2003). Moreover, recreation and

tourism development, combined with the rapid growth of the human population and continued development of mountain land, has increased pressure on environmentally sensitive areas and threatened the survival of wildlife. According to the Endemic Species Research Institute, 6 of 13 species of Taiwan endemic mammals have been driven to extinction, or near extinction, and many bird species' habitats have been destroyed (Endemic Species Research Institute, 2004). At least 20 species of river fish are at the brink of extinction, or are already extinct. The numbers of amphibians in Taiwan has fallen greatly and rare species are restricted to particular geographical areas. A steady decline has occurred in the number of Taiwan insect species and their populations, especially butterflies.

These descriptions show economic development in Taiwan since World War II has led to considerable environmental degradation, especially air pollution, water pollution and the loss of biodiversity. During the 1990s, recognition of this led to raised national awareness of the need for environmental education, especially the teaching of environmental education in schools.

2.2.4 Current status of environmental protection

The Taiwan government invested significantly to reduce the extent of pollution both before, and especially after, the establishment of the Environmental Protection Administration (EPA) in 1987. The EPA is a body that was set up to manage issues relevant to the environment. The government has taken a number of steps to protect the natural ecology. First, many laws have been established to achieve a clean and healthy environment. To prevent and reduce the pollution in the living environment the *Drinking Water Management Act* in 1972, the *Water Pollution Control Act* and the *Waste Disposal Act* in 1974, the *Air Pollution Control Act* in 1975, the *Noise Control Act* in 1983, the *Toxic Chemical Substances Control Act* in 1986, the *Soil and Groundwater Pollution Remediation Act* in 2000, the *Resources Recycling and Reuse Act* in 2003, and others were enacted. From the view of protecting and reducing the degradation of the natural environment and cultural resources, the *National Park Law* in 1972, the *Cultural Heritage Preservation Law* in 1982, the *Wildlife Conservation Law* in 1989, and others were enacted.

Second, many programs have been promoted by the EPA to assist recycling, pollution reduction, and resource conservation. Examples are the *Green Mark program* launched in 1992 and the *Four-in-One Resource Recycling Program* implemented in 1997. Currently, 21 incinerators have been built under the *Taiwan Area Garbage Treatment, Recycling, and Incinerator Construction Plan*.

Third, there has been cooperation among government organisations such as the EPA and the Ministry of Education in promoting environmental education in formal education. The EPA, the Ministry of Interior, the Forest Bureau and the local government have cooperated to provide environmental education in non-formal education. The EPA has promoted environmental products and eliminated convenient but non-recyclable products via local government initiatives as part of working towards a sustainable society.

Through these efforts, the extent of environmental deterioration in Taiwan is being reduced. The *Environmental White Paper 2003* sets out the national environmental strategy and measures to address environmental degradation issues in Taiwan with a focus on the following two aspects (Ni, 2003):

1. Conservation of the natural environment
   This includes pursuing the sustainable utilization of resources, achieving protection of environmentally sensitive areas, establishing an effective economic system for environmental life cycle management and green consumption, and conserving biological diversity.
2. Implementation of pollution prevention and control
   Implementation processes focus on ensuring air quality; water quality; soil management; waste recovery, reuse and disposal; noise and vibration control; management of toxic chemicals and environmental pesticides; and environmental hygiene.

The government goal of "azure skies, green earth, blue mountains, and clear waters" (Environmental Protection Administration, 2004) requires mutual cooperation between the people and the government. Environmental issues are not only local. The work of environmental protection is not accomplished in a single day. To be responsible members of the global village, Taiwanese citizens need to expand the scope of their concern to society at large, the nation, and the entire world.

2.2.5 Summary of section 2.2

Section 2.2 has provided a rationale for the urgent need to introduce environmental education in Taiwan. During the 2001 Taiwanese curriculum reform environmental education was one of the six *Important Issues* highlighted in the new national curriculum. The reform will be described in the following sections.

2.3 Background to the Educational Reform in Taiwan

2.3.1 Introduction

The introduction of environmental education is one of the changes in the recent educational reform in Taiwan. Environmental education was, for the first time, included in the national curriculum with the 2001 curriculum reform in that schools were required to teach it. However, Taiwanese junior high schools were only required to teach it from 2002. This section briefly describes the educational traditions and attitudes towards the environment in Chinese culture. Secondly, it describes the background of modern education and the 2001 curriculum reform in Taiwan. Finally, it introduces the characteristics, process and a critique of the 2001 reform.

2.3.2 Chinese educational traditions and attitudes towards the environment

China has a very long educational history including Confucius and Mengzh. Taiwanese education has generally followed the Confucian tradition of Chinese education. Confucius' main assertions are embedded in Taiwanese educational philosophy. He claimed that everyone should be educated because *'Among really educated men, there is no caste or race-distinction'*; that teachers should be patient and dedicated as '*To be indefatigable in teaching'*; and that there is a need to combine thinking and effort as in the phrase '*Study without thinking is labour lost. Thinking without study is perilous'* (Overseas Chinese Affairs Commission, 1982). Further, Confucius suggests that teachers need to answer differently to different students. He urged teachers to inspire students rather than simply provide information, saying *'To make the student find his own illustrations before giving him one of my own'*. He also used compliment or censure to confirm or

improve students' learning. Ultimately, Confucius demanded behaviour should be consistent with knowledge - '*Not only listen to what they said but also observe what they acted*' (Overseas Chinese Affairs Commission, 1982).

Confucianism rarely discussed nature; rather, it merely mentioned taking into account natural rules to manage human affairs (Han, 1995). However, Chinese traditional culture respects nature and believes that humans should follow the rules of nature to live on the earth (Han, 1995; Yang *et al.*, 1995). Lao Tzu and Chuang Tzu are representative philosophers in the tradition of nature worship and divination. Lao Tzu was famous in the same era (fifth century B.C.) as Confucius for his alternative assertion *Taoism* or 'The Way'. The essence of Tao is the belief in the ultimate union of nature and man, the way to peace on the earth, and the universal truth of mysticism of the immortal (Sun, 2001). Inside Lao Tzu's enduring work *Tao Te Ching*, written 2500 years ago, the most famous statements show awe towards nature (Han, 1995; Sun, 2001).

> Man models the way of earth;
> Earth models the way of heaven;
> Heaven models the way of Tao;
> Tao models the way of nature.

Taoists called their approach to action *wuwei* i.e. no-action (action modelled on nature). Therefore, they inspired the love of nature in Chinese culture and advocated the art of living and surviving was to conform to the natural way of things. That is, the Chinese attitude towards the natural world is *the doctrine of harmony with natural environment* based on Taoism (Cooper, 2001). This is revealed in numerous ancient Chinese paintings and poems of landscape and wildlife.

The decline in influence of Taoist beliefs began in the Han Dynasty, 206 B.C.-220 A.D., as Confucianism gained dominance. Han (1995) pointed out that since the late nineteenth century Chinese cultural attitudes towards nature have been strongly influenced by western thinking about conquering nature, with this shift reflected in education. Commercial tourism in the late twentieth century in Taiwan not only despiritualised the traditional nature culture but also brought environmental degradation. Consequently Han (1995), in the last decade of

twentieth century, called for rebuilding the Chinese traditional nature culture-*Taoism*.

2.3.3 Education and educational reform in Taiwan – some history (prior to Aug. 2001)

The Constitution of the Republic of China - Taiwan (promulgated in 1947) states that all citizens shall have equal opportunity to receive an education, and all children aged 6 to 12 should receive free primary education (Department of Statistics, 2002). The goal of education of the Republic of China - Taiwan is to improve the livelihoods of the people, ensure for each individual a decent existence in society, and pursue economic development and national regeneration so as to achieve the independence of the nation, implementation of democracy, advancement of social well-being, and to attain the ideal world of universal brotherhood (Department of Statistics, 2002). As to the education system, the regime of 6 years for elementary, 3 years for junior high, 3 years for senior high, and 4 years for tertiary education (6-3-3-4), was set in the Republic of China in 1922 (Department of Statistics, 2002) with influence from the USA (Junior High School Curriculum Standards Editing Team, 1995). The Central Government of the Republic of China relocated from Mainland China to Taiwan in 1949 and still retains the 6-3-3-4 regime. In 1968, compulsory national education in Taiwan was extended from 6 years (elementary) to 9 years (6 elementary plus 3 years junior high) schooling, thus involving children from 6 to 15 years old.

After several decades of separation from Mainland China, the Chinese in Taiwan encountered dramatic changes in social, economic, political and cultural areas. The values and thinking in education for Taiwanese reflects a more western influence (especially USA) than Chinese tradition. However, the revisions of both the *Elementary* and *Junior High Schools Curriculum Frameworks* (Junior High School Curriculum Standards Editing Team, 1995) have been slow and infrequent. Prior to 2001, the latest two revisions for the elementary school curriculum framework document were in 1973 and 1993 (Shan, 2000a). The junior high school curriculum framework document was promulgated from 1968 and revised in 1972, 1983, 1985 and 1994 (Junior High School Curriculum Standards Editing Team, 1995).

In the late 1990s, the need for educational reform in order to cultivate modern citizens who are competitive in the twenty first century was considered urgent. It was not, however, the government who initiated the educational reform. Since 1987, civilian groups in Taiwan have conducted a series educational trials such as forest schools, caterpillar academies, and whole-person schools (Chen, 2001). On 10 April 1994, the elite of society, especially the Nobel Prize winner Dr. Lee, Yuan-Jer, led the famous '410 Movement' and demanded educational reform. They argued that the government needed to face Taiwan's educational problems and plan for future education development. These voices, originating in grass roots, led to the formation of the Commission on Educational Reform (CER) in September 1994. Dr. Lee was invited to be its chairman. In December 1996, the CER released *The Consultants' Concluding Report on Education Reform* (C. S. Yang, 1999) and listed five major reform directions:

1) Deregulation;
2) Engagement of students;
3) Provision of accessible education;
4) Raising of education quality;
5) Promotion of a society of lifelong learning.

Combining the recommendations of the consultants' report and the ideas proposed for long-term policies such as those in *A Report on ROC Education-A Vision Towards 21st Century*, *A Report on ROC Education for the Disabled*, and *A Report on ROC Education for the Aborigine*, the Ministry of Education (MOE) mapped out the guidelines for a comprehensive educational reform in July 1997 (C. S. Yang, 1999). Executive Yuan (the highest administrative organisation in Taiwan) approved the Ministry's *Educational Reform Action Plan* in May 1998 with an allocated budget of NT$ 150 billion, and twelve associated educational policies. This action plan has since become the major guideline for the MOE educational reform efforts and the most widely acknowledged plan for educational reform in Taiwan.

The first of twelve educational reform policies is to consolidate the nine years compulsory national education. In April 1997, the MOE established the *Special Panel on the Development of Elementary and Junior High School's Curriculum*. In September 1998, the panel released the *General Guidelines of Grade 1-9*

Curriculum of Elementary and Junior High School Education. In October 1998, the *Panel on Researching and Formulating the Guidelines of Each Learning Area in Grade 1-9 Curriculum* was established. In March 2000, this group released the *Guidelines of Each Learning Area in Grade 1-9 Curriculum*. For the revision, the *Review Committee on Revision and Formulation of Elementary and Junior High School Curriculum* was established in December 1999. This committee reviewed and confirmed the adequacy of the Guidelines of each learning area and coordinating projects before implementing the Grade 1-9 Curriculum in August 2001.

Huo Huang (2003) identified five factors to the background of the national curriculum reform of 2001. First, the fixed and centralised education system could not meet societal needs. Second, although education was a government instrument for national policy and economic development, its subjective value was ignored. Third, a general misconception about the 'single value' of examinations led to 'fake justice' and a lack of respect for multiple values in society. Fourth, a strong value on attending higher education led to examination-oriented teaching in schools and distortion of the objectives of school education. Finally, was the competitive pressure from globalisation. In short, the curriculum reform needed to meet national development needs and public expectations and to introduce issues of contemporary societal concern. As was outlined in Section 2.2.3, environmental issues are of concern and hence environmental education was included as one of the *Important Issues* in the curriculum reform. The following sections will describe the characteristics, implementation process and critiques of the Grade 1-9 Curriculum.

2.3.4 The recent curriculum change and curriculum implementation in Taiwan (Aug. 2001-July 2005)

2.3.4.1 The characteristics of the Grade 1-9 Curriculum

Before 2001, there were individual curriculum development committees and curriculum frameworks for each level of elementary and junior high education. As Section 2.3.3 mentioned, several revisions had taken place for each curriculum framework but the original framework was retained over these revisions. The 2001 reform of the Grade 1-9 Curriculum was of a different scale. This

curriculum reform emphasises three dimensions: *consistency*, *integration* and *deregulation* (Wu, Chen, Chen, & Lin, 2003). In order to achieve consistency, there was only one curriculum development committee for both the elementary and the junior high level (this replaced the two previous committees). The curriculum guidelines integrate traditional school subjects (11 in elementary and 21 in junior high education) into seven major learning areas (Language Arts, Health and Physical Education, Mathematics, Social Studies, Arts and Humanities, Science and Technology, and Integrative Activities) to achieve the goal of integration. In the past, the two curriculum frameworks for elementary and junior high education regulated in detail the weekly teaching hours/content/method, evaluation, the time of beginning and concluding school, and so on. The same textbooks were used island-wide and teachers had very little autonomy. Under the aspect of deregulation of the reform, flexible curriculum guidelines replace the detailed curriculum frameworks and teachers are free to choose textbooks. Schools are allowed and required to develop a school-based curriculum and teachers have greater freedom to design their own teaching materials and/or activities. Each school has to set up its own Committee of School Curriculum Development and this provides teachers and parents opportunities to jointly design 20% of the new school curriculum (C. S. Yang, 1999). The Ministry of Education identified other features (see Appendix 1) of the Grade 1-9 Curriculum, including core competences, important issues, team teaching, activity curriculum, accountability, local to global views, reduced weekly learning hours, and the cooperation of different administration levels rather than the central-authority administration (Wu *et al*., 2003).

According to the General Guidelines, the *core rationale* in the Grade 1-9 Curriculum has five aspects (Ministry of Education, 2000a). First, the development of *humanitarian attitudes* include self-understanding and respect for others and different cultures. Second, *integration ability* includes harmonising sense with sensibility, a balance between theory and practice, and integrating human sciences with technology. Third, *democratic literacy* includes self-expression, independent thinking, social communication, tolerance for different opinions, teamwork, social service, and a respect for the law. Fourth, *native awareness and a global perspective* include a love for one's homeland, patriotism,

and a global perspective (both culturally and ecologically). Finally, *capacity for lifelong learning* includes a focus on active exploration, problem-solving, and the utilisation of information and languages. Based on these five aspects, there are ten *curriculum goals* (see Appendix 2) to be achieved through interactions between oneself and others, individuals and the community, as well as humans and nature. In order to accomplish these ten curriculum goals, students need to develop ten *core competences* (detailed in Appendix 2). The detailed contrasts and characteristics of the Grade 1-9 Curriculum in a comparison with the old curriculum are shown in Appendix 3. The key difference pertinent to this thesis is the inclusion of environmental education as one of six *Important Issues* to be addressed across each of the seven learning areas. These topics of societal concern also include information technology education, gender education, career development education, human rights education and home economics education.

2.3.4.2 The process of curriculum change and curriculum implementation in Taiwan

The Grade 1-9 Curriculum implemented in Taiwan from 2001 was intended to act as a *radical* educational revolution to produce competitive future citizens. It was expected to release students from intense examination pressure and promote greater enjoyment in learning. The Curriculum was debated publicly before its implementation, especially in 2000. The Ministry of Education (MOE) showed its determination to develop the new curriculum through the allocation of a large budget, the provision of resources, workshops, hearings, trial school schemes, and so on. The call was for *radical* thinking and attitudes from the public, especially teachers and parents.

Ideally and theoretically, it is best to implement a new curriculum step-by-step from Grade 1 then yearly up to Grade 9 (Liu, 2002; Shyu, 2001; Tai, 2003). As nine years was considered too long a time for revision and discussion, especially in a time of rapid change, several alternatives to shorten the implementation time were discussed in a MOE online questionnaire and in public hearings. In late 2000, the MOE announced the 1247-scheme as the timeframe for the curriculum implementation. The MOE phased the implementation to reduce the time from nine to four years under the following scheme:

1st phase (2001 school year): students in Grade 1 only
2nd phase (2002 school year): students in Grades 1, 2, 4 and 7
3rd phase (2003 school year): students in Grades 1, 2, 3, 4, 5, 7 and 8
4th phase (2004 school year): students in Grades 1, 2, 3, 4, 5, 6, 7, 8 and 9

According to this scheme, junior high schools would implement this new curriculum in August 2002. This escalation of the implementation from nine to four years caused huge pressure and criticism island-wide. This will be discussed in the following sections.

2.3.4.3 Critiques of the curriculum reform in Taiwan

The Ministry of Education stated the curriculum reform was influenced mainly by humanism, postmodernism, socially-organised knowledge and constructivism (Wu *et al*., 2003). The main characteristics reflecting these influences are fewer weekly learning hours, a focus of engaging students and a flexible curriculum for humanism; core competence, free market of textbook production and school-based curriculum development for postmodernism; integrated curriculum for socially-organised knowledge; the process and experience of developing a school-based curriculum for constructivism. The following sections introduce the most critiqued issues both before and during the curriculum change and curriculum implementation.

Critiques of core rationale, curriculum goals, core competences and competence indicators

The main characteristic of the Grade 1-9 Curriculum is its ten core competences, which aim to equip students with abilities that they can take with them through their lives (C. S. Yang, 1999). This aim is to be achieved by starting with students' daily experiences, combining this with textbook knowledge and arranging relevant learning activities. After the General Guidelines were released in 1998, educators were critical that no publication explained the philosophical/cultural background of the development of the ten core competences and no concrete description of national goals existed for the ten competency curriculum goals in the new curriculum (H. Huang, 2003; Su, 2000; Z. S. Yang, 1999, 2001; A. B. Yu, 1999; L. Yu, 1999). Also, no document showed the process the Special Panel had used to make choices/decisions to

develop the General Guidelines for the reform and there seemed to be no educational philosophical base in this reform. Su (2000) noted that the Taiwanese core competences were similar to competences used in the UK and Australia. Lin Yu (1999) commented that this suggested the Taiwanese core competences were value-neutral with respect to Taiwanese culture. In support of this, Tsay (1999) related the core rationale, curriculum goals and core competence in curriculum guidelines to the essence of the objectives model from Tyler in 1949. He argued the curriculum evaluation was a characteristic of the goal-attainment model from the Eight Year Study in the USA in the 1930s. The argument was that the Grade 1-9 Curriculum was influenced by global trends but might not attend to Taiwan's own societal needs and values. During the Series Conferences for the Grade 1-9 Curriculum, Ou (1999) commented that the Integrated Curriculum and School-Based Curriculum Development were characteristics of progressivism. In addition, the skill-orientated core competencies were the characteristic of the behaviourism. However, these two aspects are paradoxical. Thus, An-Bang Yu (1999) described the ten core competences and seven learning areas in the Grade 1-9 Curriculum as a curriculum 'salmagundi', that is a combination of many theories. Jia-Shyong Huang (2002) argued the combination was a result of *political negotiation* under the circumstance of deregulation where the aim was to avoid hegemony among educational philosophies and/or curriculum theories. In 2000, competence indicators were developed based on the seven learning areas and six *Important Issues*, including environmental education. Huang (2002) commented that some of them were too difficult, especially for the lower grades, while some were repetitive, abstract and unclear, and some were of low feasibility and took on different forms in the different learning areas. In 2003, a group of school teachers from Taiwan published a book, *Collection of Wildfires on Educational Reform*. They questioned whether these abstract and segmented competence indicators would fragment student learning (Tai, 2003). They also queried how the indicators could be evaluated reliably and validly. Taken together, these critiques questioned the reform being value-free and a multi-theoretical combination.

Critiques of curriculum integration, textbook provision and school-based curriculum development

- ***Curriculum integration***

The integration of the seven learning areas (curriculum integration) in the Grade 1-9 Curriculum is similar to the framework of national education in Australia and New Zealand (Huang, 2002). It is the most controversial issue in the reform. Of the previous 21 subjects, the Languages Arts (Chinese and English) and Mathematics were not integrated and received very little criticism. The other five of the seven integrated learning areas received numerous complaints and condemnation, especially Social Studies and Science and Technology. These two integrated learning areas are examined in the Basic Competence Test (BCT) which students need to pass to access senior high education.

Before the new curriculum was implemented in 2001, educators argued that school teachers would have a problem teaching the integrated learning areas (Chen, 2001; Shan, 2000b; Shyu, 2001). The reason was that teachers did not receive pre-service training for the integrated curriculum and relied on textbooks to teach big classes of students. In addition, the differentiated curriculum was rooted deep in the structure of education in Taiwan (Chou, 2000). Therefore, Kuen-Chong Li (2000) suggested the need for input from the MOE, local educational bureaus, teacher-training organisations, schools, teachers and parents to help achieve effective curriculum integration. Jan (2000) pointed out teacher training, both the pre-service and in-service systems, would be important for curriculum implementation. Yet the teacher colleges did not change to support pre-service teachers to manage curriculum integration in the new curriculum either before or after its implementation (Li, 2004; G. D. Liu, 2003; L. Z. Liu, 2002; Shyu, 2001, 2004; Yang, 2002b). Aggravation of difficulties happened, especially for junior high school teachers, due to a lack of in-service teacher development. The MOE finally announced in 2003 that curriculum integration was not compulsory. Thus, this reform feature has not been achieved.

- ***Textbook provision***

Prior to the 2001 reform, schools were constrained to buy state-specified textbooks. Since 2001, textbook purchasing has fully opened to the market. Both

schools and teachers can edit their own textbooks and teaching materials. However, the existence of private publishers has meant teachers do not need to develop all their teaching materials (Chou, 2001). Consequently, teachers only design small units for supplementary teaching rather than edit textbooks.

The open market for textbooks as an economic product has caused a *social* rather than an educational problem. Rumours of publishers bribing teachers and/or administrators or politicians have been reported in the newspapers. Kang-Kuo Huang (2003) severely criticised the cost of the new textbooks at three or four times of that of the past, giving parents more economic burden. Additionally, many errors occurred in new textbooks from individual publishers (K. K. Huang, 2003; Lin, 2002). Added to this, students need to buy new textbooks with different content when changing schools. This creates extra cost and undermines systematic learning. Teachers and parents, worried about what would be examined in the BCT, often taught or purchased more than one textbook per learning area (K. K. Huang, 2003; Tai, 2003) which negated the ideal of reducing students' learning burden. Moreover, Tai (2003) castigated the slow textbook production as causing problems for teacher lecture preparation. This situation has reduced the time teachers have had to consider the teaching and integration of environmental education. In addition, except for information technology education there is no textbooks for the other five *Important Issues*, including environmental education. This circumstance has reduced the likelihood of teachers teaching environmental education in Taiwanese junior high schools and has been perceived as a source of difficulty.

- ***School-based curriculum development***

In 2001 the Taiwan government, for the first time, gave freedom to schools to develop a school-based curriculum. This feature reflects 'deregulation' in the reform. School-based curriculum development is a demanding job and requires the principal, administrators, teachers, students, parents, experts and community people to work together. We-Shu Sheu (2001) argued that this goal would not be achieved in the short term, especially since school development in Taiwan has traditionally been centralised. Although successful experiences from the trail school scheme from 1999 to 2000 were presented on the MOE websites and

publications and published by textbook publishers, many school staff waited for the government to announce details of changes to the BCT to be held in 2005 (Shyu, 2001). The MOE finally announced in October 2002 it would keep the same examined subjects for the BCT. After this, Shyu (2002b) and Chaur-Shiang Yang (2002a) predicted that school-based curriculum development would not be achieved because schools would choose to do supplementary teaching/learning for examined subjects rather than develop a school-based curriculum for the Alternative Learning Periods. These periods constitute the Flexible Curriculum, which was initially prescribed as 20% of the total learning hours per week, or per school year. This prediction will be explored within this study which tracks the teaching of environmental education in three schools over three years.

Critiques of the process of the curriculum implementation

Ou (2000) commented that the supporting measures for the Grade 1-9 Curriculum were vigorous and well prepared compared with previous curriculum framework revisions and implementations of curriculum reform. Three hundred and ten schools, one tenth of all the schools in Taiwan, mainly those from the primary level, joined the trial school scheme in August 1999 - July 2000 working to trial one, several, or all the seven learning areas in their schools (Huang, 2002; Shyu, 2001). The aim of this trial scheme was to accumulate experience and raise questions for consideration before the new curriculum was implemented in August 2001.

Soon after the new curriculum was implemented, some trial school principals complained that the development of the Flexible Curriculum (Alternative Learning Periods*)* and the infusion of the six *Important Issues* did not have a framework for schools to refer to (Shyu, 2001). Late in the first year of the curriculum implementation, doubts emerged from schools, especially at the junior high level, about the accelerated implementation of the curriculum under a 1247-scheme. Students entering Grades 4 and 7, especially the latter, would lack some prior knowledge due to the different content order in the old and new curricula. Content taught in different grades within the two curricula led to a connection problem. Before the new curriculum was implemented at junior high level, the ex-Minister of Education We-Fang Gou in April 2002 in a main newspaper, said

that the new curriculum was premature due to the lack of proper supporting measures, although it was a good system (Liu, 2002). After its implementation at junior high level, educators commented that too soon the curriculum implementation would ruin its ideal (Shyu, 2002a; Yang, 2002a, 2002b).

In addition, We-Fang Guo in 2002 and Guang-Guo Huang (2004) criticised the policy of excluding scholars from teachers' colleges from reform planning. They were marked conservative and their opinions were not being valued. Finally, a protest rally organised by Taiwanese teachers was held on 28 September, the teachers' day, in 2002. More than 100,000 school teachers demanded the right to form a labour union superficially, but in reality teachers reacted against the policy-making process with regard to the curriculum reform.

Critiques of the Basic Competence Test

In 2001, the Basic Competence Test (BCT) replaced the traditional entrance examination of senior high schools in Taiwan. It tested Chinese, English, mathematics, science (chemistry/physics, earth science, biology and health education) and social studies (geography, history and civics). After implementing the new curriculum, what would be tested for the first year junior high graduates in 2005 became a top societal issue for discussion and debate. The MOE sent out a questionnaire to teachers asking for their advice. The result was not reported, but soon after the new curriculum was implemented at junior high level, the MOE surrendered to strong social pressure and announced it would to keep the traditionally examined subjects. Educators commented immediately that BCT following the same examined subjects as those in the old curriculum would undermine the design and expectation of the new curriculum (Shyu, 2002a; Yang, 2002a), especially curriculum integration and school-based curriculum development (Yang, 2002b).

In conclusion, there was more criticism than compliment of the 2001 curriculum reform in Taiwan. The main reasons were the hasty implementation and insufficient supporting measures in the reform. As early as 1974, educators working in Britain had stated that any change in curriculum organisation required investment in ideas, of resources, of time or of energy (Shipman, Bolam, &

Jenkins, 1974). The chance of change becoming established and having a lasting impact depends on the level of investment made. Obviously, many of those involved consider the implementation of the Grade 1-9 Curriculum in Taiwan was undertaken with insufficient time and support.

2.3.5 Summary of section 2.3

Section 2.3 reviewed the history of the 2001 curriculum reform in Taiwan. It showed that environmental education was only one of the six *Importance Issues* infused into the seven learning areas of the Grade 1-9 Curriculum. Environmental education was indeed a small part in the reform. For this reason, the critiques of the Grade 1-9 Curriculum did not pay much attention to environmental education. Section 2.4 will examine the situation of environmental education in Taiwan and its schools before the implementation of the Grade 1-9 Curriculum.

2.4 Environmental Education in Taiwan

2.4.1 Introduction

This section describes the history of environmental education in Taiwan from its introduction by international societies until the 2001 curriculum reform. The practices of environmental education in schools will be discussed.

2.4.2 General introduction of environmental education in Taiwan

Environmental education emerged in Taiwan after 1982 via the educators' introduction to public through international societies (Tzeng, 1990a). At that time, the Environmental Protection Bureau, under the Department of Health, Executive Yuan (the highest administrative organisation in Taiwan) was in charge of developing an environmental education expansion plan. The Environmental Protection Administration (EPA), Executive Yuan was established until 1987 and at this time environmental education expansion division (inside the Bureau of Comprehensive Planning) was put in charge of the development and expansion of environmental education. In the same year, the Executive Yuan developed the *Outlines for Current Environmental Protection Strategy* (Tzeng, 1990a). Chapter Two of the *Outlines* stated the need to enhance the advocacy of environmental education; to increase citizens' environmental awareness; to cultivate specialists;

and to develop environmental protection science and technology. To achieve this aim, in Chapter Three the *Outlines* suggested adding teaching materials for environmental education into the curricula at all level of the formal education. Again, in the same year, Tsong-Ming Li (1987) published *Environmental Education*, the first book on environmental education in Taiwan. He suggested environmental education be incorporated into school education along with social education and family education. In 1990, the MOE established the office of *Environmental Protection Team* and took the responsibility specifically for school environmental education. In 1991, the MOE formed the *Environmental Education Committee* to coordinate environmental education among government organisations. From 1992, the main basis for the government to expand environmental education was *Important Items for Environmental Education* (Ministry of Education, 1993). The main strategies to develop environmental education given in this document were to establish an environmental education system; to expand the social environmental education; and to develop the international cooperation of environmental education. It also required the enhancement of school environmental education at every level; the development of professional workers of environmental protection and environmental education; the strengthening of research on environmental education; and the helping and rewarding of individuals and/or groups working on environmental education expansion.

In 1997, the Executive Yuan set up the National Council for Sustainable Development. In 2000, this council drafted the Agenda 21 of Taiwan: *National Sustainable Development Strategy Guidelines*. Chapter 17 on educational development mentioned that education, especially the educational reform, would be the driving force to assist all citizens to recognize the relationship between the environment and mankind and to encourage responsible behaviour towards the environment as the basis of sustainable development (National Council for Sustainable Development, 2000). The strategies recommended were to integrate technology into environmental education resources and strengthen the sustainable education guidance for environmental education; to combine social and environmental education resources and increase the consensus and recognition of the environment; and to promote educational reform and help citizens to

understand the concept of sustainable development. It also stated that education should be blended into culture promotion.

In February 2000, the MOE accepted the Green School project, developed by university scholars from Graduate Institute of Environmental Education in National Taiwan Normal University. According to Liang and Chen (2001), the MOE provided Taiwan's Green School Partnership Network Project (TGSPNP) to promote green schools in the formal education system to achieve 'environmental education and sustainability'. The vision of a green school was comprised of four dimensions: school policy, campus design and management, curriculum and teaching, and life style. The roles of TGSPNP were first to build up linkages from central and local government to the school district. Next, it helped to team up university professors of environmental education and NGO groups to assist local government and schools towards the goal of a green school; and encouraged voices and actions from the students and school staff and local agency staff. Most importantly, the TGSPNP put the green school as a national policy from 2001 to 2005. In addition, the National Council for Sustainable Development in June 2002 developed the *Taiwan Sustainable Development Action Plan* (deadline for completion Oct. 2002 – Dec. 2011) and therefore the year of 2003 was the Founding Year of Sustainable Development in Taiwan.

In conclusion, the introduction of environmental education from international societies to Taiwan took place in less than three decades. The Taiwanese government has joined the global trend and planned to be a responsible member of the global village.

2.4.3 Introducing environmental education in Taiwanese schools and in the Grade 1-9 Curriculum

In Taiwanese schools

In 1987, Chapter Three of the *Outlines for Current Environmental Protection Strategy*, enumerated the need to 1) add adequate *environmental materials* into primary and secondary curricula to strengthen citizens' environmental awareness; and 2) add the subject of *environmental technology* into colleges and vocational

schools to prepare technicians of environmental protection (Tzeng, 1990a). The following three strategies were the possible methods recommended to teach environmental education in schools.

1. Opportunistic education
   Infusing environmental education into school curricula and teaching them in the relevant school subjects such as science (chemistry and biology), social studies (geography) or even mathematics.
2. Extracurricular activities
   Choosing environmental topics in extracurricular activities to study it.
3. School activities
   Combining environmental education with school activities such as weekly meetings (running special speeches for environmental education) and various competitions (writing, speech, drama, cartoon, wall poster and toilet beautification). (Guo, 1990, p. 29)

Ching-Ming Wang (1990) reviewed the modules of environmental education activities in Taiwan in early 1990. He stated that Taiwanese school environmental education activities were as not well developed as those of the national parks. One reason was that environmental education was not included in formal school curricula. Secondly, it was hard to teach environmental education properly under the pressure of students needing to take examinations to enter higher schools. In late 1990, Tzeng (1990b) examined the island-wide expansion work for environmental education. He commented that there was a lack of environmental protection courses and facilities in formal education in Taiwan. Tzeng then suggested establishing an *Environmental Education Centre* in each of the nine teacher colleges to develop local environmental courses and teacher development. He even commented that environmental education in Taiwan was still in its beginning and at a planning stage by 1990. Therefore, a six-year enhancement project (1991-1996) was proposed by the MOE, but under the EPA's designation, to expand environmental education in both school and social education. There were eight sub-projects to expand school environmental education in this plan. These are listed below (Ministry of Education, 1990b, p. 68-69).

1. Establish the *environmental protection team* at every education level to conduct activities on loving the environment, to beautify the campus and to process the waste and effluent of domestic uses and laboratories in schools.
2. Develop *environmental curriculum* and *teaching materials* at different levels of formal education.
3. Manage *environmental education workshops* for school staff.

4. Conduct *loving environment activities* such as world or earth environmental day; environmental education month or week; exemplars selection of loving the environment; competition of environmental protection studies; competitions of environmental speech, wall poster, cartoon, poster, calligraphy and cleaning; activities of bird/flower watching, planting and photography; activities of checking pollution sources in school grounds and community; activities of garbage classification and recycling; activities of visiting facilities of environmental protection and running films of environmental protection; and others.
5. Study and improve *outdoor education* to enhance students' environmental awareness by establishing nature and ecology education centres.
6. Consolidate the *facilities* of environmental protection in schools to handle laboratory waste and pollution.
7. Encourage school staff and students in doing *researches* of environmental education at every education level.
8. Develop and conduct *evaluation* of school environmental education.

Another six-year project (1991-1996) was developed by the MOE, also under the EPA's designation, and aimed at controlling *campus pollution* in formal education. By contrast, this project was executed with the budget of NT$868 million (Ministry of Education, 1990a); the environmental education enhancement project did not mention the budget. This can be seen as a difference in budget planning in the 1990s between the hardware and the software of the expansion of school environmental education.

Jun-Te Li (1994) stated that the MOE in the early 1990s had published a series books on environmental education for primary, junior/senior high and vocational school students. The MOE also published a series of teacher guides on nature ecological protection education for all levels of formal education, manuals on laboratory safety and environmental protection, books of general and professional environmental education courses for non-scientific and scientific tertiary education, and books for pollution control courses in vocational schools. Yang, Wang and Chen (1995) reported that the concepts of environmental protection had already been infused into the school subject textbooks of primary and secondary education by 1995. Wang, Lin, Li, and Chen (2000) analysed the works of school environmental protection teams in 254 schools during 1998 - 1999. The schools were junior high or senior high or vocational schools within nine counties in northern Taiwan. Wang *et al.* (2000) reported that the main environmental education topics run by these schools were saving energy, saving water, school

grounds greenification and beautification, ecology education, school safety and sanitation, and garbage processing. This indicated that, prior to 2001, Taiwanese school environmental education mainly focused on two themes: *environmental protection* and *ecological protection.* As to the issue of how middle schools teach environmental education at the classroom level, this was not mentioned in Wang's analysis nor in any other studies.

In the *Grade 1-9 Curriculum*

In 1990, the Ministry of Education established the *Environmental Protection Team* to be responsible for school environmental education. The Ministry required every education level, via the 1991-1996 enhancement project, to organise a *school environmental protection team*. Despite this, environmental education remained at the edge of classroom teaching. Thus, the 2001 curriculum reform included environmental education to signify the requirement for schools to give it a go. When examining the comparison of the old and new curricula at junior high school level (see Appendix 3), one of the distinguishing features of the new curriculum is the infusion of *Important Issues* (information technology education, ***environmental education***, gender education, career development education, human rights education and home economics education). According to the general guidelines of the Grade 1-9 Curriculum, these six *Issues* are required to be infused into all the seven learning areas. They all have their own curriculum guidelines. Hence, environmental education gains an official position and status with the new curriculum, which had been absent in the old curriculum.

There are five curriculum goals for environmental education in its curriculum guidelines (Ministry of Education, 2000b).

1) Environmental awareness and sensitivity
2) Environmental concepts and knowledge
3) Environmental ethics and values
4) Environmental action skills
5) Environmental action experiences

The development of the *Guidelines of Environmental Education* was influenced by the 1972 UN Conference on the Human and Environment, Our Common Future, and the 1992 Earth Summit's Agenda 21 (Ministry of Education, 2000b). The *Guidelines* (see Appendix 4) enumerate the competence indicators for three

learning stages (Grades 1-3, 4-5 and 6-9) and suggest how to infuse them into seven learning areas along with the ten core competences in the general curriculum guidelines. Thus, the curriculum reform in 2001 introduced environmental education into the school curriculum, highlighted its importance for implementation at the classroom level and provided some suggestions for how to do this.

2.4.4 The emerging research questions

Before the 2001 curriculum reform, there was little understanding of environmental education at the classroom level in Taiwanese junior high schools (see Section 2.4.3). Obviously, this reform provided a significant opportunity for the formal introduction of environmental education in schools. Environmental education is not one of the seven major learning areas but rather one of six *Important Issues* which together occupy 20% or less of school timetables. Because of this, the implementation of environmental education is one of the significant challenges facing Taiwanese junior high schools as a consequence of the 2002 curriculum change. Therefore, the emerging research questions for this thesis are:

1. What was the role and place of environmental education in the pre-reform school curricula?
2. What is the influence of the introduction of environmental education (as required in the new national curriculum) on school curricula?
3. What is the impact of the new national curriculum on teacher views and practices in environmental education?

2.4.5 Summary of section 2.4

Environmental education was introduced into Taiwanese junior high schools from the 1990s. Prior to the 2001 curriculum reform, the methods used were opportunistic education, extracurricular activities and school activities, and so environmental education was mainly in the informal, rather than the formal curriculum. Inside the formal curriculum, it was basically taught opportunistically rather than in a pre-determined way. There is a need therefore to understand the

practice of environmental education in junior high schools after the reform. Therefore, three research questions detailed above emerged to be answered for this thesis.

2.5 Summary

Chapter Two began with a brief description of the physical and social background in Taiwan as a context for the recent educational reform. The description showed that economic development, especially after World War II, has caused considerable environmental degradation in Taiwan. During the 1990s, this gradually raised national awareness of the need for environmental protection, especially through the environmental education in schools.

Section 2.3 introduced Chinese educational traditions and attitudes towards the environment, particularly the implications of the paradox between Confucianism and Taoism. Then, the section described the background of the recent educational reform and the 2001 curriculum reform. It also delineated the characteristics, implementation process and critiques of the curriculum reform. Section 2.4 first described the history of the introduction of environmental education from international societies into Taiwan. It then reviewed the practice of environmental education in Taiwanese schools before 2001. Because little research had been done on the teaching and learning of environmental education at the classroom level in Taiwan, and because environmental education had a low status in the curriculum reform, there was a need to investigate the effectiveness of its introduction into schools after the reform. Hence, three research questions emerged for this thesis to be answered.

Chapter Three will review the international literature related to curriculum generally, and the emergence of a new school subject particularly. Chapter Four will review the international literature related to the implementation of environmental education. The methodology used in this research will be described in Chapter Five.

CHAPTER THREE:

IMPLEMENTING NEW CURRICULA AND THE EMERGENCE OF A NEW SUBJECT

"Real change, whether desired or not, whether imposed or voluntarily pursued, represents a serious personal and collective experience characterised by ambivalence and uncertainty."
Micheal Fullan (1982) in *The Meaning of Educational Change*, p. 26.

3.1 Introduction

The rationale and characteristics for a new national curriculum in Taiwan in 2001 were introduced in Chapter Two. The very limited efforts to introduce environmental education into Taiwanese schools by government before this new national curriculum were also delineated. The relatively low status of environmental education even in the new national curriculum was discussed. An investigation into the effectiveness of the introduction of environmental education when implementing the new national curriculum is of possible value. This thesis tracks the introduction of what was virtually a new subject - environmental education – within the broad context of a whole new curriculum.

This chapter reviews the literature on curriculum theories, curriculum change, and curriculum implementation in general and the emergence of a new subject in particular. Section 3.2 introduces a definition for curriculum and curriculum theories. Section 3.3 discusses curriculum change, both models and global trends, while curriculum implementation models and global trends are reviewed in Section 3.4. Section 3.5 reviews the literature on the emergence of new subjects in schools generally to offer understanding of the particular themes involved when environmental education is the school subject in question.

The chapter concludes with a summary of each section and details the definitions of curriculum, curriculum change and curriculum implementation used in this thesis. The last section also indicates the relationship between literature and the 2001 curriculum reform in Taiwan. Finally, it suggests the need to compare the intended or planned emergence of environmental education as required by the

new national curriculum in Taiwanese junior high schools, with the reality in schools.

3.2 Curriculum and Curriculum Theories

3.2.1 Introduction

Education is often regarded as the best tool for government or national leaders to cultivate their ideal future citizens and so curricula often reflect government priorities and society values. In Young's (1971) terms, curriculum is central to schooling, while schooling is fundamental to the structuring and restructuring of social relations and norms. This section first reviews definitions of curriculum and identifies a definition for the present research. Next, the different philosophical thinking underlying the various curriculum theories is reviewed and a range of models of the process of the curriculum development are described. Finally, the socio-historical view of curriculum theory is introduced.

3.2.2 Defining curriculum

Curriculum has a number of definitions and can be viewed from a number of perspectives. One perspective is to view curriculum as a written plan which results from a process of deliberate planning and decision-making. According to where the decision-making is located, there are five levels of planned curriculum: national, regional, school, department/teacher and classroom (Lawton, 1980; Packman, 1996). The curriculum plan that is developed at the national level is interpreted level by level by regional governments, schools, department or subject teachers, and class teachers (Carr *et al*., 2000). Class teachers, however, hold the ultimate power to interpret the national curriculum through their actions with their students in the classroom. Reviewing the literature from the 1950s onwards, McGee (1997) summarised another perspective; curriculum is a plan and what happens when teachers implement the plan in classrooms. This view stresses student classroom learning experiences as the key interpretation and meaning of curriculum. Huang and Yang (2000), reviewing definitions of curriculum since the 1920s, came to a similar conclusion although they divided the definitions into five categories: objectives, plans, subjects, experiences and products. However, Huang and Yang's conclusion is consistent with the view that curriculum is a plan

and the implementation of that plan in classrooms, because objectives, subjects and products are usually part of plans and experiments are always linked with the implementation of the plans.

A broader view of curriculum sees it in terms of social, cultural, and historical dimensions. Lawton (1980) commented that it would be difficult to discuss curriculum in a meaningful way if there was no consideration of the social, cultural, and historical context of specific curricular issues. Therefore, some educators view curriculum as a social construction (Goodson, 1994; Grundy, 1987; Schubert, 1986) because a curriculum changes in response to historical circumstances, economic and political structures, and the human and self-interests of the makers of curricula. Grundy (1987), for example, viewed curriculum as a cultural or social construction rather than a concept coming with a set of plans. This view of curriculum is more concerned with the experiences people have, curriculum is a way of organising a set of human educational practices. Similarly, Schubert (1986) believed that a curriculum could be an agenda for social reconstruction and schools should provide an agenda of knowledge/values to guide students in improving society. Goodson (1994) also described the curriculum as a social construction because the curriculum relates to social priorities clearly tied to social class.

Some scholars stress the importance of negotiation during the process of developing a curriculum. Early in the 1960s, Williams (1961) asserted that an educational curriculum expressed a compromise between an inherited selection of interests and the emphasis of new interests. Eggleston (1977) extended this idea to argue that curriculum involved 'fundamental conflicts' over the identity and legitimacy of the rival contenders. People could look for membership of the groups who define, evaluate and distribute knowledge and the power these confer. That is why Bernstein (1971) asserted that how a society selected, classified, distributed, transmitted and evaluated the educational knowledge it considered to be of value reflected both the distribution of power and the principles of social control. Goodson (1994) proposed that a curriculum was a product of construction, negotiation and renegotiation at a variety of social levels and in a variety of arenas. He emphasises the importance of schooling when defining and

redefining the written curriculum because the curriculum is a visible public testimony of the selected rationales and legitimating rhetoric for schooling. The school curriculum is therefore a social artefact (Eggleston, 1977; Goodson, 1994), conceived of and made for deliberate human purpose. In Goodson's (1994) opinion, the written curriculum is a prescription to schools. In many countries the official school curriculum has long been treated as a given (Eggleston, 1977; Goodson, 1994) in this sense. Extending the metaphor of prescription, Goodson (1995) refers to the curriculum as a socio-historical product of particular periods of time in that it has a historical dimension which reflects the complexity of curriculum action and negotiation over time. From a socio-historical view, the school curriculum is a social process conditioned by competing ideologies and the vested interests of those both internal and external to the school (McCulloch, 1988).

This thesis will follow Goodson's social-historical view of curriculum because the research focus is the historical changes in Taiwanese junior high schools with influences from the society. Based on the five different levels of curriculum, this research will focus on the level of school because the research aim is to study what really happens in environmental education inside schools at a time of curriculum reform. The focus is on the development of school curricula, bearing in mind that at the level of the class teacher what will be taught in environmental education is prescribed by official national guidelines and the school plan (McGee, 1997). Taking into account these aspects, the definition of curriculum used in this thesis is that it is 'a school plan which is affected by social, economic, historical, cultural and political dimensions.'

3.2.3 Curriculum theories

Barrow (1984) stated that curriculum theory should primarily address itself to questions about the prescribed content of the school curriculum. He argued this on the grounds that a good theoretical grasp of what is being taught and why, and what should be taught and why, is essential to judging practice, carrying it out, and improving it. However, Kemmis and Fitzclarence (1986, p.35) delineated curriculum theory in a more critical way "curriculum theories are social theories not only in the sense that they reflect the history of the societies in which they

arose, but also in the sense that they entail ideas about social change and, in particular, about the role of education in the reproduction and transformation of society." In fact, the nature of curriculum theories and the process of curriculum development is evolutionary, something which is evident in historical developments.

Kemmis and Fitzclarence (1986) indicated that curriculum theories have evolved from the practical (pre-twentieth century) to the technical (before the 1960s) and back towards the practical (in the 1960s), becoming critical since the 1970s. Technical reasoning is about how things can be done while practical reasoning is about what ought to be done. Critical theorising aims to create conditions under which distorted existing relationships can be transformed by organised, collaborative action. The philosophical thinking of technical and practical curriculum theories derives from Aristotle in Greek times and Aristotle ranked practical above technical reasoning (Grundy, 1987; Kemmis & Fitzclarence, 1986). Historically, practical curriculum theorising was the characteristic of the pre-twentieth century. In the first half of the twentieth century, especially after 1920s, the technical tradition became dominant (Schwab, 1969). From the late 1960s, Schwab and others advocated a return to practical curriculum thinking and theorising. For instance, Reid (1978) suggested that curriculum problems were practical problems which were moral rather than technical in nature. Since the 1970s, the demand for critical thinking emerged supported by educators such as Habermas (1972), Kemmis (1986) and Grundy (1987). The reason behind this change, in Kemmis's (1986) view, is that critical curriculum theorising attempts a historical and social analysis of the contemporary forms of curriculum through a collaborative process of self-reflection. Thus, it can transcend both technical and practical curriculum theorising to critique contemporary education and to engage with the historical, social and political struggle to change it.

Goodson (1994) adopts a different approach from historical and sociological dimensions to provide a more complex meaning for curriculum theorising. He criticises contemporary curriculum theories because they do not generally seek to explain or theorise curriculum as it is defined, negotiated and realised in schools. What is inside the curriculum, in Goodson's view, is the prescription of school

subjects. He argues that the genesis of curriculum theory as prescription has long been related to the broader social and economic context. However, the written curriculum in schools has been politically and socially redefined over time. The curriculum is a kind of social construction, not only at the level of prescription but also at the levels of process, practice and discourse. Goodson's social constructionist perspective of curriculum theory seeks a reintegrated focus towards the development of data on social construction of curriculum at both pre-active and interactive levels. The most significant gap for such a reconceptualized program would be an historical study of the social construction of school curricula.

Reviewing the history of curriculum planning, a similarly evolving pathway to curriculum theories also happened in its development. Grundy (1987) and Kelly (1989) presented the evolutionary path for models of curriculum planning. First the content or transmission model views curriculum as content and education as transmission of knowledge (Kelly, 1989). This model is based on the assumption of cultural reproduction of selected knowledge-content to be transmitted in schools and indicates technical reasoning. Secondly, the objectives or product model (the industrial model from Tyler with an underlying technical philosophy) views the curriculum as product and education as instrumental activity (Grundy, 1987; Kelly, 1989). It is assumed that human behaviour can be studied scientifically and explained in terms of causes rather than purposes. Therefore, it selects content or knowledge in order to achieve predetermined objectives and/or bring about certain behaviour changes. Third, the process or developmental model (from Stenhouse incorporating practical thinking) views the curriculum as process and education as development (Grundy, 1987; Kelly, 1989). The claim of this model is that the promotion of human autonomy is a major principle of educational practice. Education is viewed as a process of growth and moral/social development. Thus, this model embraces affective more than cognitive development. Finally, the critical or emancipatory model is based on emancipatory interest from Habermas (Grundy, 1987). It is also referred to as a research model (Stenhouse) and relates to developing reflection and carrying out action in both a participatory and collaborative way. In Kelly's (1989) opinion, the content/transmission model is a very limited and unsophisticated view due to its lack of justification for what is to be taught and learned, which is curricular

prescription. He also noted that the objectives/product model takes no account of individual autonomy and fails to address value issues, which are central to educational decision-making. In contrast, the process model offers a view of what education might be and what it should be; which is to stimulate a positive awareness of the nature of all educational and social prescriptions. However, only the critical model involves action research practices by teachers. The emancipatory interest is discernible in the power of the acting subjects (teachers) to control all aspects of the process and the reciprocal, but not deterministic, relationship between action and reflection (Grundy, 1987).

In short, the development of curriculum theory and/or planning evolves towards a critical mode. However, Goodson highlights the need to study, in an historical way, the social construction of school curricula. Accordingly, this is the research focus of this thesis, to investigate school development in a longitudinal way.

3.2.4 Summary of section 3.2

Among the many definitions of curriculum available, section 3.2.2 combines both Goodson and McGee's views to define curriculum for this study as 'a school plan which is affected by social, economic, historical, cultural and political dimensions.' This definition is used in the remainder of this research. Section 3.2.3 discussed the evolution and historical development of curriculum theories based on the philosophical thinking of Aristotle and Habermas. It depicted Goodson's view on curriculum theories from historical and sociological angles to provide a more complex meaning for the notion of curriculum theorising. A socio-historical view which allows for the influence over time of different social priorities is adopted in this thesis.

The critique of the Taiwanese new national curriculum in Section 2.3.4.3, argued that the new curriculum has the essence of Tyler's objectives model reflected in its core rationale, curriculum goals and especially the predetermined goal setting of core competencies. Although no documents explained its philosophical and/or cultural background, it could be referred to as technical when considered in relation to the preceding discussion of curriculum development. However, the focus on curriculum integration and school-based curriculum development in this

new national curriculum is the characteristic of progressivism, which can be related to Stenhouse's process model. The paradox of the embedding of multiple curriculum theories indicates that political negotiation and compromise might have taken place across and between the different sectors of Taiwanese society under the circumstances of deregulation in the 2001 curriculum reform. The new Taiwanese national curriculum then could be seen as a socio-historical product.

Reviews of curriculum theories and development in this section, suggest that environmental education in the Taiwanese new national curriculum is a socio-historical product in the sense that it derived from the historical imperative of economic development and the social problem environmental degradation. The curriculum's development involved political negotiation between government departments, environmental pressure groups, education professionals at all levels of the system and public expectations. As Goodson (1994) argued, the written curriculum can be seen as a public testimony of selected rationales and legitimating rhetorics for schooling. The Taiwanese new national curriculum document, in Goodson's terms, is a prescription that has been distributed to schools to delimit school curriculum development. The introduction of environmental education as a relatively new subject in curriculum planning and development in Taiwan raises questions about how effective the curriculum change and curriculum implementation will be. These two issues will be discussed in the following sections. Whether the national curriculum planning for environmental education achieves its stated goals within implementation of the new Taiwanese national curriculum in junior high schools from 2002, is the focus of this thesis.

3.3 Curriculum Change

3.3.1 Introduction

Curriculum renewal has been a continuous and gradual process since schooling began (Kerr, 1968). Knowledge, education, society and schools themselves all are the sources of changing and/or making the curriculum. It is also a characteristic of educational reform that curricula are always evolving.

This section first introduces definitions of curriculum change and/or educational change. Secondly, it describes models of curriculum change along with global trends towards an understanding of the 2001 curriculum change in Taiwan, especially the introduction of environmental education. Thirdly, it describes the factors influencing curriculum change which could be relevant to Taiwan's case.

3.3.2 Definitions of curriculum change

A broad view of curriculum change is one that explains why and how change happens. Ornstein and Hunkins (1988) mentioned that curricula could either reflect society or reflect upon and indirectly help shape society. Some scholars have argued for the first view. Anderson (1992) stated that schooling mirrored society in the sense that the sources or engines of change within schools were located outside of the educational system in the larger society; thus social change within the society generated opportunities for educational change. Other scholars have argued for the second view. Young (1971) argued that curriculum change preceded social change so that we might be able to change society by changing the curriculum and by choosing to educate children differently. However, these two views actually interact and happen simultaneously. Social change can lead to curriculum change and then onto school change that involves the change of school culture and teacher beliefs. In the opposite way, change that happens in schools can feed back into society and then change the society itself. This is a sociological view of curriculum change and evident in the thinking of a number of leading scholars. For example, Gordon and Lawton (1978) argued that curriculum change was the result of complex patterns of interaction between influential individuals and general processes of social, political and economic change. Codd (1981) related curriculum change to social and political interests and argued a need for sociological research into the structure and dynamics of school curricula for it to be better understood. Rudduck (1991) proposed that we should try to see change as a cultural problem at the school level because some changes proposed by outsiders could require a revolution in attitude and methods related to curriculum development. Likewise, Reid (1999) argued that curriculum change is a type of socio-cultural change and stressed the role of groups, cultures and organisations. Goodson (1994) even commented that changes in curriculum might present a response to declining and/or increasing subject status in the school

curriculum. This sociological view initially sees curriculum change relevant to social, political and economic change, and then adds on cultural and organisational aspects to make it even broader. The focus of this view evolves from the interaction between curriculum change with individuals, school curricula, school culture, curriculum development and then specifically to subject status in the school curriculum. Thus, this sociological view of curriculum change can explain why a new subject could emerge successfully or unsuccessfully during a curriculum change.

As to what changes specifically happen in a curriculum change, Morrish (1976) broadly described three types of change introduced into schools: hardware (building/equipment), software (curriculum) and interpersonal relations. Fullan and Pomfret (1977) stated more precisely that a curriculum change consisted primarily of five dimensions: changes in subject matter or materials, organisational structure, role/behaviour, knowledge and understanding, and value internalisation. However, since the 1980s, Fullan (1982, 1991, 2001) has shifted to use the term educational change and to assert that change has three dimensions: the possible use of new or revised materials, the possible use of new teaching approaches, and the possible alteration of beliefs. In this way Fullan has moved to place more emphasis on changes in subject matter or materials, teaching behaviour, and values. From the early 1990s, in yet another refinement, he has argued that a fundamental shift of mind is needed in current conceptualisations of educational change to highlight value issues (Fullan, 1993). This shift towards a value-laden understanding of curriculum change has arisen because of recognition that real change in teaching behaviours and materials only happens after values have been changed.

In summary, curriculum change could be thought of as the addition of school equipment and/or the adoption of new practices including new teaching materials, teaching methods and beliefs or, more radically, a fundamental change of mind. In a broader view based on sociology, curriculum change builds on and incorporates changes in society, culture, and institutional organisation. Under changes in society and in public opinion environmental education was introduced into the Taiwanese school curriculum during the 2001 curriculum reform in a

manner consistent with a sociological view. For the purposes of this thesis, the definition of curriculum change includes attention to changes in teaching materials and practices, which encompass 'the use of a new national curriculum document'. With the introduction of the new national curriculum, Taiwanese junior high schools have been required by the Ministry of Education to submit a school plan to their local educational bureaus. In this thesis, the curriculum is defined as a school plan where this is affected by social, economic, historical, cultural and political dimensions (see Section 3.2.4). The definition of curriculum change will also consider the need for changes in values. Thus, the effectiveness of the introduction of environmental education into the school curriculum needs to be investigated. This is the goal of this study.

3.3.3 Models and global trends in curriculum change

Curriculum change influences every member in the society. The numerous educational professionals, students and parents are all involved in this social construction. Whether a curriculum change will be effective, or not, depends on its intrinsic qualities. This section introduces theoretical models and global trends of curriculum change towards understanding of the 2002 Taiwanese curriculum change at the junior high level.

There are various models for curriculum change, but basically they fall into three broad categories: top-down, bottom-up, and something between top-down and bottom-up. They could be viewed as centre-periphery, periphery-centre, and periphery-periphery (Eden & Tamir, 1978; Holt, 1980; MacDonald & Walker, 1976). Top-down or centre-periphery models of curriculum change include Havelock's *RDD* model, Westley's policy decision change, and Jenkins's institutionalisation change. Havelock, Guskin, Frohman, Havelock, Hill and Huber (1969) used the term research, development and diffusion (RDD) to describe the process of the centre-periphery model where first objectives are defined, then curriculum materials/content developed to achieve these objectives, and finally these changes are diffused to schools. This process positions the innovating project team at the front of the process of change and therefore schools are passive consumers. Similarly, Westley's (1969) policy decision change (cited in Morrish, 1976) is that changes occur through policy decisions. Normally a

central governmental authority decides to adopt a new idea and issues the requisite regulations and instructions to bring it into effect. Jenkins' (1976) notion of institutionalisation stresses the institutionalisation of the whole process of curriculum change so as to understand how to make the curriculum into a legitimate object of social policy. With the implementation of this policy, curriculum change could be initiated.

Havelock's problem-solving model, Morrish's creative change, Jenkins's and Westley's grass roots change are all examples of a bottom-up or periphery-centre (Eden & Tamir, 1978; Holt, 1980; MacDonald & Walker, 1976) model of curriculum change. The problem-solving model involves school-based change and implies a close linkage between resources and the users in schools (Havelock *et al*., 1969). It is a system-based change where teachers themselves are the change agents. Creative change as outlined by Morrish (1976) means a voluntary and self-imposed desire to alter customary usages, to reduce as much as possible the hiatus between the current practices of the system and the avowed objectives, to redefine problems and recognise new ones, and to invent new ways of dealing with these problems. The characteristic of grass roots change is that the curriculum reform movement emerges from curriculum entrepreneurs. This points to a grass roots image of reform in which the system as a whole is perpetually being infused and transformed with new ideas from those involved, and develops its own norms and practice (Jenkins, 1976; Westley cited in Morrish, 1976).

The model between top-down and bottom-up is Havelock's (1969) social interaction or periphery-periphery model (Eden & Tamir, 1978; Holt, 1980; MacDonald & Walker, 1976). The social interaction model moves the focus of change from a central team to intermediate agencies such as teachers' centres and/or colleges of education, which is a bit nearer to the school. In this model it is recognised that social diffusion is an important way in which schools pick up ideas (Havelock *et al*., 1969). It emphasises the aspect of diffusion, the movement of messages from individual to individual, from system to system, and from one place to the other (Eden & Tamir, 1978; Havelock *et al*., 1969; Morrish, 1976). The individual receiver is therefore the unit of analysis and the focus is the

receiver's perception of and response to knowledge originating from outside. Thus, the key to adoption is the social interaction or personal contact among members of the adopting group. However, in this model the centre still limited the initiatives of the teacher as the centre decided what would be the best samples to be distributed (Eden & Tamir, 1978).

There is another way to shape the various types of curriculum change. In 1980, Ernest House (cited in McGee, 1997) developed a three-fold perspective to encompass the different kinds of educational change and innovation. First, the technological perspective is best shown in the RDD model and based on a system theory approach. It assumes that teachers are technicians and teacher training will bring about improvement in education. This technological perspective is therefore in line with the centre-periphery model. Secondly, the political perspective emphasises that when curriculum change occurs, it inevitably involves conflict in that some teachers want to change while others do not. It would result in negotiation and trade-offs among involved members. This political perspective would be shown in periphery-periphery model. Thirdly, the cultural perspective is concerned with the social setting in which any change is implemented. It focuses on the complex reality of everyday life in a school and how the school culture affects attempts to change on staff members' attitudes, values, beliefs and human relationships. School staff could influence one another to achieve the school-based change. In this sense, this cultural perspective could be viewed as periphery-centre model.

There are three kinds of implementation strategy that can be used to achieve curriculum change: power-coercive, empirical-rational and normative-re-educative (Chin, 1968). First, the power-coercive strategy is one where curriculum change is introduced by official policy or force. This strategy could be associated with centre-periphery model and a technological perspective to implement curriculum change. In contrast, the empirical-rational strategy is based on persuading teachers to adopt a change by using reason and rationality to show that the change is for the better, and that it will lead to improvement. This strategy could still be associated with the centre-periphery model but might involve with a political perspective when implementing curriculum change. Third

and quite differently again, the normative-re-educative strategy emphasises the norms of schools - the attitudes, values and beliefs which are a school's culture - and how these can be shifted to more productive norms through the collaborative action of the staff although this strategy also utilises persuasion and collaboration. This strategy could be viewed as associated with periphery-centre model and a cultural perspective to achieve the goal of curriculum change.

McGee (1997) summarised these ideas to discuss global trends in curriculum change. He described the prevailing model of curriculum change up to the 1960s as centre-periphery. Due to increasing criticism of power-coercive and empirical-rational strategies in the 1970s and 1980s, organisational self-renewal became a preferred choice, this being similar to the normative-re-educative model in which the school is the central focus of change maintaining its internal structural strengths and adapting to a changing environment to improve itself. However, the demand for much broader social, political and economic agendas led to the curriculum change which has happened in Britain, USA and Australia since the 1980s, with a strong role of central governments on educational decision-making (Kennedy, 1995). In the 1990s, there are two major trends, innovation and empowerment, influencing schools (Robbins, 1993) based on the organisational development. The school culture of innovative schools is willing to try different curriculum emphasises and ideas and provides opportunities for empowering teachers by putting them at the forefront of curriculum decision-making and allowing them to develop a stronger sense of ownership of their own decisions, rather than having them imposed from outside. Yet, there still are increased demands from the central influences of the government and the Ministry of Education to conform to curriculum guidelines in the 1990s (McGee, 1997). For example, the educational reform movement initiated in the 1980s in Britain, USA and Australia with strong influences from the central governments have continued into the 1990s (Kennedy, 1995).

Based on these characteristics, the 2001 curriculum reform in Taiwan would seem to be best described by the centre-periphery model with power-coercive and empirical-rational strategies that couple strong technological perspective with slight political perspective. The development of the General Guidelines and

Guidelines of each learning area by two research panels over the years 1997 - 2000 and then the distribution of these documents to schools in 2000 (see Section 2.3.3), is exactly the centre-peripheral or top-down model with an innovating project team at the front of the process and schools at the back. Despite opposition from universities, academics and schools that the timeframe was too short, the Ministry of Education (MOE) insisted upon implementing the new curriculum on schedule under administrative orders from central government (see Section 2.3.4.2). This approach is a characteristic of the technological perspective and power-coercive strategy. In addition, workshops were run to transmit information about the curriculum change and to persuade teachers to adopt the change (see Section 2.3.4.2), a distinctive characteristic of the empirical-rational strategy and slightly involving a political perspective. However, the new national curriculum also gives freedom, the so-called deregulation in Section 2.3.3, to schools to develop their own school-based curricula. The MOE expected to achieve a school-based change by giving freedom to schools and thereby changing schools' culture. This could be seen as a normative-re-educative strategy which is more in line with a periphery-centre model and a cultural perspective of curriculum change. From these characteristics, this curriculum change could be seen to reflect multiple models of curriculum theory as a consequence of political negotiation under the circumstance of deregulation. This paradoxical situation implies that the purpose of this curriculum was to avoid the hegemony among theories/models of curriculum and curriculum change (see Section 2.3.4.3). The effectiveness of a centre-peripheral model with power-coercive and empirical-rational strategies coupled with some deregulation of authority over the curriculum to schools, needs investigation, especially as to whether or not schools would choose environmental education as their school-based curriculum.

3.3.4 Factors influencing curriculum change

Goodson (1994) pointed out the error in assuming that bureaucratic accountability and power could ensure implementation and that growth, optimism and improvement would complete the task when schools and teachers encounter curriculum change. This section sets out the range of factors that have been

proposed as influencing curriculum change in order to develop a set of factors for further exploration in this study.

Early in the 1970s, Walton (1971) described the constraints and opportunities for effective curriculum change as follows:

1. Materials, equipment and money, both actual and potentially available;
2. Political factors, including the pattern of authority relationships within the school and between schools, and the forces impinging upon the school from its environment;
3. The skills, knowledge and personalities of the teaching participants; and
4. The aptitudes, abilities, interests and defined educational needs of the pupils. (p. 31)

More recently Fullan (1991, 2001) has proposed the following factors as affecting curriculum change:

1. Existence and quality of innovation;
2. Access to information;
3. Advocacy from central administration;
4. Teacher advocacy;
5. External change agents;
6. Community pressure/support/opposition/apathy;
7. New policy and funds (federal/state/local); and
8. Problem-solving and opportunistic (bureaucratic) orientations. (p. 50)

The views of Walton (1971) and Fullan (1991, 2001) indicate that understanding of the complexity of curriculum change has evolved over time, and that the influential factors have become more tightly specified. While Walton uses the broad term political factors, Fullan divides this notion into three points, those of advocacy from central administration, external change agents, and community pressure/support/opposition/apathy. Fullan also raises additional issues such as the quality of the innovation and the method (problem-solving or opportunistic orientation) of its implementation. Both authors construe resources, especially funding, along with teacher involvement as fundamental to effective curriculum change. Obviously, these factors need attention in a study where the intention is to check whether or not the 2002 curriculum change in Taiwanese junior high schools has achieved its stated goal. In this study, the effectiveness of the infusion strategy for the implementation of environmental education is of particular interest.

3.3.5 Summary of section 3.3

Among the many descriptions of curriculum change available, a sociological view towards curriculum change and its process was adopted in this study (see Section 3.3.2). In this thesis, curriculum change is taken to mean the use of a new national curriculum document where a curriculum is taken to be a school plan. In Section 3.3.3, it is noted that there has been a similarity amongst the various different terms used for the models of curriculum change over time. For instance periphery-centre, problem-solving, grass roots and creative change all have the schools and teachers as the driving force for change. In contrast, centre-periphery, RDD, institutionalisation and policy decision change all derive more from governmental policy and initiatives. In between, there are social interaction and periphery-periphery models. The technological, political and cultural perspectives resemble the centre-periphery, periphery-periphery and periphery-centre models respectively. Three implementation strategies used in curriculum change models are power-coercive, empirical-rational and normative-re-educative. Up to the 1960s, the global pattern of curriculum change was the centre-periphery model with power-coercive and empirical-rational strategies. Organisational self-renewal became another choice in the 1970s and 1980s. Paradoxically, in the 1990s there has been an increase in demands for central government to direct the curriculum guidelines. Compared with the models, perspectives and implementation strategies of curriculum change, the Taiwanese curriculum change can be seen as centre-periphery model with power-coercive and empirical-rational strategies giving freedom to schools for their own school-based curricula development. The driving force of this curriculum change is Taiwanese central government. It could mainly reflect the technological perspective of curriculum change.

Section 3.3.4 discussed factors that impact on effective curriculum change and set out these as a platform for considering the effectiveness of the 2002 Taiwanese curriculum change at the junior high level. The situation of environmental education, which is not one of the seven major learning areas defined in the curriculum guidelines, is likely to be even more problematic than that for mandated subjects. Thus, it would seem important to study this situation in terms of factors that did, and did not, support curriculum change.

3.4 Curriculum Implementation

3.4.1 Introduction

According to Fullan's (1982, 1991, 2001) description of the curriculum change process (initiation, implementation, continuation/institutionalisation, and finally outcome), the practical test of curriculum change is in the implementation processes in schools after its initiation by educational authorities. This section first reviews definitions of curriculum implementation, then introduces models for and global trends in curriculum implementation, for the purpose of developing an understanding of the implementation process of the new Taiwanese national curriculum. Finally, factors influencing curriculum implementation, which could be relevant to Taiwan, are described.

3.4.2 Definitions of curriculum implementation

A very short definition for curriculum implementation comes from Robin Barrow (1984): implementation is 'selling the product'. This view may be seen to be based on the assumption that there is already produced a rationally defensible proposal. A more comprehensive definition deals with the idea that curriculum implementation is about doing something new, or different, from what was done in the past. For instance, Fullan and Pomfret (1977) define curriculum implementation as the actual use of an innovation, or what an innovation consists of in practice, which differs from both the planned use and any intended use, and from the decision to use the innovation. Similarly, Loucks and Lieberman (1983) define curriculum implementation as the actual use of a new practice, what the practice looks like when certain characteristics are actually in use in a social system. Again and later, Fullan (1982, 1991, 2001) describes curriculum implementation as consisting of the process of putting into practice an idea, program, or set of activities and structures new to the people attempting or expected to change. In this thesis, given the definition of curriculum and curriculum change, curriculum implementation is taken to mean 'the use of a new school plan'.

3.4.3 Models and global trends in curriculum implementation

Discussion of models of curriculum implementation actually overlaps to some extent with discussion of curriculum change in the literature. This shows an

intertwined relationship between these two terms, as implementation always arrives immediately after curriculum is changed. Fullan and Pomfret (1977) stated five dimensions of curriculum implementation in practice: changes in materials, structure, role/behaviour, knowledge and understanding, and value internalisation. They are exactly the same themes of as those for specific changes within a curriculum change (see Section 3.3.2). In Section 3.3.3 when discussing curriculum change, McGee (1997) notes House's (1980) three-fold perspectives. They are exactly the same themes Loucks and Lieberman (1983) describe in House's (1979) three views of curriculum implementation: technological, political, and cultural.

The assumptions of the technological view of curriculum implementation are that education is a technical process and teachers are technicians. Therefore, the process of involving school staff is linear and improvement is possible by training teachers in new and improved techniques. This view focuses on the innovation itself and pays scant attention to the process of change, the politics, or the people involved. It is best shown in the RDD model which belongs to the centre-periphery curriculum change model. In contrast, the political view focuses on the institutional context and what happens when the innovation meets the school. It is assumed that many groups are involved with schools and these groups have vested interests in different kinds of change. When curriculum change occurs, it inevitably involves conflict as some teachers want to change while others do not. Thus, education is political and innovations are value-laden as they are sponsored or ignored, adapted and re-shaped, by different group values, assumptions and beliefs. Thirdly, is the cultural view, concerned with the school itself, the people in it, and how the school culture affects attempts to change. This takes into account the complexity of classroom life and the implications of innovations for the individual classroom and school, including, for example, how teachers respond to constant pressure to make changes in the teaching of reading or math.

Before the 1970s, the most prevalent view was the technological one. Since then, the focus has shifted to the school and the people inside it, because the research into school effectiveness and school improvement has been hugely influential in shaping educational reform in many countries. For example, there was a trend

from the move to self-management in the late 1980s in Britain and New Zealand to the charter schools movement in USA in the 1990s (Townsend & Cheng, 2000).

The 2002 curriculum implementation process in Taiwanese junior high schools is consistent with a technological view because it followed the centre-periphery model with power-coercive and empirical-rational strategies during the 2001 curriculum reform. It assumed the implementation process was linear with an initial announcement by the central government giving freedom to local schools and giving staff the right to develop their own school-based curricula. This was followed by the curriculum design and the training workshops. The implicit assumption seemed to be that teachers just needed to have some training and then they would adopt the new curriculum, changing their beliefs and behaviours. There was no obvious consideration of possible conflicts inside schools as the political view suggests or that some teachers would want to make the changes while others would not. No account was taken of school culture as in the cultural view where factors such as: How do teachers see their work? What does it look like when teachers are involved in innovative activities? and How is the process described from teachers' perspectives? How may this affect teachers' attempts to change? Under this circumstance, whether and how junior high schools will choose environmental education, rather than other topics, for their school-based curriculum is worthy of investigation.

3.4.4 Factors Influencing curriculum implementation

Implementation is a process with variable outcomes that can not be predicted. It depends on the degree and quality of change in actual practice. In other words, once changes are initiated they proceed, or not, to some form of implementation and continuation and result in some intended and/or unintended outcomes (Fullan, 1991). Curriculum implementation is not just a simple extension to the planning and adopting processes.

A number of writers have elucidated factors influencing curriculum implementation. These mainly deal with the characteristics of the innovation, strategies used to implement a new curriculum, and the external socio-political environment. Fullan and Pomfret (1977) presented four broad categories of

influence, each with sub-components. The first factor was the characteristics of the innovation with the sub-categories of explicitness (what? who? when? how?) and complexity. Other factors were strategies with sub-categories of in-service training, resource support including time and materials, feedback mechanisms and participation; the characteristics of the adopting unit with sub-categories of adoption process, organisational climate, environmental support and demographic factors; and the final factor was the characteristics of the macro-socio-political units including design questions, incentive systems, evaluation processes and political complexity. After reviewing the work of Fullan (1991), Synder, Bolin and Zumwalt (1992) and Akker (1994), Jang (1999) concluded that there were four factors with a crucial influence on the successful implementation of curriculum change. The first factor was the characteristics of the innovation including whether the innovation suited the needs of users; whether the goal/method of the innovation was clear and easy to understand; whether the difficulty/extent of innovation was too much for users; whether the supporting measures for innovation were workable; and whether the innovation design was technically sound or not. The second one was the local factors at the level of community/school and included changes in the structure of a traditional school; the leadership of the local educational administration; support from community and school or parent board; leadership and support from principal; communication/interaction/sharing among teachers; and the professional knowledge and self guiding/checking strategies of the teachers. The third factor was the strategies planning at the level of community/school including in-service training and seminars/workshops for teachers; decision-making processes; the collection/discussion of problems arising from the process of implementation; and the fluency of communication among organisations. The fourth and final factor Jang (1999) identified was the external environment factors comprising the adjustment of government policies/laws/regulations; advice from outside experts; financial resources; and technical support. The sets of factors proposed by Fullan and Pomfret (1977) and Jang (1999) as necessary for successful curriculum implementation in schools overlap to some extent (innovation's characteristics, strategies, and macro-external factors) although Jang's set places more stress on local factors (especially community) than on schools alone. Interestingly, when these factors for curriculum implementation are compared with those for

curriculum change (see Section 3.3.4) they are essentially an expansion of those provided for this by Fullan in 1991. In this study, the effectiveness of the implementation of curriculum change in Taiwan within the framework of infusing environmental education into seven learning areas will be checked according to the criteria proposed by Jang (1999) because they are the broadest and most specific.

3.4.5 Summary of section 3.4

This section first introduced definitions of curriculum implementation and developed a synthesis view to define the curriculum implementation in Taiwanese junior high schools as 'the use of a new school plan'. It then described models and global trends of curriculum implementation. Finally it introduced the intrinsic factors of curriculum change influencing curriculum implementation. It also highlighted the importance of the relationship between school and community when implementing any new curriculum.

This thesis proposes to investigate and understand the introduction and implementation of environmental education in Taiwanese junior high schools as a consequence of the new national curriculum implemented from 2002. As the researcher has stressed, environmental education had low status in both the old and new Taiwanese national curricula; therefore, understanding the actual practice or implementation of this low status new comer is important, especially since the implementation of environmental education happened under an infusion strategy. Environmental education was competing with the seven main learning areas. Whether or not the junior high schools will choose environmental education to be their school-based curriculum is of the most particular interest.

3.5 The Emergence of a New Subject

3.5.1 Introduction

Curricula have existed since ancient times, examples include the seven liberal arts in West and the six arts in China. McGee (1997) described subjects as the centuries-old tradition of the collections of knowledge that had coherence and were linked by concepts that clustered into meaningful fields of knowledge. As

environmental education is a new comer to the national curriculum in Taiwan, this section reviews literature of the process and themes of the emergence of a new subject and focuses on the issue of subject status in the school curriculum.

3.5.2 The emergence process of a new subject

There are two ways by which a new subject emerges in schools: either evolving internally (voluntarily) or introduced externally (compulsorily). That is, internal evolution or external compulsion. Layton (1972) proposed a tentative model for the emergence of a school subject in the case of science from the nineteenth century in England. The model outlines a three-stage process for dealing with the internal emergence of a new subject. First, this subject gains a place in the school timetable with rarely trained, but enthusiastic, teachers. The selection of subject matter is relevant to the needs and interests of the students. Second, subject specialists emerge and may offer teacher professional development. The internal logic and discipline of the subject become influential in the selection and organisation of subject matter. In the final stage, teachers construct a professional body to achieve the specialisation of this subject. University scholars leading inquiries in this field determine the subject matter taught in schools. This process of development for school subjects can be seen as a process of aspiration upwards.

Reviewing the literature, there is no generalised model for the emergence of a school subject introduced externally or compulsorily; although there are many particular instances, for example the introduction of technology education in many countries such as New Zealand, of subjects that have been introduced by central government via curriculum change. The process of development for the school subject such as technology education can be seen as a process of aspiration downwards.

3.5.3 Subject status in the school curriculum

The relative status of a school subject could be seen from the number of timetabled periods given to it and whether it is compulsory or optional (Bernstein, 1971). Subject status represents the collective professional status of subject teachers in schools (Goodson & Anstead, 1994). It is a phenomenon of subjects' competition in the school curriculum. This competition actually exists in teaching,

learning and resource allocation but is rarely discussed publicly in schooling. Therefore, Musgrove (1968, p. 101) referred to subjects as "communities of people, competing and collaborating with one another, defining and defending their boundaries, demanding allegiance from their members and conferring a sense of identity upon them".

School subject-matter provides an insight into the interplay between social, cultural, economic and professional interests that give form to our contemporary school practices (Popkewitz, 1987). The teaching and learning of subject matter in schools reflect the development of society, culture, economy and professional knowledge. Indeed, school subjects symbolise the deep structure of curriculum differentiation within contemporary schools. They are comprised of shifting sets of teacher sub-groups and are held together under a common name at particular periods in history (Goodson, 1987). School subjects, in Goodson's view, represent substantial interest groups and can be viewed as "no more than socio-historical constructs of a particular time" (Goodson, 1987, p.5).

To understand curriculum change that includes the introduction of interdisciplinary work, it is particularly important to understand power relations between teachers and between school subjects (Paechter, 2000). The impact of subject status to interdisciplinary school subjects influences their emergence in schools. The next section will discuss themes that contribute to subject status in the school curriculum.

3.5.4 Themes influencing subject status towards the emergence of a new subject

There is no single theme with unique power to influence the subject emergence process. Themes discussed below are intertwined but not an independent variable in influencing the emergence of a new subject in schools.

3.5.4.1 Prerequisites

Historically, the themes described in this section provide positive influences and/or function as prerequisites to support the emergence of a new subject in

schools. The order of the themes is based on the extent a theme could offer support.

Examinations especially external examinations

Examination has a long history in the West, but especially in the East. In China, the examination system existed 1300 years ago (Shyu & Jou, 1997). No theme is as influential as examinations on subject status in the school curriculum. The reason is its importance in schooling and as a means (external examination) for gaining entry to a higher level of education and for gaining the status of expertise in society. When checking the history of the emergence of school subjects, the highlighted issue is the contested nature of subject knowledge (Goodson & Ball, 1984). In other words, subject status is a reflection of gaining a place in examination.

Since the nineteenth century, academic subjects and external written examinations have become closely interconnected. Goodson (1987) commented that this strong connection was explained by a need to teach these subjects in such a way and to such a standard as it would ensure success in the School Certificate examination. For example, biology was first introduced into Oxford and Cambridge examinations in 1885 so that its long process of subject emergence in schools was initiated (Goodson, 1987). Further, Goodson pointed out that acceptance of the criterion of examinablility affected both the content and form of the knowledge presented. This was seen as acceptable because examinability carried with it the guarantee of high status. Therefore, knowledge would become even lower status if it was difficult to examine.

In junior high schools, teachers and students are timetabled to teach and learn about subject disciplines that are subsequently evaluated in external public examinations (Burgess, 1984), no matter whether high or low status subjects. Consequently, at the institutional level, access to resources and to teaching time affects, and is affected by, subject status. However, knowledge is not examined only by paper-pencil test though it is the most common, economic and easy way. The failure of the emergence of environmental studies is because the knowledge was not claimed to be an academic discipline and examined (Goodson, 1985a). In

contrast, the success of the emergence of biology and geography is because they were tested in examinations, especially in external examinations, during their establishment (Goodson, 1995). In short, the gaining of external examination strongly supports the emergence of a new subject in schools.

University discipline and department

Goodson (1987, p. 4) stated that Hirst and Peters provided another explanation for the inclusion of school subjects into school curriculum "the intellectual discipline is created by a community of scholars, normally working in a university, and is then translated for use as a school subject." Indeed, most of the subjects taught in primary or secondary schools can be found in similar departments in universities. This shows the direct connection between a university discipline and its associated school subject. Additionally, subjects in universities are much more precisely differentiated than the subjects taught in schools.

Reviewing the changing patterns of curricula and examinations, Goodson (1987) illustrated the close relationship between the secondary school curricula and the examinations boards controlled by the universities. The academic goals in secondary education were linked to the specialised course requirements of university departments and established a ladder leading to professional occupations. Goodson (1985a) stated that the model of subject emergence towards an academic discipline was found in both geography and biology. After they were successfully promoted in secondary schools, however, it was the university specialists in the field rather than school teachers that selected the subject matter. These two subjects drew support from a base of specialist scholars working in universities such as departments of geography and biology. In comparison, that environmental studies had not succeeded in claiming to be an academic discipline was due to the denial of its having a university base status passage. Whether the knowledge area gains support from university scholars or not is another strong reason influencing the emergence of a new subject in the school curriculum.

School timetable

Subjects taught in schools need a place in the school timetable, this makes them into a real and concrete subject body. Layton's (1972) tentative model for the emergence of a school subject mentioned that a subject gaining a place in the school timetable was the first stage of the emergence of a new subject in schools. For example, in the beginning of the emergence of geography and French, at least one or two lessons per week for geography (Goodson, 1995) and no more than two hours weekly for French (Radford, 1985) were distributed to teach them in schools. Indeed, a glance at the school timetables indicates which subjects lay at the heart of the school curriculum. Generally, the more powerful or high-status subjects such as mathematics, science and information technology occupy more curriculum time and institutional space than other subjects (Paechter, 2000). They are the basic building blocks of the formal school curriculum and are highly visible. In some cases where innovation is taking place such as the development of humanities and life science, they lack an identified place in the school timetable. While the teaching of humanities is often based on history, geography and religious education, and life science will be constructed out of chemistry and biology (Burgess, 1984).

Not every subject timetabled is evaluated through formal examination in schools, for example, art, music and physical education. However, these subjects are still examined when attending art, music and physical education departments in universities. Thus, the ultimate function of school timetable is that timetabled subjects will be and can be examined in external examinations so as to attend universities. This builds a strong connection between the themes of school timetable, external examination and university department.

Textbooks and/or syllabi

Textbooks and/or syllabi used in schools record the up-to-date knowledge for each particular area of learning. From ancient times, students have focused on learning from teachers and texts rather than curricula (Hamilton, 1990). Davies (1973) stated that textbooks are rewritten over time with associated changes in pedagogy, views of the child and of the purpose of education. They are the result

of a process of political conflict and negotiation both within the subject and between groups within the subject and external interest groups (Cooper, 1985).

Kuhn (1963) stressed that education in the natural sciences was carried on through the device of the textbook which was a shared paradigmatic consensus among scientists. He referred to textbooks as the major device for initiating students into academic paradigms. Westbury (1990) argued that subject textbooks were at the heart of schooling. He proposed there would be no schools if there were no textbooks because a large proportion of potential university students learn from school subject textbooks. This is exactly what Chambliss and Calfee (1999) asserted: textbooks were important because teachers relied on textbooks to guide them as to what needed to be taught and how to teach. Thus, textbooks contribute to the emergence of a new subject in schools. For example, the process to develop the specialism of English in the twentieth century in England included the production of textbooks (Ball, 1985). The case of the subject of English's emergence in the Norwegian school curriculum in the late 1960s is another example of the need for textbooks (Gundem, 1988). Layton (1973) identified the need for books as one of the necessary conditions for the establishment of science in the elementary school curriculum in the nineteenth century. This evidence implies that subject status is higher and more stable when there is a subject textbook to support the teacher and student with the teaching and learning in schools.

Yet textbooks record only part of the knowledge and/or wisdom of a subject. This is the so-called 'selective tradition' (Teitelbaum, 1987) where only the knowledge presented inside textbooks is addressed during teaching and learning. Not surprisingly, some knowledge and skills are not commonly available for this reason. Weber in 1952 pointed out that the ancient curriculum of Confucian education in China comprised a very narrow selection from the available knowledge in a society (cited in Goodson, 1987). The elite in ancient Chinese society focused on the learning and memorising of classical texts rather than other fields of knowledge. Knowledge such as mathematics, astronomy, science and geography was common but viewed as non-academic in that period of time.

As early as 1912, Holmes described the bond between textbooks and external examinations. He described the function of the textbook towards examination as the 'fatal path' to 'mechanical obedience' because teachers would demand their students be examined on a clearly defined syllabus when accessing universities, which is the material included in the textbook (cited in Goodson, 1988). Students' success, therefore, would rely on how the examiner tests via the clearly defined syllabi or textbooks. This adds an unbroken bondage of textbooks onto the themes of external examination and university department.

Government leadership and administration

The government is one of the most crucial and influential powers in helping a school subject to emerge. For example, the efforts made to incorporate science into the school curriculum in the late nineteenth century had support from the Association of Public School Science Masters, the examination, and most importantly science had government recognition and financing for laboratories (Young, 1976). One of the three essential resources Layton (1973) identified for the establishment of science in the elementary school curriculum was a sound and supportive administrative framework. This framework provides the groundwork needed to achieve the subject's emergence in schools and works with government leadership, especially in relation to financial support. In another example, in the 1960s in British Columbia's secondary school curricula, the introduction of school physics was accompanied by textbooks, examinations, and graduation requirements from the Ministry of Education. This was a remarkable centralisation of control (Rowell & Gaskell, 1988). The case of design and technology in England and Wales as part of the national curriculum was introduced by top-down curriculum change in 1990 (Paechter, 2000). In yet another case, technology education was established in the national curriculum in both Britain and New Zealand by government legislation in the 1990s. This evidence shows that the decisive influence from central government can not be ignored when introducing a new subject in schools.

Subject associations

Goodson (1995) described internal or bottom-up factors during the process of subject emergence as invention (teachers trying new ideas), subjects as coalitions (groups of teachers coming together to implement a change) and coalitions in action (the establishment of a new subject in schools). The crucial one among these internal factors is teachers' coalition into a subject association. When checking the history of school subject emergence, a list of cases showed the influence of the subject association and its important role during their emergence process, especially the English Association for the subject of English (Ball, 1985), the Geography Association for the subject of geography (Goodson, 1995), and the International Technology Education Association for the subject of technology education (Lewis, 1995). Goodson (1985b) mentioned other influential subject associations: the Mathematical Association, the British Association for Language Teaching and the Modern Language Association. Although the American Industrial Arts Association had sought to gain a place for the subject of technology education since the 1940s, it did not achieve this at the national level up to the 1990s (Lewis, 1995). However, after the International Technology Education Association development of *Standards for Technological Literacy* in 2000, it could be seen as a subject emerging in the national framework in USA (International Technology Education Association, 2000). This confirms the positive influence from subject association on the subject emergence in schools.

Yet the existence of a subject association does not guarantee the successful establishment of a subject. An example is the Rural Studies Association for rural studies and/or environmental studies in Britain (Goodson, 1987). In the late 1960s, the subject of rural studies pursued academic status by gaining support from both external written examination and university discipline but finally failed to gain a permanent place in the British secondary school curriculum. Another example is the Chinese Society for Environmental Education in Taiwan established in 1993. This Society has not achieved a national change in Taiwanese junior high schools up to now, at least at the level of classroom teaching of environmental education.

However, the influential people inside a subject association are not school teachers but university scholars, who hold the ultimate right and power to determine the subject matter taught in schools and the definition for the subject. Therefore, whether or not a subject is a university discipline or department with specialist scholars probably still precedes subject associations as a theme that influences the emergence of a new subject in schools.

Professional development

In Layton's (1972) model for the emergence of a new school subject, teachers may be recruited by trained specialists. During the second stage of this model, scholarly work emerges and provides a focus for teacher development. In fact, when school teachers encounter something new in their teaching in either content or method, one of the ways they gain expertise is through teacher education or attending the subject associations. Further, Layton (1973) identified trained teachers as one of the three necessary resources to include science into elementary school curriculum in England in the nineteenth century.

A successful example of the professional development is the School Board in London, trying to introduce a new approach, heurism, in elementary school science teaching in the late nineteenth century. The Board offered evening classes and a further summer school to help teachers gain the expertise needed to teach science in heuristic way (Waring, 1985). The British Social Hygiene Council offered biology programs of 2-3 days conference, lecture series and workshops, courses and summer schools to give practical help to teachers in the 1930s in England (Goodson, 1987). After introducing the new physics in secondary schools in British Columbia in 1964, B.C. Science Teachers' Association funded more than 20 weekend sessions. The largest school board in B.C. offered a weekly night class for two years to help teachers overcome the difficulties associated with implementing the new program (Rowell & Gaskell, 1988). However, teacher professional development can not guarantee the successful emergence of a new subject. Gribbes (1994) investigated the effectiveness of teacher professional development in environmental education. He found a low degree of curriculum change at both the personal classroom and whole school levels after teacher attendance at an in-service zoo education program.

In sum, although teacher professional development can not promise a new subject will emerge in schools, it definitely can help to consolidate the existing status of a school subject, especially when it requires new teaching content and/or method.

Informal curriculum

An informal curriculum involves more activities than a formal curriculum in schools and includes extracurricular activities, school assemblies, competitions, speeches, and so on (Huang & Yang, 2000). Although no literature strongly argues the importance of informal curriculum during the process of subject emergence, many studies provide evidence to show its influence compensates and/or supports the teaching of subjects taught in the formal curriculum in schools or universities. For example, civics and citizenship education in Australia links to both the formal and the informal school curriculum (Department of Education and the Arts, 2006). The formal curriculum can be found in the official syllabuses, but students also learn about civics and citizenship through participating in school activities and external clubs or organisations. In addition, the development and formation of certain values and behaviours often derives more influence from the informal curriculum than the formal curriculum. For example, school psychologists argue that the unique features of academic school psychological programs in universities are expressed more often through the informal curriculum via the role they play in associated activities (Eshel & Koriat, 2001). The workplace and educational culture of a medical school constitutes an informal curriculum, one that can have the greatest influence on the formation of a doctor's professional identity (Suchman, Williamson, Litzelman, Frankel, Mossbarger & Inui, 2004). In another example, a study of values in the Northern Ireland Curriculum shows an abundance of opportunities within the informal curriculum for the transmission and discussion of values in schools (Smith & Montgomery, 1997). Thus, the importance of the informal curriculum in reaching and enriching existing school subjects, especially the affective domain, cannot be ignored. There should also be an awareness of its potential contribution towards the emergence of a new subject in the school curriculum.

Non-formal education

Non-formal education can be viewed as the learning and training which takes place outside recognised educational institutions (The Encyclopedia of Non-formal education, 2006). In practice, learning is a cumulative process and rarely occurs in a single environment or from a single experience. The educational programs non-formal sites developed could be enticing and creative to support what the students are learning in the classroom, and are responsive to the needs of the learners (Kilkenny, Sivek, Daudi, & Heimlich, 2000). Although the contribution of non-formal education to subject emergence in schools is not clearly discussed in the literature, attention has been paid to it in the recent decades, especially since the 1970s (Siaciwena, 2000). For instance, the importance of teaching and learning science education via non-formal education in science museums and other informal settings has been recognised since the early 1990s (Feher & Rennie, 2003). However, non-formal education was not mentioned when science emerged as a new subject in schools in the late nineteenth century. Martin (2004) asserted that science centres and other non-formal educational institutions could play a role in the reform of science, technology, engineering and mathematics education nationally and serve as educational resources globally. The 1990 World Conference on Education For All, in Thailand, not only highlighted the importance of non-formal education but also provided global strategies for strengthening it (Siaciwena, 2000). Higher education has also been undergoing a paradigm shift from an instruction-centred college/university model, to a learner-centred integrated network model (Nanda, 2003). Compared with formal education, the characteristics of non-formal education are that it is short-term and specific, non-credential based, recurrent and part-time, individualised and output-centred, practical, entry requirements clientele determined, environment-based and community related, flexible, learner-centred and resource saving, self-governing and democratic (Fordham, 1993; Torres, 2001). In short, non-formal education could enhance personal learning at any time and any place. With more self-motivation, non-formal education can lead to even more effective learning outcomes than formal education to learners' lifelong learning process. Obviously, non-formal education can support the teaching of subjects taught in schools i.e. from literacy campaigns to computer

technology. Accordingly, the contribution of non-formal education to a new subject's emergence in schools should not be neglected.

In summary, the themes discussed above are interlaced and helpful in promoting not only the emergence of a new school subject but also the consolidation of existing subjects in schools.

3.5.4.2 The influential themes

The themes discussed in this section, compared with the prerequisites, have been found to have either positive or negative impacts on the emergence of a new subject. The order of the themes presented is based on the extent of their influence on the subject's emergence in schools.

Subject characteristics and definition

Kelly (1989) described two theories of Western European philosophy for knowledge: rationalist and empiricist. He also noted that rationalists such as Plato, Aristotle, Descartes and Kant, take the supremacy of intellect over other human faculties and stress that true knowledge is that which is achieved by the *mind* independently of the information provided by the *senses.* Empiricists such as Locke, Hume and Dewey take a contrary stance and maintain knowledge can be derived only from the evidence that the world offers us through the use of our senses. In the Western tradition, rationalism is valued above empiricism, the greater the level of abstraction the more status a particular kind of knowledge has. This idea has implications for school curricula. There are three broad curriculum traditions in the West dealing with the nature and purpose of the school curriculum, namely: academic, utilitarian and pedagogic (Goodson, 1987). These represent three clear constellations of curriculum styles. While the academic tradition stresses abstract and theoretical knowledge for examination, the utilitarian tradition deals with practical knowledge and sometimes is not amenable to written examination. In comparison, the pedagogic tradition stresses more personal, social and commonsense knowledge and therefore places the way the child learns as its central concern in devising subject matter. The utilitarian curriculum tradition is related to non-professional vocations. Although the

majority of people work for most of their adult life in non-professional vocations the utilitarian curriculum has still a low status.

Goodson (1985a) in his evolutionary profile of the school subjects argued that a progressive movement was away from stressing utilitarian and pedagogic versions of the subjects towards increasing promotion of more academic versions, which could be seen as the internal 'academic' evolution. He identified this movement as a sequence to theory of subject emergence. Certainly, there were examples showing this phenomenon i.e. new geography in the subject of geography, molecular biology in the subject of biology, and examinable environmental studies in the subject of rural studies in the early 1970s. However, the Goodson's model of subject establishment towards a culminating academic discipline, especially for geography and biology, requires a base of specialist scholars working in universities to continue the definition and legitimation of the discipline content. This promotion of a more academic version of school subject is actually connected with the theme of university discipline and department discussed in Section 3.5.4.1.

Snook (1996) indicated that the nature of subject itself relied not only on subject matter but on the views of educators as well. He asserted that, taking technology education for instance, the systematic introduction of this new subject needed careful investigation because there was no clear definition and no obvious curriculum for it. In Snook's view, the unclear characteristics and definition of technology education could create obstacles for teachers to recognise and teach it even when it was introduced systematically. Bernstein (1971) claimed that in order for a school subject to retain its identity, strong boundaries have to be maintained between it and other subject areas. He used the concepts of classification and framing to analyse the differences between strongly classified *collection* curricula that are well insulated from each other and those of weakly classified *integrated* types. Strongly bounded subjects have a distinct subject identity. Weakly bounded subjects have an ambiguous subject identity, which can impede their emergence as a new subject. Bernstein (1971) viewed the curriculum as organised units of time, each of which has certain content. These contents can be seen to differ in status according to the amount of time they are

given and whether they are compulsory or optional. If a subject is allocated sufficient time and is compulsory this will help its emergence in schools. If it does not, it is difficult for a subject to develop as a valid subject in the school curriculum. However, the strong or weak boundary nature of the subject would lead to this subject being compulsory or optional with sufficient or insufficient time in the school curriculum. This adds the connection between the themes of school timetable and subject characteristics/definition. In short, a strong boundary subject could be given more time and be compulsory in the school curriculum and this would be helpful to its emergence in schools.

Material interests (subject teachers)

The material interests of subject teachers include their pay, promotion and conditions; in short, the resources and career chances distributed to and status attributed to the subject teachers' community (Goodson, 1985a). High status subjects, normally academic ones, are placed at the top of the hierarchy of school subjects because resource allocation prioritises able students who receive favourable treatment. As a result, academic subjects provide their teachers with a career structure characterised by better promotion prospects and pay than less academic subjects.

The battle over the emergence of environmental studies in the late 1960s in Britain is an example of the struggle among subject sub-groups and reflects territory competition, one of the subject teachers' material interests. It is rural studies teachers who pursued the increasing career chances and resources allocation inside schools. The interconnected relationship between academic subjects and external examinations only partly explained the need to teach examinable environmental studies in schools. The rest of this connection was played out through the vested interests of subject teachers' sub-groups. In university geography there were three major sub-groups: regional geographers, field geographers and new geographers. The first two groups were more sympathetic to environmental initiatives and had large support among school geography teachers due to their similarities. University biology also had three sub-groups: ecology, field biology and molecular biology. The first two groups promoted environmental studies whereas molecular biology opposed it because

their main concern was laboratory work rather than fieldwork. It could be seen that the reason university scholars were willing to support the innovations of environmental studies in schools was based on their own material interest. Another example is the change of Design and Technology from Handicraft in the 1970s due to subject teachers pursuing higher status and respectability (Goodson, 1987). In these instances, support from subject teachers' material interests was more influential when the new subject evolved internally (voluntarily) rather than when the subject was introduced externally (compulsorily). The motivations behind internal evolution and external compulsion are either active or passive and would lead to different responses from subject teachers. However, the material interest is not restricted at the level of subject teachers. It could be the motivation of any interest group relevant to the subject emergence and result in negotiation among these groups.

External constituency

The external constituency can be regarded as the public; including parents, employers, trade unions, universities, scholars, politicians, administrators and others (Goodson, 1995). Their dominant ideologies and contemporary economic and cultural relations cause the development of certain knowledge content in the school curriculum. The creation of science, social studies, mathematics, reading, English, art or early childhood education, as a school subject-matter, involved the struggle of various social and professional interests who sought to use the school to express particular purposes and values (Popkewitz, 1987) and consequently established the 'selective tradition' discussed inside the theme of textbooks and/or syllabi in Section 3.5.4.1**.** The interests expressed were in terms of career, status and access to resources for particular groups.

One example of the influence of the external constituency, composed of legislators, educational committees and college professors, was the emergence of the high school biology curriculum in USA in the first quarter of the twentieth century (Rosenthal & Bybee, 1987). In another example, four general curriculum interest groups affected the high school mathematics curriculum in USA: namely the humanists, the developmentalists, the social efficiency educators and the social meliorists (Stanic, 1987, 1988). In addition, the introduction of the new

physics into the secondary school curriculum in British Columbia in 1964 was because the educational constituency (physics teachers, university physicists, B.C. Science Teachers' Association, Royal Commission on Education, and central government) supported school physics as a subject preparatory to university physics (Rowell & Gaskell, 1988). This example shows the direct influence from university discipline based specialists and is therefore connected with university entrance examinations. It could also be viewed as material interests existing in both school physics teachers and university physicists to maintain their occupational status. Additionally, the support from subject association and government could not be ignored. This is the case that many intertwined factors contributed to the emergence of a new subject in the school curriculum. Thus, the power of the external constituency needs to be considered in any analysis of subject emergence.

In summary, themes discussed in this section provide the platform to consider whether or not the emergence of environmental education in new Taiwanese national curriculum is likely to achieve its goal. In fact, before the emergence of French as a school subject in the nineteenth century, it had a very low status including a lack of time allocation (much less compared to Latin), low pay for teachers, an absence of promotion prospects for teachers of French, the neglect of modern languages in universities lead to few entrance scholarships, and the no properly qualified teachers of French (Radford, 1985). It was not until mid-twentieth century that French achieved its high-status and academic prestige in schools in England. Thus, there is a need to investigate whether or not environmental education is another case of subject emergence following this traditional pattern.

3.5.5 Summary of section 3.5

This section first described two processes for the emergence of a new subject in schools, namely internal evolution and external compulsion. It then introduced the issue of subject status in the school curriculum. Finally it delineated themes deemed to be prerequisites and influential factors contributing to the emergence of a new subject in schools.

Subject status is crucial to schools, especially in Taiwanese junior high schools, as junior high graduates need to pass the Basic Competence Test (BCT) before attending senior high schools (see Section 2.3.4.3). Academic subjects such as Chinese, English, mathematics, science and social studies are dominant among all the school subjects because they are examined in the BCT. The amount of time devoted to teaching these subjects and associated activities is much greater than that allocated to unexamined ones such as art, music and physical education. School policy for the priorities of these subjects also shows a hierarchy amongst subjects and activities in schools.

There is a need to compare the traditional pattern and themes for a new subject's emergence with the way environmental education was introduced during the 2001 curriculum reform in Taiwan. Whether or not environmental education is a similar or different issue needs clarification.

3.6 Summary

Chapter Three described the issues of curriculum in general and the emergence of a new subject in particular. Section 3.2 introduced definitions of curriculum and defined curriculum for this thesis as a school plan which is affected by social, economic, historical, cultural and political dimensions. It also introduced different curriculum models and identified the new Taiwanese national curriculum as a combination of Tyler's objectives model and Stenhouse's process model.

After reviewing the definitions of curriculum change, section 3.3 designated the use of a new national curriculum document as the definition of curriculum change in this thesis. It also introduced models and global trends in curriculum change and identified the 2001 curriculum reform in Taiwan as the centre-peripheral model with power-coercive and empirical-rational strategies plus a technological perspective.

Section 3.4 introduced definitions of curriculum implementation and then used the use of a new school plan as the definition for this thesis. This section also described the models and global trends of curriculum implementation. It noted

that the curriculum implementation initiated in Taiwanese junior high schools had a technological, rather than a political or cultural, underpinning.

Section 3.5 delineated the two processes and many themes for a new subject to emerge in the school curriculum. It then referred to the issue of whether environmental education would be similar or different from the traditional process of school subject emergence.

Chapter Four will introduce and discuss the nature and implementation of environmental education worldwide to set the scene for a better understanding of the situation in Taiwan when introducing environmental education into schools via a national curriculum change.

CHAPTER FOUR:
THE IMPLEMENTATION OF ENVIRONMENTAL EDUCATION WORLDWIDE

"Environmental education represents a challenge to existing patterns of schooling."
Ian Robottom (1985) in *Evaluation in Environmental Education: Time for a Change in Perspective?*, p. 34.

4.1 Introduction

Chapter Three reviewed issues related to curriculum generally (particularly its introduction) and the emergence of new subjects. This chapter applies this review to the specific case of environmental education - its nature, curriculum models and implementation worldwide. It aims at understanding whether or not environmental education might be expected to follow the traditional pattern of a new subject's emergence, as discussed in Chapter Three, in Taiwanese junior high schools. It will argue that environmental education is paradigmatically novel in the educational scene. The focus of this chapter is the potential effectiveness of the infusion strategy for curriculum design and planning for environmental education, during the 2001 curriculum reform in Taiwan, along with the issues junior high school staff have when they face this infusion situation.

Section 4.2 describes the uniquely integrated nature of environmental education. Section 4.3 introduces the curriculum models of environmental education and its history and barriers when it has been incorporated into school curricula. The implementation of environmental education worldwide is delineated in Section 4.4. In Section 4.5 the paradigmatic shift involved as environmental education impacts on education at large, will be discussed. Section 4.6 highlights the potential research issues around the implementation of environmental education by infusion in Taiwan. Accordingly, Section 4.7 develops and presents the four research questions for this thesis. Section 4.8 concludes this chapter with a summary of each section.

4.2 The Nature of Environmental Education

The classic definition of environmental education was formulated and adopted by IUCN/UNESCO International Working Meeting on Environmental Education in the School Curriculum in 1970:

> Environmental education is the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the inter-relatedness among man, his culture, and his biophysical surroundings. Environmental education also entails practice in decision-making and self-formulation of a code of behaviour about issues concerning environmental quality (Schmieder, 1977, p.25).

In the 1970s, educators did identify the distinction between environmental education and traditional school subjects. Goudswaard (1977) contrasted the features of environmental education with the typical learning environments for traditional disciplines, which mainly consisted of classroom or laboratory based introduction and/or discussion of selected elements of complex topics. Even though field trips in biology, ecology and geography included visits to natural areas, those disciplines still did not meet the goals of environmental education. This was because they excluded active interfacing between natural systems and human activities. Eichler (1977, p. 102) also noted that established education tended to avoid the debate "between people who see themselves as distinct from nature and in absolute control of natural systems, and those who hold the man-in-nature view which makes people recognize that they are part of a much larger community than just the human one, a community whose health and survival are seen as those of man himself (sic)." In Eichler's (1977) view, environmental education could be described as problem-centred, interdisciplinary, value-oriented, community-oriented, concerned with man's survival as a species, based on student-initiated activities and involvements, and present- and future-oriented. In the 1990s, the nature and characteristics of environmental education became broader. The following statements based on the 1977 Tbilisi conference recommendations, show the characteristics of environmental education in an expanded form. In Palmer's (1998) terms, environmental education is a life-long process; inter-disciplinary and holistic in nature and application; and a approach to education as a whole, rather than a subject. It is concerned not only with local to global dimensions, and past/present/future dimensions, but also with building an environmental ethic. It views the environment in its entirety including social,

political, economic, technological, moral, aesthetic and spiritual aspects; concerns the inter-relationship and interconnectedness between human and natural systems; recognizes that energy and material resources both present and limit possibilities; emphasizes active responsibility; and uses a broad range of teaching and learning techniques, with stress on practical activities and first hand experience. Environmental education also encourages participation in the learning experiences; the development of sensitivity, awareness, understanding, critical thinking and problem-solving skills; and the clarification of values and the development of values sensitive to the environment. Finally, environmental education should be enhanced and supported by the organization and structure of the learning situation and institution as a whole.

Given what has been said above about the nature and/or characteristics of environmental education, it is obviously different from most current school subjects in the school curriculum, especially those of language, mathematics, science and maybe social studies, in which many boundaries serve to divide rather than integrate knowledge. Thus, there is a practical problem for school teachers of how to teach environmental education properly, and probably in contrast to, their own subject specialisms. As environmental education is to be mandatorily infused into all the seven learning areas in the new Taiwanese national curriculum, its integrative and holistic nature will definitely challenge junior high school teachers on the issues of how, what and why it will be taught from September 2002 onwards. How effective the teaching of environmental education in classrooms, and at the school level will be and what problems and/or obstacles will be encountered is in need of investigation. The next section will discuss curriculum models for environmental education and their practice in schools and the problems associated with the current school curriculum.

4.3 Curriculum Models for Environmental Education

4.3.1 Introduction

Environmental education is not a new issue in education. It has been emerging as a school subject since the mid-twentieth century, especially since the late 1960s, due to increased awareness of the degradation of the environment which has

accumulated subsequent to the industrial revolution in the late eighteenth century, particularly in developed countries. Rachel Carson's (1963) book *Silent Spring* broadly focused public attention onto issues relevant to the environment. This section describes in detail the evolution and history, over these several decades, of the theories or theoretical frameworks of environmental education contributing to the understanding of relationships and problems between these theories and school curriculum.

4.3.2 Types of theoretical frameworks

According to Stevenson (1993), consensus does not exist on the adequacy of current theoretical models of environmental education curricula. However, the history of modern environmental education curriculum theory could be described in terms of three movements. First, the empirical-analytical curriculum perspective or technical model which originates from the positivist tradition borrowed from the natural science. This focuses exclusively on the technical and behavioural aspects of curriculum. Second, the interpretive curriculum perspective or phenomenological model originates from social/theological science and concerns understanding the social reality of the individual. Finally, the critical curriculum perspective which has an overt political agenda of creating social justice by examining the contribution of the curriculum to maintaining or transforming social and economic inequalities in the larger society.

The first perspective, the technical model, traditionally represents the dominant model of curriculum theory for environmental education but it has been partially replaced by the other two in the past 30 years due to its lack of a value dimension. The other two perspectives, the interpretive and critical models, became more influential first in England, next in Australia and then in United States. The interpretive approach gained attention in the late 1960s but is now seen as restricted in that it seeks to inform rather than change individuals' practices. In contrast, the critical curriculum perspective provides a framework to examine the moral acceptability of environmental policy and educational decisions in terms of the social justice of the values underlying both. Its limitations are abstractness and a lack of classroom trialling due to the demands and pressures on teachers. A critical theory perspective became mainstream, enhanced by deep identities

groups (Payne, 2001) in North America and Australia, in the early 1990s. There is a similarity, obviously, between these theoretical models of environmental education and the general curriculum models described in Chapter Three (see Section 3.2.3) namely the technical, practical and critical philosophical models respectively. This indicates the close and intertwined relationship between environmental education and education at large. Environmental education is a broad field, and actually co-evolved in its educational philosophies in a similar way to education as a whole.

More recently, there has been considerable debate about the theoretical frameworks for environmental education. For instance, Walker (1997a) has argued that socially critical theory did not provide strategies to solve problems associated with environmental education although it did provide an effective mechanism to criticise the practice. Socially critical theorists advocate 'emancipatory action research' with reflection and revision from practitioners (students and teachers) at each stage. Without the critical dialogue between practitioners and the researchers, Walker points out that socially critical theory falls short of the transformative process and does not adequately explain educational change. It is particularly problematic when schools are structured in a way that will not accommodate the radical social change required by this theory. Therefore, Walker suggested a problem-based methodology to address both the theory and practice of education at large. In this approach, practitioners and researchers work together developing a better theory to solve a particular educational problem when learning and teaching environmental education in schools. Payne (2001) also critiqued the socially-critical perspective. He referred to the reality of globalisation and the detraditionalisation of time, place and space as the modern progress worldwide. Further, Payne identified a lack of attention to the human subject and interpretation of agency as limitations of the socially-critical perspective. Thus, Payne suggested a human-constructive perspective for environmental education. It is a critical ecological ontology in which learners interrogate their own everyday experiences within society, and over time, through the interconnected relationships that exist between family, school, local, neighbourhood and global realities. The goal is to better see how they

individually and collectively embody the environmental problems, both positively and negatively.

In summary, from the evolution in the models and theoretical frameworks discussed above, an amalgam appears to be emerging. Increasingly, environmental education is focusing on the issues-based and problem-solving aspects of students' daily experiences locally, and globally, across pluralistic dimensions.

4.3.3 History of environmental education and the school curriculum

Environmental education is actually not fully new to the current school curriculum. It originates from nature and outdoor study and later conservation education. However, the aim of both nature study and conservation education was to develop knowledge, skills and awareness about natural resources and their management. Early in the 1970s, Eichler (1977) stated that environmental education in primary level would consist of perceiving natural objects, dimensions, plants and animals, etc. At secondary level, it would introduce more scientific-ecological, social, political and economic aspects of environmental education, though some were still difficult to be comprehended. These aims were widely incorporated into primary school curricula and the science and geography curricula of secondary schools (Childress, 1978). In contrast, socially critical thinking and decision-making were not the focus in the very early days of environmental education. Therefore, Stevenson (1987) noted that neither nature study nor conservation education challenged the socio-economic or political fabric of our society.

The term 'environmental education' was first used internationally in the IUCN (International Union for the Conservation of Nature and Natural Resources) Conference in Paris in 1948, and in 1965 in the United Kingdom at the country level (Palmer, 1998). Environmental education arose out of a growing awareness of environmental degradation in the mid-twentieth century. However, the scene changed in the 1980s. Greenall (1987) stated that the very nature of environmental education was a political process. Stevenson (1987) also mentioned the contemporary concept of environmental education existed in the

context of the political activism of the environmental movement. Therefore, the socially critical and political action goals of environmental education were raised as a focus for nature study and conservation education. Again and later, Stevenson (1993) suggested that environmental education had historically evolved from the apolitical practice of nature study to the committed activism that emerged from the Belgrade and Tbilisi international conferences.

Reviewing curriculum history, the battle over environmental education's emergence in the school curriculum began in the late 1960s in Britain, though it failed in the early 1970s. There were three groups of educators involved in this struggle, geography and biology were the main forces in universities and rural studies in secondary schools. In fact, secondary rural studies teachers tried to attain a better position for rural studies in the secondary school curriculum by changing its name to environmental studies. The school teachers realised their low subject status and tried to gain recognition and support from university scholars. This action exactly reflects the role of subject teachers' material interests (see Section 3.5.4.2) affecting the emergence of a new subject in schools. This situation is different from the contemporary global trend for governments to give official curriculum status to environmental education, in some way, in the school curriculum. The process of environmental education's emergence in the late 1960s was upwards, since the 1990s it has been downwards. That is, there has been a change from voluntary to compulsory and from grass roots to imposed. The difficulties environmental education faced in the late 1960s would be a mirror of further thinking for contemporary educators and/or government officers.

Eichler, first in 1977, asserted the response to the environmental situation by educators must be *radical*, as environmental education should not be considered as another subject competing for a place in the existing school program. He even suggested a total *reform* in schools to make it possible to structure a creatively and functionally designed program. Eichler also mentioned that due to students' limited experience in real life, it caused difficulties to introduce meaningful environmental education such as examining the concepts of public participation in decision-making, the redistribution of wealth, overproduction, materialism, the

value of simple things in life, and the questionable value of some technological innovations.

This discussion shows there has been a long relationship between environmental education and school curriculum, at least since the 1960s. Based on the political nature of environmental education, the theoretical curriculum models to implement environmental education are developed and will be introduced in the next section.

4.3.4 The models of environmental education implementation

The 1971 European Working Conference on Environmental Conservation Education suggested two ways to teach environmental education in schools: either incorporate environmental education into existing subject areas, or teach it as a subject in its own right (Goodson, 1987). During the conference it was recommended all students be engaged in fieldwork, in first hand investigations and in open discussion of problems. Most important, in the context of widespread reform of education systems, was the recognition of environmental education as a priority by the responsible authorities. In 1977, one of the Tbilisi recommendations was that environmental education should be viewed as an approach to education as a whole rather than a subject as a way of providing some unity to the educational process for learners (Palmer, 1998). Eichler (1977) also asserted that environmental education should not be considered as just another subject competing for a place in the existing school program. Consequently, Eichler (1977) suggested five strategies for environmental education curriculum development in schools (Table 4.1).

In the 1980s, there were two suggestions for models of how to implement environmental education inside school curricula (Yang, 1991). One was the multidisciplinary approach and the other was the interdisciplinary approach. The multidisciplinary model infuses environmental education into existing school subjects according to its relevance to the teaching content of each school subject (Eichler's Model 3). The interdisciplinary model views environmental education as an independent teaching unit containing materials from every school subject

Table 4.1 Curriculum models of environmental education in the 1970s (from Eichler, 1977)

Model 1: ***Environmental studies as a special subject***	A subject of environmental studies 'in its own right' taught by a specially trained teacher or a team of teachers.
Model 2: ***Environmental study units ('themes') in standard subjects***	The units could be used in subjects like biology, geography, physics, civics and history.
Model 3: ***Integration of concepts of environmental study into secondary school programs***	Environmental teaching could be integrated into subject areas most closely aligned to the environment, especially sciences and social studies.
Model 4: ***Integration of environmental study units, or of concepts, into existing subjects, and a special course on human ecology***	This would be a combination of either Models 1 and 2, or Models 1 and 3.
Model 5: ***Complete curriculum reform***	To establish environmental education programs through complete renewal of the school curriculum.

(Eichler's Model 1). Most recently, Law and McConnell (2000) have moved away from Yang's dichotomy and, like Eichler have presented a range of possibilities. They have defined five models to implement environmental education in schools (Table 4.2).

Table 4.2 Curriculum models of environmental education in the 2000s (from Law & McConnell, 2000)

Model 1: ***Curriculum infusion***	Each subject teacher selects material from an environmental education curriculum and independently treats it in its own way. Environmental education is claimed to be ubiquitous across the whole school curriculum but no cross-subject linkage is achieved.
Model 2: ***Multi-disciplinary or thematic (Teacher-centred approach)***	Primary or junior high teachers choose topics relevant to the environment and develop topic-based or issue-based classroom programs. There is a degree of content integration as the content knowledge is cross-curricular, but no transference across subject areas is achieved. The learning is largely promoted by teacher-contrived learning experiences.
Model 3: ***Interdisciplinary approach***	Junior or senior high school teachers from 2 or 3 departments plan together to develop a topic-based or issue-based program, which is an integrated curriculum. Children's needs are considered with meaningful connections made for students between the curriculum and their daily lives. Essential skills, attitudes and values are the major focus and transcend each subject involved in this program. But, the uneven cross-curricular integration can make environmental education an enterprise of the subject with better integration e.g. science.
Model 4: ***Transdisciplinary model***	A school develops and acts on an 'environmental plan' in that subject division are subservient to this action plan. The school aims at achieving the goals from that environmental plan and it becomes the school feature such as the Green Schools in both Taiwan and mainland China and Enviroschools in New Zealand.
Model 5: ***Environmental education course Approach***	Environmental education is treated as an independent subject or course such as an environmental education course at senior level of secondary schools or university.

There are general similarities, obviously, when comparing these models for the implementation of environmental education from the 1970s to the 2000s. However, the most frequently used approach to classroom-based environmental education programs has been to integrate environmental education concepts into discrete subject areas such as chemistry, earth science, geology, marine science, archaeology, art and literature, special education, drama, agricultural education in both primary and secondary curricula (Hart & Nolan, 1999). Yet implementing environmental education through this approach may face a similar fate as that described by Lewis (2000) for technology education: when subjects do not have a particular champion within a school they do not get the support and attention they need and deserve.

Due to scant research on the teaching of environmental education at the classroom level (see Section 2.4.3), the curriculum model currently being implemented in Taiwanese junior high schools needs investigation. The infusion model prescribed in the *General Guidelines of Grade 1-9 Curriculum of Elementary and Junior High Education* details the governmental intention for the classroom teaching of environmental education in schools. Experience from the early 1990s, when environmental education was not included in the school formal curricula in Taiwan (see Section 2.4.3), shows there are barriers to teaching environmental education properly in the Taiwanese school curriculum. As the relationship between environmental education and the school curriculum is not a new issue or problem, the reasons and obstacles to the appropriate incorporation of environmental education into the school curriculum need to be fully understood. This will be discussed in the next section.

4.3.5 The barriers to environmental education being incorporated into school curricula

As early as 1965, a meeting of IUCN's Education Commission's North West Europe Committee called for environmental education in schools, in higher education, and in training for the land-linked professions (Wheeler, 1985). In 1968, the UNESCO Biosphere Conference called for the development of curriculum materials relating to studying the environment for all levels of education, the promotion of technical training, and the stimulation of global

awareness of environmental problems. In addition, it even advocated the setting up of national co-ordinating bodies for environmental education around the globe (Palmer, 1998). However, the greatest landmark for the evolution of environmental education was in 1970 in Carson City, Nevada, USA when the first effort was made internationally to incorporate environmental education into all levels of education (Filho, 1996; Goodson, 1987). The International Working Meeting on Environmental Education in the School Curriculum suggested, not only to world governments and their responsible educational authorities but to national education organisations as well, that environmental education should be introduced through a *reform* of the total curriculum as an obligatory and integrated component of the school educational system at all levels. Further, it suggested that national environmental legislation should be used to include obligatory environmental education at all levels. Yet this is still not the first effort made towards the issue of putting environmental education into school curricula. Goodson (1987) described the history of initiatives made to include a new subject - environmental studies, changing over from rural studies, in British secondary schools from 1965. The reasons for its failure are the breadth of content in the syllabus, the overlap with other subjects such as geography and biology, and its unclear definitions. Also, environmental studies is held to be hard to evaluate, and hence unacceptable for university entrance. These reasons clearly demonstrate the importance of several themes - clear subject characteristics and definition, external examinations and university department, for the emergence of a new subject discussed in Chapter Three (see Section 3.5.4). 'Environmental studies' is a typical case of a new subject struggling to emerge or evolve internally and upwards.

In the 1970s, Esland (1971) had already described the gap between rhetoric and reality in environmental education: the introduction of environmental education into school curriculum represents a fundamental challenge to the dominant conception, organisation and transmission of knowledge, creating for most teachers a conflict with their approach to teaching and learning. Tanner (1974) mentioned that environmental education had a revolutionary purpose of transforming the values underlying our decision-making from the present ones which aided environmental degradation to those which supported a sustainable

planet in which all people lived in human dignity. Eichler (1977) indicated clearly that one weakness in the efforts to establish environmental education programs in schools was students' lack of experience in their lives. Other issues were the inability of most secondary school subject teachers to teach the interdisciplinary nature of environmental issues; and the slow or even impossible task for administration to bring together experts and organise various educational agencies to develop programs with valid content and then to introduce these in schools.

In the 1980s, Robottom (1982, 1983) and Volk *et al.* (1984) elaborated on the discrepancy between the acquisition of environmental knowledge/awareness in traditional school programs and the action-orientated goals of the contemporary rhetoric of environmental education (cited in Palmer, 1998). Stevenson (1987) identified three major contradictions between environmental education and current schooling patterns: the purpose of schooling, curriculum and pedagogical practices, and school organisation. First, he noted that the traditional purpose of schools is to conserve the existing social order by reproducing the norms and values that currently dominate environmental decision-making. Stevenson contrasted this with the revolutionary purpose of environmental education mentioned above. Second, the school curricula tend to be discipline-based and emphasize abstract theoretical problems through the mastery of many fragmented facts, concepts and simple generalizations organised loosely within discrete bodies or fields of study. In contrast, environmental education calls for inter-disciplinary and flexible inquiry such as having problem-solving, action-based activities individually or in groups on real environmental issues. Third, the action-orientated and open-ended inquiry required by environmental education involves difficulty, ambiguity, contradiction and autonomy that could bring problems in maintaining order and control in classrooms.

These barriers and contradictions between environmental education and schooling remained the same in the 1990s throughout much of the world's formal education (Palmer, 1998). Environmental education is often a marginal subject. Hunt (1990) commented on the findings from the Environment and School Initiatives (ENSI) project in Australia indicating that environmental education was marginal in

school programs. Annette Gough (1997) even described environmental education as not only marginalized within formal education systems, but also an historically marginalizing discourse. Despite the introduction of new policies and curricula to support environmental education, in many countries environmental education has continued to languish at the margins of mainstream schooling, competing with other priorities (Bolstad, Baker, Barker, & Keown, 2003). Hart and Nolan (1999) summarised the barriers to environmental education being incorporated into school curriculum as follows:

- lack of teacher preparation;
- limited opportunities for teachers to participate in curriculum decision-making process; and
- poor dissemination of appropriate teaching models and skills for an action-oriented environmental education curriculum. (pp. 12-13)

The results of the Australian ENSI project suggested a complementary set of conditions in order for environmental education to be successful. They are:

- a teacher with specific expertise in relation to the problem being investigated or the involvement of an outside 'expert';
- committed teachers and principals;
- financial support;
- a committed community;
- recognition of a shared, community-based environmental problem;
- a preparedness on behalf of the teachers, students and community participants to confront their own values and the values held by others;
- school and parental agreement that the environmental problem will become the focus of the curriculum;
- acquisition of the appropriate skills and a willingness to take action to remedy the environmental problem identified;
- a problem that is solvable by school students. (Walker, 1997a, p. 156)

It seems that the literature nowadays still stresses those inconsistencies mentioned since the 1970s. However, the real limitation, and a substantial one, is the breadth of coverage or cross-curricular nature of environmental education, as recommended in *Tbilisi Report* in 1977 and *Our Common Future* in 1987, when it needs to be taught in a subject-based school curriculum. All of these barriers and obstacles have kept educators thinking deeply about the real and ultimate goal of environmental education.

In the early 1990s, the Deakin-Griffith Environmental Education Project stressed the great potential of environmental education to bring about fundamental changes in social values, processes, institutions and structures by playing a major role in social transformation (Fien, 1993). Turning to the twenty first century, there are many voices calling for transformation (Malone, 2006; Sterling, 2002; Wilson-Hill, 2003), sustainability (Department of Prime Minister and Cabinet, 2003; Fien & Tilbury, 2002; Hopkins & McKeown, 2001; Malone, 2006; Parliamentary Commissioner for the Environment, 2004), and systemic change (Benedict, 1999). These goals have shifted the focus of environmental education to a higher level. The problems which environmental education encounters are not merely self-generated; rather, they are also a basic problem of education itself. This is also the situation that environmental education has encountered in Taiwan over the last several decades, and will be further discussed in the following sections. The fact that environmental education has been taught via the informal curricula (extracurricular and school activities) more than the formal curricula (learning areas) in Taiwan (see Section 2.4.3) shows similar barriers to teaching it in the Taiwanese school curriculum. These reasons and obstacles need to be fully understood and will be discussed later in this chapter.

4.3.6 Summary of section 4.3

Section 4.3 introduced firstly the theoretical frameworks of environmental education. It described the evolution from nature study to environmental education and the history of the emergence of environmental education in the school curriculum. It then delineated theoretical implementation models of environmental education. Finally it pointed out the barriers to environmental education being incorporated into school curriculum.

Environmental education currently focuses on the issues-based and problem-solving aspects of students' daily experiences locally, and globally with pluralistic dimensions. However, its evolution in theoretical frameworks seems to follow similar changes (from a technical to a critical mode) as education at large. Within school curriculum, the evolution from nature study to conservation education then to environmental education shows different educational philosophies. Environmental education stresses more the political process i.e. socially critical

thinking and decision-making, while both nature study and conservation education aim to develop only knowledge, skills, and awareness about natural resources and their management.

The section then presented the relationship between environmental education and school curriculum via the case of environmental studies in British secondary school curricula. The barriers and obstacles show the integrative nature and action-orientated dimension of environmental education, which are not easy to achieve through traditional teaching strategies. In addition, the failure of environmental studies was not unexpected because it did not meet the traditional themes for the emergence of a new subject (see Section 3.5) such as a clear definition, specified content, examination and university department. Whether or not environmental education in Taiwan will face a similar process and fate needs investigation. Further, the theoretical curriculum models for environmental education implementation are sometimes dichotomous and often multifaceted. At the classroom level, the most widespread model for environmental education implementation is to integrate environmental education concepts into school subjects such as chemistry, earth science, geology, etc. This happened in Taiwan prior to the implementation of the new national curriculum. Whether the situation for the teaching of environmental education in Taiwanese junior high schools from 2002 has changed or not, is a research question for this thesis.

4.4 Environmental Education Implementation Internationally, especially in Asian Countries

4.4.1 Introduction

Palmer (1998) stated that the speed of development of thinking and documentation relating to environmental education in the 1970s and 1980s was quite remarkable. He also commented the late 1980s and 1990s had no reduction in that speed. However, Benedict (1999) stated that in the majority of countries environmental education was still an optional, extra activity and has not yet come into the mainstream.

To what extent environmental education is currently incorporated into formal education policies and programs in a variety of countries is the focus of this section. The section also explores the extent to which influences are received from non-formal education, and why some of them are successful.

4.4.2 The implementation of environmental education globally

This section delineates the overall picture of environmental education implemented in the world except in Asia, which will be described in the following section. The countries selected are generally from the main continents and were chosen on the basis of the availability in the literature.

4.4.2.1 Europe

The evolution of environmental education in Europe gained impetus through the 1980s, especially after the 1987 Moscow Intergovernmental Conference on Environmental Education (Filho, 1996). In Europe, environmental education outside the formal education system has achieved a greater impact than that taught in schools, in particular the informal organisations such as nature clubs, nature centres and national parks (Sterling & Cooper, 1992) and non-governmental organisations (NGOs) (Filho, 1996).

Britain

Environmental education currently in Britain is delivered by many agencies, both formal and non-formal education sectors, which often have an education section (Hodgetts, 2000). In fact, environmental studies had been introduced into many primary schools in the late 1960s and 1970s as a form of topic work or local studies (Huckle, 1993). Together with the reform of school leaving examinations, the comprehensive secondary schools in the 1970s also encouraged curriculum innovation and environmental education courses for older students. Although these were mainly dominated by education *about* and *from* the environment, some initiatives in urban environmental education already represented a socially critical education and were further developed in the 1980s (Huckle, 1990). However, it had a limited impact on the majority of schools and teachers who were moving back to more conservative curricula by that time in response to the prevailing political and educational climate (Huckle, 1993).

It was not until the late 1980s that British government paid attention to the reform of education and environmental policy (Huckle, 1993). In 1990, environmental education was firmly established in the national curriculum as one of the five cross-curricular themes (environmental education, economic and industrial understanding, education for citizenship, health education and career education) with its own booklet of non-statutory guidance accompanying by the three core (English, mathematics and science) and seven foundation subjects (history, geography, technology, music, arts, physical education and modern foreign language) and religious education (Hodgetts, 2000; National Curriculum Council, 1990).

Huckle (1993) pointed out that those cross-curricular themes, delivered in a variety of ways, were unlikely to be a high priority for most schools and teachers because the core and foundation subjects comprised 70% of the total timetable in schools and would be formally tested. In addition, a Panel for Education for Sustainable Development in 1998 noted that environmental education had a marginal presence in UK schools (Bolstad, Baker, Barker, & Keown, 2003). This was revealed by there being a minority of schools which had written environmental education policies. Moreover, Scott and Reid (1998) noted that the government document *Teaching Environmental Matters through the National Curriculum* indicated the government policy in the mid-1990s: it was schools' own responsibilities to decide whether or not to take environmental education in their schools. Scott and Reid (1998) criticised these policies as being unlikely to be effective unless schools were provided with better advice and support. This cross-curricular status of environmental education was later downgraded to an optional topic and then was closely linked to the sustainability debate (Filho, 2004). Consequently, NGOs such as World Wide Fund Nature and Councils of Environmental Education are playing an increasingly important role in the funding and organisation of course, and in producing resources to support environmental education in schools (Bolstad, Baker, Barker, & Keown, 2003; Hodgetts, 2000; UNEP-UK, 1992). This is exactly the theme, non-formal education, which contributes to the emergence of a new subject in schools discussed in Chapter Three (see Section 3.5.4.1).

In conclusion, it seems that the impetus from the non-formal education to environmental education has been more effective than the formal education in Britain, though the school curriculum includes environmental education as a cross-curricular theme. Owing to the government policy to let schools make their own decisions regarding the implementation of environmental education, it seems not easy to teach environmental education systematically via many dimensions inside the formal education system because it will not be formally tested.

Norway

The environmental education strategy developed by the Norwegian Education Ministry is the example of a systemic approach, which is quite successful because Anderson and Wennevold (1997) described environmental education as having gained a strengthened position in day-to-day teaching in Norwegian schools as well as in the curriculum since 1972. Based on the assumption that environmental education could be viewed as a process of systemic change, Benedict (1999) asserted that the meaning of a sustainable environmental education was to introduce high quality environmental education practice into the school system, resulting in widespread and permanent changes, which could be called systemic changes and would persist even if pressure for change was removed. Such an approach, giving more lasting results may be slower than efforts aimed at the classroom practice, in Benedict's view, but should make much more effective use of the limited public funding currently available for environmental education development. Therefore, the goals of the Norwegian strategy are primarily directed towards the system as a whole, not individual schools or programs.

According to Bolstad, Baker, Barker and Keown (2003), the impetus for environmental education in Norway began in 1972 with the UN Conference on the Human Environment in Stockholm. Next, the national primary curriculum first included in 1974 a compulsory topic Protection and Conservation of the Environment, and secondly Norwegian educational authorities from the late 1970s emphasised the development of strategies for environmental education. In response to the 1987 Brundtland Report, the Norwegian government in 1989 produced a white paper giving national guidelines for the development of environmental education. Benedict (1999) commented that 'shortcuts don't work'

and the desired systemic change should build an education system in which all the parts recognised and took responsibility for environmental education, from teacher training colleges to research institutions, centres for developing teaching materials, school principals, teachers and not least the Ministry of Education itself. Therefore, in the early 1990s, under the strong central government leadership and a co-ordinated plan for environmental education development in schools, strategies in Norway included the introduction of compulsory environmental education for pre-service teachers, revisions to the national curriculum, and a mandatory in-service development program for teachers (Bolstad, Baker, Barker, & Keown, 2003). These are indeed the themes of government leadership and professional development contributing to the emergence of a new subject in schools as discussed in Chapter Three (see Section 3.5.4.1).

There were steps taken for a good curriculum framework for environmental education in Norway. First, Benedict (1999) noted that a curriculum reform, Reform-94, from primary schools included strong emphasis on what was called 'the environmentally aware human being'. In addition, the last curriculum revision, L-97, strengthened the natural sciences and clearly stated that project methodology and local work with environmental issues were to be included in schools. The amount of school time devoted to thematic and project work after the 1997 school reform, was greatest in primary schools (80% in Grade 1) and then gradually reduced to 20% in lower secondary schools. At the level of teacher education, 40 hours in-service training courses in environmental education were conducted for all teachers in both primary and secondary schools in the early 1990s. Further, the curriculum of teacher training college was also revised to include a new compulsory course Nature, Society and Environment after 1997 school reform to give training to all the pre-service teachers (Anderson & Wennevold, 1997). At the county and regional level, an innovative system of inter-sectoral cooperation, county contact groups, was started in the early 1990s and it did foster the discussion of the environment and schools by key partners from both governmental sectors and NGOs. The county contact groups also reported to the Ministry of Education and participated in regular national meetings (Benedict, 1999). An environmental education network functions as a forum for exchange of environmental information between schools, local and regional

management in different sectors, and research institutions, and builds up a good model for national cooperation.

In summary, the Norwegian experience shows that efforts to bring about educational change through environmental education should be directed at framework factors i.e. placing the responsibility for environmental education in the education system, curriculum change, teachers' competence-building, and networks of national cooperation with the world outside the school.

Austria

The view of environmental education in Austria, according to Bolstad, Baker, Barker and Keown (2003), is one of 'socio-ecological environmental education'. That is, rather than seeking to indoctrinate students in environmentally sound behaviour, learners should be able to develop an understanding that environmental issues are structurally anchored in society and therefore have to be understood as community issues with conflicting interests at several levels: individual, social and structural.

Austria has been notable not only in its support and involvement in Environment and School Initiatives (ENSI) but also in its 'ecologisation of schools' project (Bolstad, Baker, Barker, & Keown, 2003). The concept of ecologisation of schools is a school development process, triggered by ENSI, and is in line with current European trends of decentralisation/de-bureaucratisation and individualism in education at large (Elliott, 1999; Rauch, 2002). It uses environmental education as a medium for school development on a pedagogical, a social-communicative, and a technical-economical level as well as a medium for quality development in teaching and learning in schools (Rauch, 2000). Therefore, it is a whole school environment project started from the basis of ENSI international network and commissioned by the Austrian Ministry of Education and Cultural Affairs. NGOs have been particularly active in promoting environmental education in Austria. An organisation, ARGE-Environmental Education (Filho, 1996, 2004), has played an historical role by systemically providing training programs, workshops, and seminars on environmental education for both teachers and other target groups. This organisation also

worked with Austrian governmental agencies i.e. Ministry of Education, Ministry of Environment, and Ministry of Foreign Affairs, to play a key role in the development of environmental education by supplying training and preparing educational materials (Filho, 1996).

This shows that both the formal and non-formal education in Austria are active in promoting environmental education. Obviously, the extent of influence from ecologisation of schools funded and commissioned by the government is much broader as its target group is their next generation, students. However, the function of NGOs can not be ignored for it offers training to adults who will teach or influence the young generation in many ways. Again, Austria, like Norway, offers another example of strong central government leadership.

Cross-national cooperation

- ***Pan-European programs***

In 1992, the Commission of the European Community released its recommendations for environmental education and targeted the *Environment Programme*, which is under the *Third Science Framework Programme* commenced in 1991 with an extremely large research budget (Convey, 1993). There are many sub-regional environmentally-based programs, the pan-European programs, such as the Baltic Sea Project (184 schools involved in all the countries bordering the Baltic Sea including Baltic States and Russia), the Mediterranean Project, the Elbe River Project, the Blue Danube River Project, and the French/German/Swiss Basle Project. Each of these projects has at its centre an area environmental question, which is of some importance to the contiguous countries. Working together on these projects allows for the development of desirable cross-border educational initiatives concerning the environment.

As well as the pan-European programs, the ENSI project is also a famous European cross-national cooperation. Details of this are discussed in the following section.

- ***ENSI***

Environment and School Initiatives Project (ENSI) is an international network within European member countries, initiated in 1986 by OECD/CERI (Organisation for Economic Co-operation and Development/Centre for Educational Research and Innovation), but with no official legal status and not able to pass resolutions binding to other member countries (Bolstad, Baker, Barker, & Keown, 2003). Most of the European member countries are voluntarily co-operative and annually fund the ENSI work programs but do their own work on the organisation and practice of focus projects. Each country involved has a national co-ordinator responsible for keeping contact between their government and ENSI and for organising the national ENSI activities in line with the ENSI work programs. The features of ENSI are:

- a strong theoretical position on the nature of environmental education;
- a sustained focus on teacher education, both in-service and pre-service;
- an emphasis on the formation of national and international collaborative initiatives and networking between schools, and between schools and other institutions (particularly teacher education institutions);
- a progression of focus over time, away from the development of school-based environmental education pilot projects, towards a focus on systemic changes to enable environmental education to become a sustainable feature of mainstream education. (Bolstad, Baker, Barker, & Keown, 2003, p. 52)

The characteristic of international cooperation of ENSI in Europe is very inspiring to environmental education and also an exemplar to the rest of the continents in the world. The focus of ENSI evolving from school-based environmental education towards the systemic changes to involve environmental education in the mainstream education in a sustainable way, is consistent with the Norwegian strategy and based on the fact that mainstream education could reach the largest proportion of the young generation.

4.4.2.2 North America

United States

The public concern about environmental education emerged in the 1960s in the USA (Disinger, 1998). Although the federal government had passed the National Environmental Education Act by 1970 which was only effective till 1975, the second National Environmental Education Act was signed again into law in 1990

by President Bush (Hodgetts, 2000). Despite obvious advances made in the field of environmental education since this Act was promulgated in 1990, the federal government's role, however, is "neither to lead or to co-ordinate; those tasks are reserved for the 50 states, each of which makes its own decision in these areas" (Disinger, 1998, p.226). This is very similar to the attitude of the British government. A survey of 446 teacher training institutions showed that only half of the students in pre-service teacher education were exposed to environmental education and few institutions required students to complete a course in environmental education (McKeown-Ice, 2000), as there is no mandate from the federal government to incorporate environmental education into pre-service teacher education. This situation leads to much of the national leadership in environmental education having to come from professional associations: the American Nature Study Society, the Outdoor Education Association, the National Association for Interpretation, the Conservation Education Association and the North American Association for Environmental Education (Disinger, 1998). This is exactly the theme of subject associations encouraging the emergence of a new subject in schools discussed in Chapter Three (see Section 3.5.4.1).

It is the responsibility of each state in USA to implement environmental education. One example of pre-service teacher education via government leadership comes from Wisconsin.

- ***Wisconsin***

Although there is a long history in Wisconsin of environmental education (EE) based in schools (Hodgetts, 2000), the Wisconsin Department of Public Instruction mandated in 1985 that all pre-service teachers of early childhood, primary education, agriculture, science, or social studies must achieve EE competencies before receiving certification (Lane, Wilke, Champeau, & Sivek, 1996). In 1990, the state mandated again that sequential environmental education curriculum plans must be developed, implemented and evaluated by each school district (Bolstad, Baker, Barker, & Keown, 2003).

In 1992, a teacher survey was conducted and aimed at assessing these Wisconsin's EE mandates (Lane *et al*., 1996). Although many teachers were being certified without environmental education training and many school

districts had not implemented environmental education curriculum plans, this survey showed a positive relationship between the amounts of time teachers devoted to environmental education and how frequently they referred to their district's environmental education curriculum plans. This analysis therefore strongly suggests that pre-service preparation in environmental education and environmental education curriculum plans contribute to teachers' effective classroom teaching practices in the concepts of environmental education.

The state government in USA is more influential than the federal government due to the political situation. The case of Wisconsin indicates that government leadership, at least to pre-service teacher education, is crucial and needed. The influence from policy-makers in government organisations is therefore not to be ignored.

Canada

Although environmental issues have become a focus for public attention in Canada since the late 1960s, environmental education has evolved through the 1980s to become everyone's concern in the 1990s (Hart, 1998). Hart (1990) described environmental education in Canada as almost invisible within mainstream educational practice in the late 1970s. In the late 1990s, in addition to some NGOs producing local and national materials, Hart (1998) stated that a growing number of provinces provided guidelines for integrating environmental education concepts into existing school subjects or developed education strategies for sustainable development. From elementary schools to universities, environmental education activity is not only recognised as an acceptable curriculum emphasis but also actively promoted by core people in academic and administrative positions (Hart, 1998). Environmental education became a priority for many Canadian elementary school teachers in the mid-1990s. Most of the universities' education faculty members had a main interest in environmental education and government people were active in being co-ordinated via the Canadian Network for Environmental Education and Communication. Throughout Canada, Hart (1996) described how teachers and children were actively restoring school grounds, parks, even wetlands; recycling; fund-raising for rainforests and whales as well as the local zoo; planting trees and writing to

elected officials about local issues. In Hart's view, these activities were the result of teachers passionately committed to doing something for the environment based on fundamental principles and values such as care, respect and responsibility which they extended from individual relationships to people-environment relationships. Hart (1998) concluded that the drive seemed to come from personal belief and commitment. Those who have adopted an ethic that includes the environment, especially teachers, have transformed their thinking about how the world works and are transforming the consciousness of the next generation.

As Hart suggests that the personal belief and commitment are the drivers leading to these positive changes, it seems that the systemic changes in Canadian society are rooted in their social beliefs and values rather than mandates from national or province government. However, Canadian provincial governments still contributed to promote environmental education by providing guidelines for the integration of environmental education concepts into existing school subjects or developing education strategies for sustainable development. Although these efforts could not directly change school teachers' teaching behaviours, the governmental effort providing resources of environmental education to teachers was not ignored, either.

4.4.2.3 Africa

As the population in primary schools represents a high percentage of the total population, the provision of environmental education in African primary education is considered a vital opportunity to achieve sustainable development. In 1998, a documentation analysis of ten countries in southern and eastern Africa (Taylor, 1998) showed that all of the countries had incorporated environmental education into their national policies and environmental education was already incorporated across the primary curriculum in eight countries (Zambia, Malawi, Tanzania, Uganda, Kenya, Namibia, Zimbabwe, and Botswana) except Ethiopia and Mozambique. The school examinations in Malawi, Uganda, Kenya and Zimbabwe even included environmental education themes. However, the limited pre-service and in-service teacher training and the lack of instructional materials led to inappropriate teaching of environmental education such as teacher-

dominated approaches with emphasis on cognitive aspects, becoming a general pattern in these countries in the 1990s.

In contrast, the wildlife clubs in non-formal education in Africa represent an important institution for providing environmental education to youth (Chadri, 1997; Mucunguzi, 1995). It is a grass roots conservation organisation for students and found in at least 17 Anglophone countries and ten Francophone countries in Africa in the late 1990s (Boulton & Eddershaw, 1997). For example, the Wildlife Clubs of Kenya (WCK) begun in 1968 was the first wildlife club movement worldwide and prompted the establishment of wildlife clubs across Africa in the 1970s. Further, its influences reached other continents and therefore wildlife/environmental clubs today exist throughout Africa, Asia, Latin America, Australia and Europe (McDuff, 2000). WCK has involved more than one million youth over three decades and its key success factors are partnerships between motivated individuals and conservation organisations, involvement in high-profile environmental issues, student trips to national parks, impacts on career choices of student, and decentralisation of the organisation (McDuff, 2000).

The power of NGOs in African environmental education seems to be more influential than government policies, formal education systems, and even the school examinations. These NGOs in Britain, USA and Africa not only compensate for the deficiency in government policies but reflect that the nature of environmental education should be taught in the environment rather than just classroom. It also highlights the importance of non-formal education when expanding environmental education worldwide.

4.4.2.4 Oceania

Australia

Environmental education in Australia took place prior to 1975 UNESCO seminar *Education and the Human Environment* held in Melbourne and then was shaped by international developments during the 1970s. This field became more highly organised internally in 1980 with the formation of its own national professional association - Australian Association for Environmental Education (Fien & Ferreira, 1997; Robottom, 1998).

Historically, environmental education in Australia has been teacher-based and school-based (Fien & Ferreira, 1997; Robottom, 1998). Interested teachers have had the opportunity to develop curricula based on investigation of environmental issues within the school's own community. A great diversity existed in environmental education across the country (Andrew & Robottom, 1995; Fien & Ferreira, 1997) and education systems. Acknowledging that environmental education should be part of the school curriculum and teacher education programs (Walker, 1997b), it became mandatory in the 1990s to teach environmental education in schools in most states and territories of Australia (Australia Education Council, 1991). This resulted in a greater centralisation of environmental education curriculum. *Studies of Society and the Environment* was the home of environmental education during the national curriculum processed in 1989 (Fien & Ferreira, 1997). This was one of the eight areas (the other seven: English, foreign languages, science, technology, mathematics, health and arts) of knowledge from the national curriculum but also included in science, technology, and health. After these efforts, however, environmental education was frequently not included in the curriculum in many schools (Walker, 1995, 1997b). A survey, conducted in 1994 with curriculum coordinators from 150 government secondary schools (95% among all) in the Melbourne metropolitan area, showed that less than one fifth of schools offered environmental studies/education as a separate subject. This was against the emphasis in the 1990 Victorian Conservation Strategy and the Victorian Ministerial Policy on Environmental Education providing separate subject on the environment as a focus means to teach environmental education (Lamb & Araos, 1998).

The fact was that the majority of schools offered formal modules or topics on the environment in science, geography and biology, but few had formal policies or integrative approaches to the teaching of environmental education. It was taught mainly by individual teachers and was not mandatory. Few schools did teach environmental education across all the subjects because traditional school subjects had much greater purchase value on higher education (Lamb & Araos, 1998). However, a three-way partnership between Australian Association for Environmental Education (AAEE), a university and at least one education system developed the National Professional Development Program over the years 1994-

96 and enhanced in-service teacher education (Smith, 1997). Teachers were encouraged but not mandated to undertake programs and issued certification, recognised in promotion, from AAEE after completing the professional development. While AAEE offered significant support to teachers and the Commonwealth along with state/territory government provided policies that gave official legitimation to environmental education, it seemed that the general pattern of environmental education tended to remain an activity for the enthusiasts (Fien & Ferreira, 1997; Robottom, 1998). Despite this, a great number of successful innovative environmental education programs and research projects from all states and territories of Australian showed that the characteristic of environmental education in Australia was a form of education interested in exploring and understanding the cultural, social, political, ethical, moral, emotional, and economic dimensions of environmental issues as well as their scientific dimension (Robottom, 1998).

In summary, Australian environmental education relies on raising enthusiasm among teachers and students. The personal belief and commitment among teachers and/or the public is not as high as Canada to get the whole system changed. Although many exemplary programs of environmental education do exist, these lighthouse examples cannot offer the majority of students environmental education experience in Australia (Fien & Ferreira, 1997). It indicates a need and priority to implement environmental education in the mainstream education in a sustainable way.

New Zealand

After the term 'environmental education' received prominence in 1970 at a meeting of the Physical Environment Conference, environmental education received increasing recognition in the 1970s in New Zealand (Hodgetts, 2000). In 1981, the efforts to incorporate environmental education into the New Zealand school curriculum led to the Department of Education Lopdell House Conference on Environmental Education, and the completion of a report *Environmental Education Across the Curriculum* (Ellis, Simpson, & Young, 1981). A draft version of the *New Zealand Curriculum Framework* in 1991 included a proposed learning area named Science and the Environment, but environmental education

was separated from science when the *New Zealand Curriculum Framework* was released in 1993 (Bolstad, Baker, Barker, & Keown, 2003). The difference between these two documents indicated a debate at that time over whether environmental education should be an independent learning area, or whether it would be most effective when infused across the curriculum (Barker, 2001). Finally, the Ministry of Education in 1995 published the *Draft Curriculum Guidelines for Environmental Education* and then in 1999, *Guidelines for Environmental Education in New Zealand Schools* was released to schools (Hodgetts, 2000). Like the UK, environmental education in New Zealand schools is a cross-curricular theme infused into seven essential learning areas (language and languages, mathematics, science, technology, social science, the arts, and health and physical well-being), particularly science, social science and technology.

In the early 1990s, environmental education in NZ primary schools had no coherent, directed approach and there was also a lack of systemic approach in secondary schools. However, some primary and secondary school teachers or schools had a special interest in environmental education and they provided various environmental education opportunities to students (NIER, 1993). Additionally, the influences from some groups involved such as the New Zealand Natural Heritage Foundation (NZNHF), community groups, NGOs and universities also made a great contribution to environmental education initiatives at that time. The 'Enviroschools' project began in 1993 and was a cooperation between organisations, i.e. schools, government agencies (national, regional and local) and universities (Bolstad, Baker, Barker, & Keown, 2003), providing good opportunities for the learning of environmental education for students from the schools involved. Before the promulgation of 1999 *Guidelines for Environmental Education in New Zealand Schools*, a mandate for school-based environmental education was already apparent in other documents, suggesting schools should engage with local environment and environmental organisations (Bolstad, Baker, Barker, & Keown, 2003). Thus, in the late 1990s, there was a growing acceptance across the country that environmental education was not just the responsibility of the formal education sector, and that the community of interest had a key role to play (Bolstad, Baker, Barker, & Keown, 2003).

Over the year 1999 - 2000, the largest national school survey of environmental education to date, with 709 schools (26% of all schools) showed that 81% of schools were offering environmental education activities or programs (Chronis, 2001). Popular activities offered were conservation, tree-planting, native flora and fauna studies, recycling, composting and worm farming, and water and marine studies. According to Bolstad, Baker, Barker and Keown (2003), there were six characteristics of environmental education in New Zealand schools:

- An emphasis on creating and exploiting links between programs in schools and extra-school agencies (e.g. regional authorities, conservation and environmental societies and other interest groups);
- The endorsement of whole school approaches to environmental education;
- The advocated inclusion of Maori knowledge and values in environmental education;
- A tradition of education 'in' the natural (and local) environment - e.g. through school camps, biology field trips, and learning experiences outside the classroom;
- The frequent selection of certain areas of content 'about' the environment in school environmental education programs and an abundance of resource materials to support these (e.g. biodiversity, local floral/fauna, nature conservation, water, air, waste and recycling, tree-planting and bush studies and various aspects of gardening); and
- A central focus on the relationship between environmental education development and the content of curriculum statements in the seven learning areas of the curriculum framework. (pp. 46-50)

Because the return rate of 2001 national survey was only around 26%, the situation seems to be unknown for the remaining 74% of New Zealand schools. Although Bolstad *et al.* derives six characteristics from previous studies of environmental education in New Zealand schools, it seems that these are also lighthouse exemplars similar to the case for Australia. Only small numbers of students receive the experiences of environmental education. Again, there is a need and priority to get environmental education into the mainstream education in a sustainable way.

4.4.3 The implementation of environmental education in Asia

Hong Kong

Hong Kong began to promote environmental education in schools during the mid-1980s when environmental protection became an increasingly important

governmental issue (Lee, 2000). Environmental education in Hong Kong held the status, allocated in the 1992 *Guidelines on Environmental Education in Schools*, of a non-compulsory and cross-curricular initiative. The *Guidelines* emphasised environmental education as a whole school concern and recommended schools to appoint an environmental co-ordinating committee to bring together environmental work across school subjects and to arrange whole school events such as environmental days, visits, etc (Stimpson, 1997).

Because the education system is highly centralised (Stimpson, 1997) and Hong Kong Education Department adopted a laissez-faire attitude towards the *Guidelines* (Lee, 2000; Stimpson, 1997), most schools tend to teach environmental education in the formal curriculum through either existing moral, civic and religious education programs or school subjects such as general studies at the primary level and integrated science, geography and biology at the secondary level. In the informal curriculum, schools tend to organise environmental education activities such as visits to nature reserves and urban/country parks, fieldtrips, and competitions (Lee, 1997).

Under the circumstances of government laissez-faire attitude, although the Environmental Protection Department and NGOs have provided support for environmental education in schools, *New Environmental Paradigm Survey 1991* indicated that a minority of the respondents in the general public had positive attitudes towards the environment (Ng, 1991). According to the study carried out in 1990-93 at the University of Hong Kong, Yeung (1996) stated that, among school subjects, geography made the greatest contribution to environmental education via teaching environmental issues. However, at the senior secondary level the teaching of environmental education was didactic. Expository methods such as lecturing with a reliance on notes were more frequently used than inquiry-oriented methods. Therefore, cognitive environmental objectives were often emphasised while values and behaviour were neglected. This fact was strongly affected by public examination pressure which led to a lack of teaching time/resources in schools and encouragement/assistance from the educational authorities. The low status of environmental education in schools was because it would not be publicly examinable (Stimpson, 1997). Central to the success of the

environmental education initiatives, therefore, were the teachers in the classroom and the curricular choices they made. Stimpson also stressed that there was a need for the development of teacher education.

In conclusion, external examinations in Hong Kong led to schools teaching more cognitive knowledge rather than values and behaviour in environmental education. This is not only because the central government adopted a laissez-faire attitude to school environmental education but also because values and behaviour of environmental education would not be publicly examined. This is a case strongly influenced by external examination when examining the emergence of environmental education in schools.

China

During the early 1970s, the People's Republic of China (PRC) started work in the area of environmental protection and environmental education following the 1972 UN Conference on the Human Environment (Stimpson, 1995). Although China adopted environmental protection as a basic national policy in 1973, the nature, purpose and expectations of environmental education were not clearly defined and then this policy was submerged by the Cultural Revolution until the 1980s (Gu & Lee, 1984). The central government in 1981 renewed its attention to environmental education and highlighted two components - environmental protection legislation and environmental science (Stimpson, 1995). In 1992, the first national working meeting of environmental education was held (Yen, 1993). This meeting proved to be a turning point for the development of environmental education in PRC by its implementation of environmental education in kindergarten, primary and secondary schools. Since then, environmental education has increasingly been seen as an important part of the whole strategy for protecting the environment in China (Xu, 1995).

Zhu (1995a) described environmental education as being an element in primary education since mid-1980s with three features: the development of environmental knowledge, a cross-curricular approach and the use of extracurricular activities. The situation of environmental education in secondary schools was organised within either a single subject model (some schools), or an infusion model (most of

the schools), or elective courses (many schools) or as extracurricular activities. Yet people in PRC kept putting efforts into the development of environmental education. In December 1996, the former State Environmental Protection Bureau and the former State Education Commission jointly issued the *National Environmental Publicity and Education Action Essentials (1996-2010)* (Wu, 2002). The essentials mandated the establishment of Green Schools to foster environmental education in formal education, at kindergarten, primary, secondary and tertiary levels. At the end of 1997, 60 schools in the Guangdong province were awarded the first Green Schools titles by the Guangzhou Municipal Environmental Protection Bureau and Education Commission for their high achievement in environmental education. To promote the development of Green Schools, the State Environmental Protection General Bureau and the Ministry of Education awarded a national commendation to Green Schools in 2000 and then presented this recognition to National Green Schools every two years.

The major constraint hindering environmental education in PRC is examination (Wu, 2002; Zhu, 1995b). It is a social problem and system constraint and reflects the tension that has confronted contemporary Chinese primary and secondary school teachers for nearly twenty years. A popular demand has existed for schools to emphasise the teaching of the entrance examination courses. This demand leads to those, such as environmental education, not examined being marginalized especially in key-points schools. For this reason, Wu (2002) suggested that the transformation from examination-based to quality-oriented education would provide greater opportunity for environmental education in PRC.

In sum, the obstacle China encountered when implementing environmental education in schools is similar to what happened in Hong Kong. An exam-orientated society could lead to the neglect of teaching the essence of environmental education, especially values and behaviour, in the mainstream school education.

Cross-national cooperation

- ***Asia-Pacific environmental education networks***

A joint initiative, the *Learning for a Sustainable Environment: Innovations in Teacher Education* project, of UNESCO-ACEID and Griffith University in Australia began in 1994 and provided a network for teacher educators to offer pre-service and in-service environmental education for teachers in the Asia-Pacific region (Fien & Tilbury, 1996). Since then, this network has not only developed modules for pre-service and in-service teacher education but also conducted cross-national investigation of young people's attitudes to the environment, nature and ecological sustainability in different Asia-Pacific countries (Bolstad, Baker, Barker, & Keown, 2003). Different from ENSI, the Asia-Pacific Environmental Education Networks up to now offer teacher education rather than first hand experiences to students. The influence on the young generation is indirect and slow compared with the ENSI project. The degree and dimension of cooperation needs to be extended.

4.4.4 Summary of section 4.4

This section shows that environmental education has become a recognised area of the curriculum in the 1990s, though most countries choose a cross-curricular implementation methodology. Moss (1993) stated that the provisions for environmental education were most effective when they were incorporated into education policy, because formal education had the greatest potential to reach a large proportion of children of school age. However, the effectiveness would be satisfactory only if combined with the strong central government leadership as in Norway and Austria. In countries where schools were just left to make their own decisions such as Britain, USA and Hong Kong, the provisions for environmental education tend to be less effective.

There is a need indicated to have proper teacher training not only for pre-service teachers but for in-service teachers as well. Teachers need to be adequately equipped with both the knowledge and the associated pedagogical approaches to teach environmental education in an interdisciplinary way. In addition, public entrance examination to higher schools is a universal obstacle for schools to

implement environmental education properly and efficiently as seen in China, Hong Kong, Britain, and possibly Australia.

Given what has been said about successful examples globally, cooperation is a crucial factor in the successful implementation of environmental education in schools especially the cooperation among organisations and/or nations. This includes inter-sectoral cooperation among governmental organizations (Norway), international cooperation (Pan-European Programs, ENSI and Asia-Pacific Network), cooperation between government and NGOs (Norway and Austria), cooperation between school and local community (Norway, Austria, Canada, Australia and New Zealand), and cooperation between school and government (Norway, Austria and New Zealand). This demand for organizational cooperation is because of the integrative and holistic nature of environmental education, which leads to its complex prerequisites in environmental, economic, political, cultural and moral areas. This is hard to achieve through education systems only.

Historically, environmental education positioned within existing educational frameworks acts as one of several forms of 'adjectival education' such as peace education, health education and social education (Gough, 1997). Environmental education is a field that has developed mostly outside the mainstream education system and certainly outside the traditional areas of curriculum (Bolstad, Baker, Barker, & Keown, 2003). Filho (1996) stated that the establishment of nationwide environmental education strategies, although helpful, was not a precondition for development and sustainability in the long term. In Filho's view, Germany, England and Wales are the cases where the development of environmental education has been ongoing but no national environmental education policies exist.

The influence of non-formal educational sectors such as Wildlife Clubs in Kenya should not be ignored, though it does not reach every school child. Its influence is far beyond the formal educational sectors to the receivers' adult lives and/or careers. Other non-formal educational sectors such as nature centres, museums, zoos, national parks, or even media are involved in everyone's life and have greatest potential influencing beliefs and attitudes in environmental education. In

addition, personal belief and commitment in Canada is the key factor changing citizens' attitudes and behaviours, which could be motivated from every way mentioned above.

In summary, the responsibility of achieving effective environmental education in schools can not just rely on school teachers and the Ministry of Education. Every member and organization in society is responsible for this duty. The systemic change which is needed will be discussed in the next section.

4.5 A Paradigm Shift? Environmental Education and Education at Large

Since the 1970s, environmental education has comprised three core threads generally accepted worldwide, namely education *about* the environment, education *in* the environment and education *for* the environment (Lucas, 1972). Education *about* the environment aims to produce knowledgeable individuals who understand how natural systems work and the impact of human activities upon them. Education *in* the environment uses the world outside the classroom as a learning resource and encourages students to build a relationship with the environment. Education *for* the environment embraces education in and about the environment and focuses on students developing values, lifestyle choices and skills for active participation to support the protection and improvement of the environment. The tendency in both primary and secondary schools emphasising education *about* the environment, rather than education *in* and *for* the environment, is part of a larger on-going debate in environmental education (Jickling & Spork, 1998). The main argument is that knowledge and understanding do not necessarily lead to positive attitudinal or action changes (Hungerford & Volk, 1990; Lucas, 1991).

Due to an increasing focus on the crucial importance of education *for* the environment (Palmer, 1998; Walker, 1997b), the 1990s saw a move away from the term 'environmental education' and towards 'sustainable development'. Other terms include 'education for sustainability' and 'education for sustainable development'. The shift in emphasis implicit in the notion of sustainable

development was endorsed in the United Nations General Assembly in 1987 (McKeown & Hopkins, 2003). This shift is revealed in three historically important documents for environmental education - the Belgrade Charter, the Tbilisi Declaration, and Agenda 21 (McKeown & Hopkins, 2003). The Belgrade Charter and Tbilisi Declaration were released in 1975 and 1977 respectively, while Agenda 21 was promulgated much later in 1992. The terms 'society', 'economics' and 'development' were not mentioned in the Belgrade Charter. The key word in its goal statement of environmental education was 'environment'. Although the words 'social', 'political' and 'economic' appear in the Tbilisi document, they are not as prevalent as the word 'environment'. The Tbilisi Declaration calls for a broad approach to environmental education with goal statements about awareness, knowledge, skills, values and participation. Its emphasis, however, is still the environmental problems and the impact of humans on the natural environment and much less on the quality of life in terms of society and economics. Therefore, McKeown and Hopkins (2003) concluded that the overall intent of environmental education in the 1970s was to preserve the natural environment and reduce human impacts on it and much less on the plight of people. This was addressed more in the 1980s and 1990s. Again, Annette Gough (1997) pointed out that the major difference between Tbilisi statements and those contained in Agenda 21 was that 'environment' was used in Tbilisi, 'environment and development' has been substituted in Agenda 21.

In the early 1990s, there were two important changes in environmental education (UNESCO, 1995). First, a recognition of the omnipresent relationship between environment and humans contributed to proponents of environmental education seeking to ensure that environmental education was incorporated into school curricula as an interdisciplinary subject rather than a stand alone subject. The second change was the addition of the notion of sustainable development to environmental education, again in recognition of the interconnected relationship between humans and the environment. Therefore, environmental education after the 1992 Rio Summit was reconceptualised as education for sustainability (EfS) (De Haan & Harenberg, 1999). There are a number of similar terms in use for this notion: education for sustainable development (ESD), education for a sustainable future (ESF), sustainability education (SE), and environmental and sustainability

education. Tilbury (1995) defined the new focus of environmental education for sustainability (EEFS) as follows: relevant, holistic, values-orientated, issues-based, action-orientated and critical.

Barraza, Duque-Aristizabal and Rebolledo (2003) stated that education for sustainable development represented a sub-movement within environmental education. It represented a shift away from the concept of environmental education as understood in the 1970s and 1980s. The reason for this shift, Huckle (1999) suggested, is environmental education carrying too much baggage and being too closely associated with nature studies and natural science. Education for sustainable development is seen to be broader and more concerned with social and cultural aspects of nature than environmental education ever was (Barraza *et al.*, 2003; Fien & Tilbury, 2002; Hopkins & McKeown, 2002). However, the sustainability debate has been criticised, particularly in the UK and Australia, for its strong orientation towards an economic market philosophy and economic growth (Elliott, 1999; Fien & Tilbury, 2002; Hopkins & McKeown, 2002; Rist, 1997). All major social stakeholders north and south on this planet recognise this notion of both preservation and development. In the environmental debate, Rauch (2002), for example, suggests that the term 'sustainable development' is a coinage of words, which combines the notions of economic development and the avoidance of environmental strains in one vision. He notes that sceptics have pointed to the danger of this term being reduced to a mere catchword so that the consensus that was reached on the abstract aims of sustainability is stalled and the idea degenerates into an empty shell. In support of this concern, Sterling (2002) pointed out that 'education for sustainable development' or 'environmental education' within a framework of a mechanistic education paradigm (a managerial and instrumental view of education) could only meet with limited success. However, the roots of education for sustainable development were firmly planted in environmental education (Hopkins, Damlamian, & Lopez Ospina, 1996; Parliamentary Commissioner for the Environment, 2004). Moreover, a broad socio-ecological approach to environmental education was founded on general educational goals and on societal processes towards a sustainable society (Kyburz-Graber, Rigendinger, Hirsch, & Werner, 1997; Malone, 2006). In reality, environmental education is indeed difficult to carry out because it is so wide-

ranging (naturalist, conservationist, problem-solving, systemic, holistic, humanist, critical, bioregional, feminist, etc.) and demands in-depth changes. Therefore, environmental education calls for the involvement of the whole educational community: schools, museums, parks, municipalities, community organisations, firms, etc (Sauve, 2002). It is important for each actor, in Sauve's view, to identify his/her own educational niche in environmental education, depending on the particular context of his/her own action, the target group and the resources available. The issue for each actor is to choose objectives and strategies that are relevant and realistic without forgetting the full range of other possible objectives and strategies. Each specific activity or project should be seen as complementary to and preferably integrated with those of the other environmental education actors and with other associated dimensions of education at large, in particular citizenship education and health education.

Apart from ecological matters proper, environmental education is determined by notions of fair and equitable global distribution leading to the emergence of a new configuration of ecological, economic and social components. In this way, Rauch (2002) stated that education for sustainability could become a trailblazer for educational reform. Earlier than this, Benedict (1999) stated that the introduction of environmental education could be viewed as a process of educational change, which should cause systemic change to the institutional framework of schools and/or society. This systemic approach would focus on placing responsibility for environmental education with the educational authorities; curriculum revision; competence building and development of networks of intersectoral cooperation with institutions outside the school. Consequently, the new paradigm of sustainable development was endorsed in 2002 Johannesburg Earth Summit (Malone, 2006; Pigozzi, 2003). The political Declaration in this Summit states that sustainable development is built on three interdependent and mutually reinforcing pillars - economic development, social development and environmental protection, which must be established at local, national, regional and global levels. This paradigm expands the vision of environmental education onto a higher level, one that fits with broader goals for and purposes for education at large.

Educating people for sustainable development requires a balance among economic goals, social goals and ecological responsibility (Malone, 2006; Parliamentary Commissioner for the Environment, 2004; Pigozzi, 2003). Next, education should provide communities with the skills, perspectives, values and knowledge to live in a sustainable manner. This should be interdisciplinary, integrating concepts and analytical tools from a variety of disciplines. Education, therefore, must be reoriented to include the changes needed to promote sustainable development. Thus, education for sustainable development must be attentive to developments and reforms in education at large. In 2002, Sterling critiqued the dominant learning paradigm, especially that in Western education systems, as being focused on functional or informational learning and orientated towards socialisation and vocational goals that take no account of the challenge of sustainability. Rather, it is a modernist educational paradigm, deriving from a broader social and cultural paradigm and is fundamentally mechanistic and reductionist. David Orr claims that the upshot is that education must be taken back from those who intend it to be centralised, homogenised, standardised, technologised and industrialised (cited in Sterling, 2002). New paradigms in general education are focused on moving towards a sustainable society, which is often seen as one that is democratic, participative and equitable (Barraza *et al*., 2003). Therefore, Noel Gough (1987) and Sterling (2002) call for an ecological educational paradigm, which is participative, democratic, co-evolutionary, collaborative, reflexive, process-oriented, dialogic, systemic, integrative, connective, adaptive, creative, holistic, synergetic, transformative, purposeful and epistemic. The real need is to change from transmissive towards transformative learning (Sterling, 2002). The ecological, participatory worldview in terms of whole systems thinking extends, connects and integrates the three aspects of paradigm, ethos, eidos and praxis, to reflect wholeness. The sustainable education paradigm requires vision, image, design and action with a systemic change at all levels (Sterling, 2002). In the book *See Change*, it is claimed that education for sustainability encompasses a new vision for education at large to empower people of all ages to assume responsibility for creating a sustainable future (Parliamentary Commissioner for the Environment, 2004). Finally, Malone (2006) presented similar key principles underpinning the new learning (educational reform movement) and education for sustainable development (ESD). They are

integrated and interdisciplinary, active citizenship and project-based learning, intellectual quality and participatory action research, deep understanding and critical active engagement, learning communities, multi-literacies, recognition of differences, life-long learning, and pedagogical innovation and quality. Malone strongly asserted the visualisation of ESD as a model for the new learning in the twenty first century. In other words, if ESD could be linked to the current global education reform movement, educating for sustainability would be swept along with the energy of the reform effort.

In summary, a shift of emphasis over the last several decades has occurred not only in environmental education but in general education as well. The scope of both has changed from specific to broad, from boundary defining to integrative, and from uniform to pluralist. This shift requires that everyone play a role working collaboratively whatever their society, culture or country, in order to achieve the goal of sustainable development. Given this global trend in environmental education, whether it is possible to achieve such a demanding shift by way of a centralised curriculum change as in the 2001 Taiwanese curriculum reform or whether other strategies might be required will be the consideration for next section.

4.6 Implementing Environmental Education in Taiwan: An Emerging Research Problem

Environmental education represents a fundamental challenge to existing patterns of schooling. Robottom (1985, p. 34) stated "Its inquiry is a challenge to habitual patterns of teaching; its interdisciplinary character is a threat to conventional disciplinary curricular structures; its emphasis on outdoor education presents problems for the existing organisational pattern." Therefore, the introduction and implementation of environmental education into the school curriculum is never easy.

Entering the twenty first century, global influences with powerful electronic media penetrate everyone's daily life. Although Taiwan is a small island on this planet, it usually follows the global trends closely. Since the 1980s, global

educational reform and curriculum reform have occurred silently, but strongly, in many countries such as USA, Britain, Australia, New Zealand and Singapore. Taiwan, with its distinct educational climate, caught the worldwide reform train but towards its own destination. Due to severe environmental degradation in Taiwan, the importance and necessity of environmental education was reflected in the design of the 2001 curriculum reform. The Ministry of Education in Taiwan called for 'radical change' to the whole society and system via the implementation of *Grade 1-9 Curriculum*. The governmental effort towards the issue 'education ***for*** the environment' was to include 'environmental education' in the new Taiwanese national curriculum and it was one of the six *Important Issues* that were to be infused into the curriculum core learning areas (see Section 2.3.4.1). Whether the redevelopment of the whole educational climate in Taiwan has been of a sufficiently radical type to permit the emergence of a paradigmatically novel curriculum area - environmental education - is a key issue for this thesis.

It needs to be remembered that the extent to which schools make decisions on how to implement environmental education in their school plan is the responsibility of teachers and administrators. To what extent this top-down centralised curriculum change, via a short and squeezed implementation scheme (reduced from a nine to a four year implementation timeframe), will achieve its expectation is a timely and relevant research question in Taiwan. Whether or not the beliefs and attitudes of school teachers and administrators will be changed (and to what extent they are changed), whether or not classroom teaching practices and school activities will be changed (and to what extent they are changed), and the reasons for any changes are also potential research questions.

4.7 Developing the Research Questions

The research aim for this thesis was given in Chapter One as follows:

> To explore the implementation of environmental education in junior high schools within the context of the national curriculum reform in Taiwan.

Based on the research aim and the nature of the implementation of environmental education at the classroom level in Taiwanese junior high schools before the 2001

curriculum reform, three research questions emerged and were stated in Chapter Two. These were:

1. What was the role and place of environmental education in the pre-reform school curricula?
2. What is the influence of the introduction of environmental education (as required in the new national curriculum) on school curricula?
3. What is the impact of the new national curriculum on teacher views and practices in environmental education?

Chapter Three documented themes from the literature on ways for any new subject to emerge in the school curriculum; however, very little research was found that documented themes relevant specifically to the emergence of environmental education in schools. Given the current international focus on environmental issues to be properly infused into the school curriculum and the often-stated differences between environmental education and traditional school subjects, there is a need to identify and compare differences between the emergence of environmental education and of other contemporary school subjects in schools. In addition, Chapter Three overviewed the issues of the curriculum, curriculum change and curriculum implementation to set the scene for understanding the emergence of a new subject in schools during the period of curriculum change. Therefore, a further research aim for this study is:

> Does this curriculum design achieve its stated purpose of incorporating environmental education as a new subject, or not?

Apart from the three research questions to be answered for this thesis, the emerging research problem to do with this thesis detailed in Section 4.6 highlights the need to investigate whether or not the educational climate after the 2001 curriculum reform in Taiwan allowed the emergence of environmental education in schools. The question is: What will be the nature of the implementation of environmental education in Taiwanese junior high schools via the 2002 curriculum change? Thus, the fourth research question for this thesis is:

> What are the crucial themes in curriculum change for the introduction of the new subject of environmental education in schools?

To sum up, the four research questions for this thesis will be developed as follows:

1. **What was the role and place of environmental education in the pre-reform school curricula?**

2. **What is the influence of the introduction of environmental education (as required in the new national curriculum) on school curricula?**

3. **What is the impact of the new national curriculum on teacher views and practices in environmental education?**

4. **What are the crucial themes in curriculum change for the introduction of the new subject of environmental education in schools?**

4.8 Summary

Chapter Four reviewed the nature, curriculum models and implementation strategies for environmental education. The paradigm shift of environmental education towards education at large was also discussed. Finally, the research questions for this study concerning the nature of the implementation process for environmental education in Taiwan are set out.

Section 4.2 reviewed the definitions and characteristics of environmental education. The unique integrative nature of environmental education was described as a life-long process, an approach to education as a whole rather than a subject, problem-centred, interdisciplinary and holistic, value-oriented, community-oriented, having local to global dimensions, student-initiated activities with first hand experience, the clarification of values, and being past/present/future-oriented.

Section 4.3 described the theoretical framework of environmental education co-evolving with education at large from a technical to a critical mode. The problematic and contradictory relationship that has historically existed between environmental education and the school curriculum was discussed. Then theoretical models for the implementation of environmental education and the

barriers that have arisen when teachers and administrators seek to incorporate environmental education into the school curriculum over the last several decades were outlined.

Section 4.4 delineated the contemporary implementation of environmental education worldwide. It raised crucial factors via successful examples for the implementation of environmental education. These factors are: strong central government leadership; professional development for both pre-service and in-service teachers; a cooperative network nation-wide, including non-formal educational sectors; and personal belief/commitment.

Section 4.5 reviewed the evolution in emphasises of environmental education. The focus was 'education about, in and for the environment' in the 1970s. 'Education for sustainable development' was substituted in the 1990s. At the beginning of the twenty first century, environmental education was redirected towards the development and reform of education at large via a systemic change approach.

Section 4.6 described the research problem in this thesis: the nature of the implementation of environmental education in Taiwan via the 2001 curriculum reform. Finally, section 4.7 developed the four research questions for this thesis.

Chapter Five will describe the methodology and research program for this thesis and Chapter Six will present stories of the three case study schools. Chapter Seven will answer the first three research questions by synthesising data across the case studies. Chapter Eight will answer the fourth research question by discussing between data and literature to synthesise the themes for consideration for the successful introduction of a new subject, especially environmental education, in schools.

CHAPTER FIVE:
RESEARCH METHODOLOGY

"Innovation is a risky business and must be recognised as such."
Michael Fullan (1972) in *Thornlea: A case study of an innovative secondary school*, p.4.

5.1 Introduction

Chapter Two described Taiwan's geography, population, economy, environmental issues and environmental protection as background to the recent educational reform, and the 2001 curriculum reform. It also described the rather haphazard practice of environmental education in Taiwanese schools before 2001, that is, when environmental education was not an official school subject. Further, it pointed out that environmental education has still not been one of the seven major learning areas in the new national curriculum, although it was one of the six *Important Issues* infused into learning areas.

Chapter Three reviewed curriculum theories, curriculum change and curriculum implementation generally, especially as concerning the emergence of a new subject. It provided traditional themes from literature when discussing the emergence of a new subject in schools. The prerequisites of the subject emergence are the gaining of external examinations, a university department, priority in the school timetable, textbooks, strong government leadership, subject associations, sufficient teacher professional development, supplementary informal curriculum in schools, and supportive non-formal education in society. However, the really decisive themes for subject emergence included the presence of clear subject characteristics and definition, substantial subject teachers' material interests, and a supportive external constituency, especially parents.

Chapter Four specifically considered the nature of, and curriculum models of environmental education. It described a dilemma: environmental education is holistic and integrative; but the themes for the traditional emergence of a new subject were well-defined knowledge with strong boundaries. Although literature suggested many models for the implementation of environmental education, the best one was an approach to education as a whole rather than just the subject itself.

From worldwide successful examples, simply gaining a place in the national and/or school curriculum was not sufficient for its implementation. For this reason, environmental education, in fact, challenges the traditional pattern for the emergence of a new subject in schools.

This chapter, Chapter Five, considers the research methodology for this study. Section 5.2 takes into account an appropriate interpretive methodology to be used, while Section 5.3 introduces the case study research specifically for this study. Section 5.4 describes data-gathering methods to be adopted. The overall considerations of trustworthiness and triangulation are considered in Section 5.5, which also discusses ethical considerations and the limitations of this research. Section 5.6 describes the overall research program. Finally, the chapter is completed by the summary in Section 5.7.

The four research questions are concerned with the role and place of environmental education in the pre-reform school curricula, the influences of the introduction of environmental education on school curricula, the impact of the new national curriculum on teacher views and practices in environmental education, and the crucial themes in curriculum change for the introduction of the new subject of environmental education. To answer these questions, the following section will introduce the methodology adopted in this thesis.

5.2 An Interpretive Methodology

Change brings *hope* and *risk* at the same time to the education. During curriculum change, many uncertainties and potential problems and/or barriers do exist and need to be understood if they are to be overcome and effective curriculum change achieved. Akker (1994) indicated the difficulty of reaching conclusions about the nature of the cause of any difficulties, let alone suggesting possible solutions, without having accurate information understanding intermediate stages in the curriculum implementation process. In their study of curriculum innovation, Crossley and Vulliamy (1997) noted that educational researchers have increasingly called for interpretive studies that document the processes of change at the school level, in the hope that findings will be more

helpful for the improvement and further refinement of implementations strategies. Interpretive inquiry can be conducted using both quantitative and qualitative methods (Erickson, 1986). Hart and Nolan (1999) indicated that quantitative methods were dominant in environmental education research before the early 1990s when there was a shift to interpretive, critical and postmodern lines of inquiry. This thesis relies strongly on the interpretive methodology where the concern is to understand the situation on the subject emergence of environmental education in schools during a national curriculum change.

The goal of interpretive studies is to understand the complex world of lived experience from the point of view of those who live in it, and to interpret it (Schwandt, 1994). The major concern in interpretive studies is with individuals and developing an understanding of their interpretation of the subjective world around them (Cohen, Manion, & Morrison, 2000). Interpretive inquirers usually watch, listen, ask, record and examine activities which happen in their study sites. They seek to elucidate the process of meaning construction and clarify what and how meanings are embodied in the language and actions of social actors (Schwandt, 1994). Interpretive inquiries can be conducted using a range approaches including case study. There has been an emphasis to study environmental education via case study research since the late 1990s, especially studies on how environmental education is incorporated into primary and secondary school curricula (Hart & Nolan, 1999). The following section will introduce the case study.

5.3 Case Study

The case study is described as ‘an umbrella term’ for a family of research methods having in common the decision to focus on inquiry around an instance (Adelman, Jenkins, & Kemmis, 1977). Like all research methods, in a case study the researcher collects evidence systematically, studies relationships between variables and promotes a methodical study. It mainly deals with the interaction of factors and events and sometimes it is only by taking a practical instance that we can obtain a full picture of this interaction (Nisbet & Watt, 1978).

A case study is the preferred strategy when 'how' and 'why' questions, emerging from 'what' questions, are being posed; especially when the investigator has little control over events and when the focus is on a contemporary phenomenon within some real-life context (Yin, 1994). According to Bell (1993), the great strength of the case study method is that it allows the researcher to concentrate on a specific instance or situation and to identify, or attempt to identify, the various interactive processes at work. Such processes would probably be hidden in quantitative research, such as surveys, but may be crucial to the success or failure of systems or organisations. Nisbet and Watt (1984) suggested three stages in undertaking a case study. First, it is better to commence with a very wide field of focus in an open phase and without selectivity and/or prejudgement. Then, progressive focusing enables a narrower field of focus to be established, identifying key foci for subsequent study and data collection. Third, a draft interpretation is prepared which needs to be checked with respondents before appearing in the final form. It is important to gather data openly and not to generate hypotheses too early.

The case study relies on interview, observation and document analysis (Denzin & Lincoln, 1994b). In addition, selection has to be made when a single researcher is gathering all the information. It is difficult to cross-check information and therefore the danger of distortion always exists. Critics of the case study approach point to the fact that generalisation is not usually possible and question the value of the study of single events (Bell, 1993). However, Bassey (1981) argued that the 'relatability' of a case study was more important than its 'generalisability'. He emphasised the contribution of a case study was that those details were sufficient and appropriate for another teacher/researcher working in a similar situation to relate his decision-making to that described in the case study. Therefore, the researcher should identify an 'instance' such as the introduction of a new syllabus, the way a school adapts to a new role, or any innovation or stage of development in an institution, and then observe, question and study it (Bell, 1993).

The *infusion* approach of environmental education has been mentioned in school education over decades, though its effectiveness still needs to be examined. This is the first time, in the 2001 curriculum reform, that the Ministry of Education in Taiwan has introduced environmental education officially into its national

curriculum. Thus, it is necessary to understand 'what' is the strategy schools choose for developing environmental education infusion approach in this new curriculum, 'why' and 'how' do schools choose the strategies to achieve this goal, and finally 'what' is the content into which schools infuse environmental education in their school curricula and/or school-based curricula. The case to study in this thesis will be the school itself; including the power structure, the way of negotiation and co-operation among staff, and teacher development inside a school.

As to the number of schools being studied, Yin (1994) mentioned a single case as offering a poor basis for generalising. Morse (1994) stated that the product may be much stronger than if only one group is studied. Frequently two settings, at least, are selected for the distinct purpose of comparing and contrasting the populations. To make even a better study, three junior high schools will be the consideration in this thesis. The next section will describe the data-gathering methods that were adopted in this research.

5.4 Data-Gathering Methods Adopted in this Research

5.4.1 Introduction

There are three general methods of information gathering: interview, document use and observation. Richardson, Dohrenwend and Klein (1965) stated that all three methods were often used in the same study, either concurrently or in sequence, to verify or to supplement the information gathered by any one of them or for the peculiar advantages of each at various stages. However, Bell (1993) suggested that no method should be excluded, though observation and interview are most frequently used in case study. Interviews are the major method for collecting data in this research, while documents and observation are supplementary. All three will be described in the following sections.

5.4.2 Interview

Interviewing is the favourite methodological tool for the interpretive research. Kahn and Cannel (1957) defined an interview as a specialised pattern of verbal interaction, which is initiated for a specific purpose and focused on some specific

content area with consequent elimination of extraneous material. It is a planned conversation in order to gather certain information. Richardson *et al.* (1965) indicated the use of the interview must be based not only on the investigator's subjective preference but also on an objective assessment of the information to be gathered including the personal characteristics/resources/skills of the investigator and the available sources of information. Cannell and Kahn (1968) noted an interview would happen when conversation was initiated by the interviewer for the specific purpose of obtaining research-relevant information. An interview is focused by the researcher on content specified by research objectives of systematic description, prediction or explanation.

Witz, Goodwin, Hart and Thomas (2001) suggested the interview philosophy must aim to promote expression of as many aspects and manifestations of the phenomenon by the participants, and in as many directions, as possible. There are two factors, purpose and structure, comprising an interview (Hunt & Eadie, 1987). As early as 1965, Richardson *et al.* divided interviews into two categories: standardized/structured (schedule and nonschedule) and nonstandardized interviews. It is generally recognised that there are three main forms of interview; structured, semi-structured, and unstructured interviews with one-on-one or groups.

The purpose of the interviews in this study aimed to properly understand the process of the longitudinal school development when facing curriculum change. Therefore, the interview schedule is the same one for every research subject in order to compare the similarity and/or difference from different interviewees with different academic backgrounds and positions in their schools. However, extra questions were often asked to gain a broader picture of the school. It was planned to have four rounds of interviews (once per semester) over two school years. Due to the lack of obvious changes to the schools' development between two semesters, this was changed after the first round of interviews having three rounds of interviews (once per year) over three school years. In short, a semi-structured interview was used three times (once a year) in this research with basically the same interviewees over three school years (Aug. 2001-July 2004). The interviewees are the principal, instructional director, environment officer and

seven teachers from each of seven major learning areas. It results in ten interviewees, at least, in each of the three schools studied. The reason to have this interviewee structure is because environmental education would be taught in an infused way (required by the new Taiwanese national curriculum) in each of the seven learning areas. Special interviewees such as the ex-instructional director in Riverside junior high school and the new biology teacher in Redbrick junior high school were interviewed only once with different questions, which was for the purpose of gaining a better understanding of their schools' development.

The interview questions in this research were first set in English (see Appendix 5) and then translated into Chinese (see Appendix 5). The language used in the interviewing process was Chinese. The transcribing was done in Chinese to reduce translation error between two languages so as to understand properly the interviewees' opinions. When analysing data and writing the thesis, Chinese was translated into English.

5.4.3 Document analysis

Documentary analysis is derived from historical methods which are essentially concerned with the problems of selection and evaluation of evidence (Bell, 1993). In any form of historical tracking, document location and analysis is a key form of evidence because documents are the main sources of information about history or past events and may provide useful complementary information. Therefore, document analysis can be used to supplement information obtained by other methods.

In interviews and observations, the researcher gathers data for the purpose of his/her own investigation. Both techniques intrude as a foreign element into the social setting they would describe by creating measured attitudes, eliciting atypical roles and responses which are limited to those who are accessible and will cooperate (Webb, Campbell, Schwartz, Sechrest, & Grove, 1981). However, documents are usually produced for reasons other than research and therefore are not subject to the same limitations (Merriam, 1988). Thus, the review of documents is an unobtrusive method (Marshall & Rossman, 1999; Merriam, 1988; Yin, 1994) which is rich in illustrating the values and beliefs of research subjects

in the setting. In addition, documentary information is likely to be relevant to every case study topic (Yin, 1994). Therefore, researchers supplement interviewing and observing with gathering and analysing documents produced in the course of everyday events or constructed specifically for the research at hand (Marshall & Rossman, 1999). Documents can be considered under two broad categories: *existing documents* (not produced for a specific study but relevant) and *elicited documents* (produced at the instigation of the investigator by the individuals being studied) (Richardson *et al*., 1965). Documents also can be divided into *primary* and *secondary* sources (Bell, 1993). While primary sources are those existing in the period under research (e.g. the minutes of meetings), secondary sources are interpretations of events of that period based on primary sources (e.g. a history of the school which obtained evidence from the minutes).

The major documents for this research are the plans of the school curriculum submitted to local educational bureau for the implementation of the new national curriculum including school calendar, teaching plans of the seven learning areas and the topic teaching. City administrative orders were also collected as supplementary information. According to the categories mentioned above, these school plans and administrative orders are not only existing documents but also primary documents. The reason for examining these documents is to seek relevant issues on the planning of environmental education in their school curriculum. The limitations of documents are their uselessness for any information about future behaviour and they have little value in uncovering motives and opinions which are usually elicited by skilful questioning (Richardson *et al*., 1965). As the prediction of future behaviour is not the aim of this research and opinions could be collected from interviewing, the limitations of document analysis, therefore, had little influence on this research program.

5.4.4 Observation

Traditionally, observation is purposeful and selective watching, counting, listening to, or even smelling of objects or of phenomena as they take place (Richardson *et al*., 1965). It is essential when documents do not exist and the accurate and full information cannot be obtained by interviewing. Moreover, observation can be particularly useful to discover whether people do what they

say they do, or behave in the way they claim to behave (Bell, 1993). However, observation is confined by the budget, time, researcher availability and place. It is useful in conjunction with a study that will depend primarily on interviewing to achieve the requirement of triangulation.

The observations in this study kept a broad view with the whole reform climate in both junior high schools and society. They included everything new or different from the past events in Taiwan. It did not include classroom observations because the infusion strategy for implementing environmental education in the new curriculum led to sporadic teaching in classrooms, which was difficult to anticipate and monitor. This decision was made while conducting the first round of interviews.

5.4.5 Questionnaire

The questionnaire is a widely used and useful instrument to collect survey information, providing structured and often numerical data, being able to be administered without the presence of the researcher (Wilson & McLean, 1994). While the larger the sample, the more structured, closed and numerical the questionnaire may have to be, the smaller the sample, the less structured, more open and word-based the questionnaire may be (Cohen *et al*., 2000). However, a qualitative, less structured, word-based and open-ended questionnaire would be more appropriate if a site-specific case study is required because it can capture the specificity of a particular situation (Cohen *et al*., 2000).

In this study, a questionnaire on a small scale and less structured with open-ended questions was given to only one of the three schools studied. In fact, only Grade 7 homeroom teachers, eight in total, completed this questionnaire because none of them was the research subject interviewed. The reason for such a small distribution was because there was a weekly period of environmental protection education in their school timetable. This period was distributed only to Grade 7 homeroom teachers in this school as nothing similar existed in the other two schools.

5.4.6 Summary of section 5.4

Section 5.4 considered a number of ways in which research data in this study could be collected. They are interviews, document analysis, observation and questionnaire survey. For the purpose of this research, it was decided that data would be primarily collected in the form of interviews with at least ten school staff from each of the three schools studied over three school years (Aug. 2001-July 2004). It resulted in three rounds of interviews, which were conducted once a year with all of the interviewees. In addition, school curriculum plans over two school years from August 2002 would be collected for the document analysis. The overall observation of the changes in a macro level would be run over the whole research process. A questionnaire, in fact, was not a planned method but conducted under the special circumstance to collect richer and supplementary information.

5.5 Overall Considerations

5.5.1 Introduction

This section discusses the standard considerations in the development of the research methodology for this research. The considerations are discussed as follows:

* Trustworthiness and triangulation (Section 5.5.2)
* Ethical considerations and the researcher's role (Section 5.5.3)

5.5.2 Trustworthiness and triangulation

The interpretive approach to judging the quality of research is different from the criteria of reliability, internal validity, external validity and objectivity used for empirical-positivist research paradigm. Lincoln and Guba (1985), and Guba and Lincoln (1989) proposed *trustworthiness* for interpretive studies as parallel to the criteria that have been used in conventional research. Trustworthiness is about the quality of the research and how a researcher persuades their audience that the findings of the research are worth paying attention to. Each aspect of trustworthiness had parallels with the traditional criteria, namely *credibility*, *transferability*, *dependability* and *confirmability*. According to Guba and Lincoln (1989), credibility parallels internal validity. In order to have credible findings

and interpretations the researcher could use the techniques of prolonged engagement, persistent observation, peer debriefing, negative case analysis, and member checks. Prolonged engagement requires researchers to invest sufficient time in the study site to overcome their personal distortions. Persistent observation is to identify characteristics that are most relevant to the research aims and questions. Peer debriefing aims to provide an external check with the researcher discussing with a disinterested peer the findings, analysis and tentative hypothesis to further explore the research. Negative case analysis is a process aiming at revising working hypotheses as more and more information becomes available. Member checks are to test interpretations with members of the stakeholders from whom the original constructions were collected. Transferability maybe thought of as parallel to external validity or generalisability: it is to provide a database that makes transferable judgements possible for potential appliers studying in their own situations. Dependability parallels reliability and is related to the stability of the data over time. To ensure dependability, methodological changes and shifts need to be recorded and tracked. Confirmability maybe thought of as parallel to objectivity and relates to whether the interpretations and outcomes of an inquiry derive from the data. For this, the logic used to integrate the interpretations into a coherent and corroborated whole is clearly outlined in study.

In this study, aiming at prolonged engagement, the researcher visited school staff a number of times and conducted up to three interviews with teachers over a period of three years. Over this time, the researcher built up trust and rapport and gradually became accepted by the school staff involved in this research. In this longitudinal way, persistent observation was achieved when the researcher identified key issues relevant to the aims of this study and revised assumptions about research questions back and forth. Peer debriefing was done by discussion of the emerging findings, analysis, assumptions and thinking about this research with a peer interested in environmental education. Negative case analysis was carried out by the researcher leading to the development of the fourth research question. The interview transcription and the researcher's interpretations of this was member checked by the interviewees after the first round of interviews (30 minutes). Three fourths (27/37; 73%) of the interviewees returned the member

checked transcription to the researcher with little revision. As the length of the second (60 minutes) and third (90 minutes) round of interviews was much longer and staff member interviewed had come to trust the researcher, these were not member checked. Transferability has been achieved by detailed description of the research process (see Section 5.6) and the school case studies (see Chapter Six). Dependability was achieved by describing the changes in methods used in the study. Three major changes were made. First, it was decided not to conduct classroom observations before the second round of interviews (see Section 5.4.4). Second, after the first round of interviews the frequency of interviewing was changed from once per semester to once per school year (see Section 5.4.2). Finally, a questionnaire was designed when conducting the second round of interviews to understand the teaching content of environmental education in one of the three schools studied. Confirmability was achieved at the same time as dependability.

Triangulation, or the use of two or more methods when collecting data (Cohen *et al*., 2000) was used to ensure the quality of the research data. Triangulation is a powerful strategy for demonstrating concurrent validity, especially in qualitative research (Campbell & Fiske, 1959). According to Denzin (1970), one approach to triangulation is to use cross-sectional and longitudinal approaches. In this study, data concerned with time-related processes were collected on three occasions from each of the three different schools, thus meeting the requirements of a cross-sectional study. Data was collected from the same group of school staff from each of the three schools at different times sequence constituting a longitudinal study. In addition, methodological triangulation (Denzin, 1970) was achieved through the combined use of interview, document analysis, observation and questionnaire.

5.5.3 Ethical considerations and the researcher's role

All researchers at the University of Waikato are required to gain approval for their research proposal by submitting an ethical approval application to an Ethics Committee ensuring that no research participants will be exposed to personal harm or self esteem diminishment (Taylor, 2000). This research also followed this procedure.

The introductory pamphlet with outlines of this research was shown to every research participant (including principal, instructional director, environmental officer and teachers from seven learning areas) from each of the three schools before gaining their permission to join this research. They all knew their interviews would be tape-recorded and transcribed. They were told of their right to withdraw at any time and that they would be offered transcripts of all interviews. Interviews would be conducted only after gaining their personal permission. Moreover, all participants knew that anonymity, privacy and confidentiality would be provided and pseudonyms of schools would be allocated. All interviews were conducted during normal school days while subjects were available to be interviewed, but with no influence on their daily jobs.

Kvale (1996) presented three ethical aspects of the researcher's role: scientific responsibility, relation to the subjects, and researcher independence. First, researchers have the scientific responsibility to their profession and research subjects that the research project yielding knowledge is worth knowing and that it is as controlled and verified as much possible. Next, researchers take on different roles in relation to their research subjects such as exploiter, reformer, advocate and friend. Finally, researchers should be aware of the independence of their research and the maintenance of a professional distance in order not to report or interpret everything from their research subjects' views. The main role of the researcher in this study was a friendly, polite, objective, sympathetic and patient observer. The researcher usually explored, recorded and analysed objectively at any time throughout the research process. It was not easy to achieve these goals while being a full time junior high school teacher and part time researcher at the same time. The researcher was a biology and homeroom teacher who needed to conduct the interviews outside of lecturing time. Objectivity is especially hard to be achieved because the limited time spent in each of the schools studied would possibly reduce the amount of data collected.

5.5.4 Limitations of the research

This research is a three-school case study in Taiwanese junior high education. Therefore, understanding and findings of how schools and teachers adjusted their roles, beliefs and teaching under this large-scale curriculum change, in this

research, is mainly and actually only telling the stories about these three schools. The findings of the research could be generalised to and anticipated for other Taiwanese schools with similar a school development and educational climate when facing this curriculum change. In reality, the limitation of this research is that its findings could not be generalised to schools with successful implementation of environmental education in Taiwan. However, in Section 5.3 Bassey (1981) strongly argued that the 'relatability' of a case study was more important than its 'generalisability'. The contribution of this research is that the details of the study could be sufficient and appropriate for another researcher working in a similar situation to relate his decision-making to that described in this case study.

In addition, a case study only gives a partial insight into curriculum implementation as captured at a particular time, and this point must be kept in mind when interpreting case study data (Walker, 1983). Because the case study does not change, but the situations and people reported in it have moved on even before the report is available, the picture presented in this research may reflect the situation as it may have been, but not the situation as it will be (Spurr, 2002). This is another limitation in this study, as years later the findings probably would not remain the same if the schools studied have different staff members with different beliefs and actions.

5.5.5 Summary of section 5.5

Section 5.5 discussed how the procedures adopted in this research were effective to ensure the trustworthiness of the data collection via triangulation. Ethical considerations were outlined and the role of the researcher with the limitation of this case study research was mentioned.

5.6 Research Program

This research is a three-school case study over a three year long data collection period. The focus of this study has been the school itself meeting the change from the new national curriculum since August 2002. Therefore, it is not only a

descriptive study of school development/management but also an explorative study of environmental education infused into existing school learning areas.

The broader research issues pursued in this thesis are:

1. Describing the views of school staff, including teachers and administrators, towards environmental education;
2. Cataloguing the opinions of teachers and administrators about the content and teaching methods and learning outcomes of environmental education;
3. Exploring the views of teachers and administrators about the relationship between environmental education and other school subjects;
4. Documenting what really happened to environmental education in a small number of junior high schools before, during and after the first year of the implementation of the *Grade 1-9 Curriculum*; and
5. Probing the possibilities for enhancing environmental education in Taiwanese junior high schools.

5.6.1 Overview of the three schools

The pseudonyms (Redbrick, Parkway and Riverside) of the three schools studied were relevant to their location or outlook. They were chosen to represent typical Taiwanese junior high schools so that the results could be generalised as much as possible. Each case with a special characteristic (a new school for Redbrick, an incinerator in Parkway and two books of local knowledge in Riverside) was for the researcher an opportunity to observe potentially different school development during this study. In addition, the schools studied were not too far to access so that the researcher could manage this study while being a full time school teacher. This consideration (typical, potential and access) are the basic requirements when choosing the schools to be studied.

They are medium size schools in the context of 33 public and private junior high schools in the city studied. Yet Parkway and Riverside became significantly smaller within the research timeframe and this change is shown in Table 5.1. This was not only because more private and public schools were established in their neighbourhood but also because fewer of their graduates attending the star senior high schools, which will be discussed in the following chapters.

Table 5.1 Demographic data of five junior high schools in the city studied

Number/ School Size	Classes		Teachers		Students	
	2000/01	**2002/03**	**2000/01**	**2002/03**	**2000/01**	**2002/03**
Largest school	76	86	146	178	3193	4163
Redbrick	40	40	84	84	1407	1405
Parkway	42	27	76	62	1385	1011
Riverside	37	26	68	69	1064	916
Smallest school	13	9	25	24	494	384

The organizational framework of all junior high schools is very uniform across Taiwan. It is headed by, firstly, the principal and then the six directors of three departments (Study Affairs, Student Affairs and General Affairs) and three offices (Guidance Office, Personnel Office and Accounting/Statistical Office). This structure was challenged when the new national curriculum was implemented from August 2002. It called for the Study and Student Affairs departments to be combined. However, the three schools studied had retained those six directors up to this research's completion in June 2004.

In this research, the principal, the instructional director (i.e. director of the Department of Study Affairs) and the environment officer (under the Department of Student Affairs) formed the part of the administration related to environmental education during curriculum change and implementation. At least seven teachers i.e. one from each of the seven learning areas (Language Arts, Health and Physical Education, Mathematics, Social Studies, Arts and Humanities, Science and Technology, and Integrative Activities) formed the part of teaching related to the implementation of environmental education in schools. Their views and opinions were the focus of this research.

In summary, a very uniform school administrative structure, together with very similar and ubiquitous teacher perceptions of educational problems, meant that the three case study schools had much in common. Nevertheless, each of the case studies in Chapter Six will show an interestingly unique response to the challenge of environmental education. They are stories of varying degrees of flexibility, redirection of resources, opportunism and pragmatism.

5.6.2 The research process

The four phases studied are presented below and will be described in the following sections. Figure 5.1 shows the whole process of this research:

Phase 1: Setting up the Research Program

Phase 2: Monitoring anticipatory school development

Phase 3: Monitoring the first year of classroom implementation

Phase 4: Monitoring the curriculum in place

Towards the understanding of school development before, during and after curriculum implementation in these three schools studied, there were three rounds of semi-structured interviews (see Appendix 5) conducted in Phases 2, 3 and 4 respectively. One interviewee, basically, would be interviewed three times during research process, one in the 2001, 2002 and 2003 school years if they had not transferred to another school. These four phases actually overlapped to some extent in the whole research process, because the process in one school could be completed earlier than the other two. In short, each phase was conducted at different occasions in three individual schools within half to one school year.

Phase 1: Setting up the research program (Late April - June 2001)

A crucial consideration for this research was proximity. The researcher was a full time junior high school teacher and needed to visit research schools during school hours. Therefore, the schools studied had to be located near the researcher's own school. For the sake of objectivity, the school the researcher working in was not considered. In the 1999 to 2000 school year, pilot schools (the MOE Trial School Scheme for the Grade 1-9 Curriculum) in this city studied received funding from the Ministry of Education but worked on only one learning area (see Section 2.3.4.3). They were not considered for study in this research either, let alone those private schools with different administration frameworks. Considering the generalisation, therefore, the three schools to be studied should be public junior high schools and non-pilot schools with different potential for their future school development (see Section 5.6.1). Thus, they were found for this research program through visiting five schools' principal and/or instructional director within two and half a months (late April - June 2001). The search began from the nearest schools to the researcher and then spread out to nearby locations.

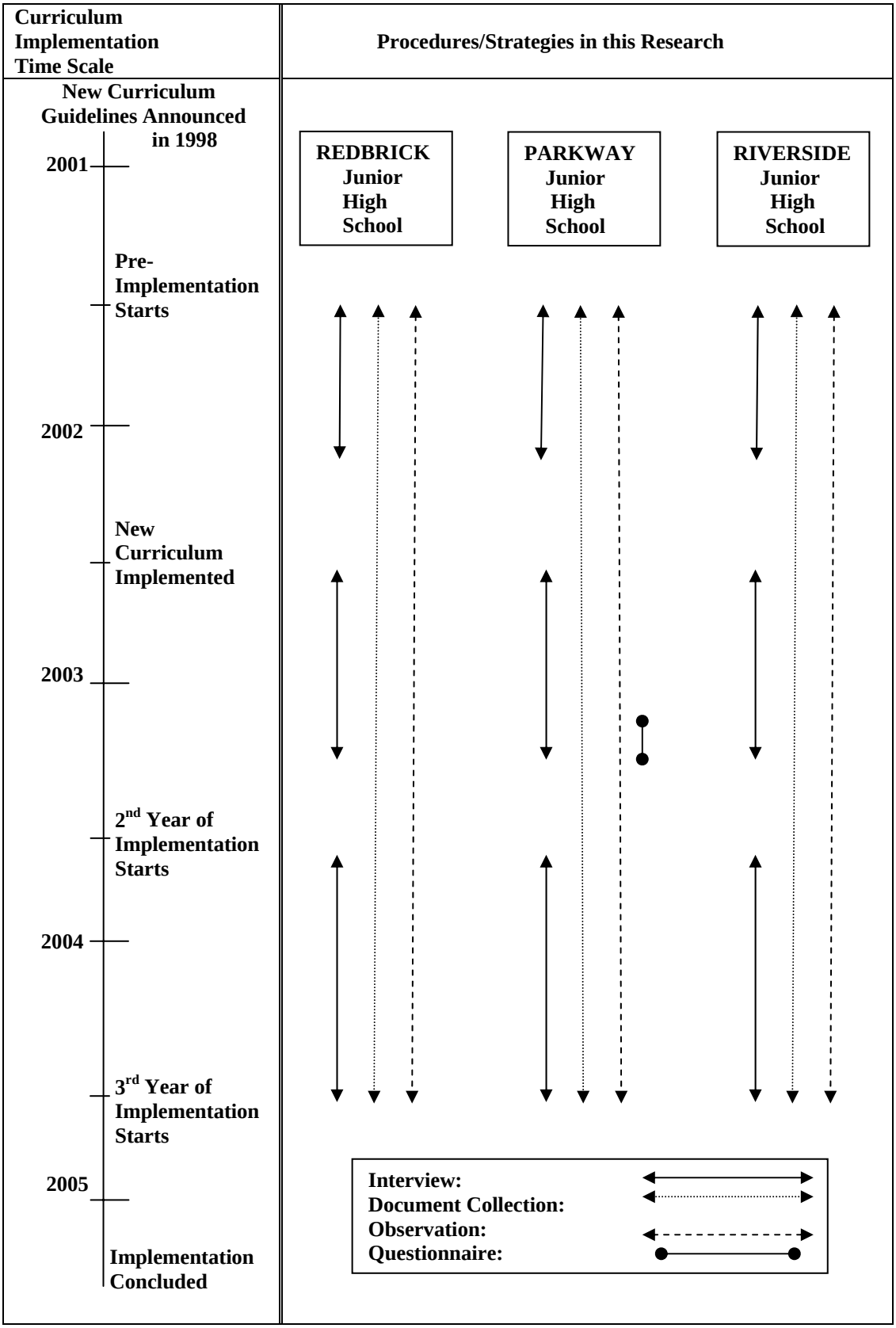

Figure 5.1 The Research Process

The search for teachers was started immediately after obtaining the principal's agreement. However, the Parkway principal asked to seek teachers' agreement first before giving his consent. Therefore, teacher search in Parkway was achieved quickly in late *Phase 1* with strong help from the keen instructional director. However, the instructional director then left his position after the data collection was commenced in September 2001. As to the other two schools, teacher selection was actually started from the beginning of *Phase 2* (Sept. 2001-June 2002) with less help from instructional directors, and was gradually completed by mid-Phase 2. To achieve the job relevancy, there were at least ten research subjects in each of these three schools studied due to the requirement of infusion strategy of environmental education in the new national curriculum. Table 5.2 shows the job background of each research subject, whose position would be relevant to the implementation of environmental education in the new curriculum.

Table 5.2 The list of research subjects

School Name/ Job Description		**Redbrick**	**Parkway**	**Riverside**
Administrators	**Principal**	1	1	1
	Instructional Director	1	1	1
	Environment Officer	1	1	1
Teachers	**Language Arts**	2 (Chinese & English)	1 (Chinese)	1 (English)
	Mathematics	1	1	1
	Science & Technology	2 (Biology & Chem/Phys)	1 (Chem/Phys)	1 (Biology)
	Social Studies	1 (Civic)	2 (Civic & History)	1 (History)
	Health & Physical Education	1 (Health Education)	1 (Health Education)	1 (Health Education)
	Arts & Humanities	1 (Art)	1 (Art)	1 (Art)
	Integrative Activities	1 (Scouts Training)	1 (Scouts Training)	1 (Scouts Training)

Following the ethical considerations, the researcher explained the goal, method and procedure of this study before gaining the agreement of both administrators and teachers. They then signed a consent form to formally join this research. For the sake of comparison, there were two teachers in some learning areas (Language Arts, Science and Technology, and Social Studies). This was done because two different subject teachers within one learning area were already gained in the first

two schools. Staffing changes, however, including position changes inside schools and new staff transferring from other schools are inevitable in schooling. It resulted in recruiting a new interviewee at the same time. Basically, thirty-three interviewees participated in the three rounds of interviews in this research.

Phase 2: Monitoring anticipatory school development (Sept. 2001 - June 2002)

This was the year (the 2001 school year) before the formal implementation of new national curriculum in Taiwanese junior high schools. Staff in junior high schools needed preparation for the curriculum change. The school climate was full of uncertainties. There were two one-week in-service workshops of the Grade 1-9 Curriculum run to all of the junior high school teachers during the winter and summer vacations in the 2001 school year. The introduction of the new national curriculum was the main goal of these compulsory workshops. School teachers might be required to do practice such as lesson plans after some introductory sessions to cultivate their abilities to implement the new curriculum in the 2002 school year. Schools practised activities relevant to the new curriculum to prepare for the curriculum implementation. These included running learning area meetings frequently, forming a Committee of School Curriculum Development, writing curriculum plans for seven learning areas and school development, trying the possibilities of topic teaching and/or curriculum integration in school activities, and so on. School staff would exchange opinions with each other in both formal and informal settings.

The beginning of *Phase 2* began with staffing changes, four in total, in all three schools studied including principal, instructional director and environment officer. The researcher then needed to look for new research subjects with the same job background because school itself was the focus of the case study in this thesis.

The first round of interviews to collect the baseline data began from *Phase 2* along with research subjects searching. There were 38 interviewees in this round of interviews in *Phase 2,* including staff who had moved in the same school from the position studied and those who had transferred to another school. The researcher first phoned interviewees to book an interview time, then visited them at school to conduct the interviews. It was often difficult to conduct interviews

immediately or soon after making the phone call. Waiting normally happened to the researcher before conducting interviews. Sometimes, the researcher needed to make a second phone call after waiting for the time requested by some interviewees. Most of the interviews were around 30 minutes duration. It took a whole semester to complete this first round of interviews by January 2002. Verbal transcription then took another whole semester for completion and analysis before development of the second round of interview questions.

Phase 3: Monitoring the first year of classroom implementation (Sept. 2002 - June 2003)

This was the first year of curriculum implementation (the 2002 school year) to Grade 7, while the Grades 8 and 9 still followed the old curriculum at the junior high level. School staff had submitted their school curriculum plans, posted on school websites, to the City Educational Bureau. They were implementing the new curriculum according to their school plans. This was the first time Taiwanese junior high schools had ever had to submit their curriculum plans to their local educational bureau.

Staffing changes of six interviewees, including instructional director, environment officer and subject teachers, happened again during *Phase 3*. The second round of interviews was conducted along with document collection of school curriculum plans and city government's administrative orders. There were 35 interviewees in this round of interviews in *Phase 3* including staff who had left the position studied in the same school and transferred to another school. Most of the interviews were an hour in length. It again took a whole semester to complete all the second round of interviews, except for the Parkway principal, by January 2003. He was suffering from a serious illness and stayed at home in the latter part of the first semester. His interview was then completed mid-second semester (March 2003) after he returned to his job. Verbal transcription was conducted after some interviews were completed in the first semester and continued through the second semester.

At this stage, environmental education was chosen to be Parkway's school-based curriculum. One weekly period of Environmental Protection Education was distributed to Grade 7 homeroom teachers in the Parkway school timetable.

However, nothing similar happened to the other two schools (Redbrick and Riverside). Thus, in late *Phase 3* (mid-February to June 2003), a questionnaire was given specifically to the Grade 7 homeroom teachers (eight in total) in Parkway junior high school. The aim was to understand the teaching content Parkway teachers were delivering to their Grade 7 students. The third round of interview questions were developed after analysing the second round of interviews, school documents and the questionnaires.

Phase 4: Monitoring the curriculum in place (Sept. 2003 - June 2004)

This was the second year of curriculum implementation (the 2003 school year) to Grades 7 and 8, while Grade 9 students still received the old curriculum at junior high level. School staff had submitted their second-year school curriculum plans and continued to implement the new curriculum. In general, the format and content of school curriculum plans still followed the first-year one with only minor revision. There was no electronic format presented in school websites because the file was too big. In addition, the City Educational Bureau requested schools to only submit tables of Flexible Curriculum, textbook publishers and lecture hours rather than the whole school curriculum plan. Obviously, the administration procedure was reduced to a more simple way.

After experiencing one-year curriculum implementation, school staff were less busy than in *Phase 3*. The frequency of meetings for the seven learning areas and the Committee of School Curriculum Development was less, compared with the first year of curriculum implementation. As Curriculum Integration had not been strongly requested by the Ministry of Education since late in the first year of curriculum implementation, subject teaching became dominant again. However, staffing changes in *Phase 4* still happened across these three schools. There were 32 interviewees in this round of interviews in *Phase 4* as one teacher dropped out of the research. Because of the repeated interview questions from rounds one and two, the third round of interviews was a long one with the average length more than 90 minutes. Therefore, two visits were usually required to complete this round of interviews. There were two administrators' interviews which needed four visits to complete. Consequently, the third round of interviews lasted for a whole school year and was completed by June 2004. Due to the long length of

time, transcription for the third round of interviews took more than one school year and was completed by March 2005.

5.7 Summary

Chapter Five described the overall methodological considerations including interpretive methodology, data-gathering methods (case study, document analysis, observation and questionnaire) and the research program used in this thesis. Section 5.2 explained the reasons for choosing an interpretive paradigm in this thesis. It was based on the research aim to explore, understand and describe school staff views towards environmental education in particular and curriculum change in general.

Due to a school itself being the unit studied, Section 5.3 introduced the main method, case study, used in this research. Next, Section 5.4, described in detail the data-gathering methods including interview, document analysis, observation and questionnaire.

Section 5.5 addressed the general methodological issues of trustworthiness and triangulation with attention to ethical considerations and the limitations of this thesis. Finally, Section 5.6 described in detail the research program with overview of the three schools studied and the four study phases. The reason for choosing three typical Taiwanese junior high schools (with potentially different school development) is part of the final generalisation at the end of this research. Due to the staffing changes, the total interviewees were 38, 35 and 32 in Phases 2, 3 and 4 respectively.

The following chapter, Chapter Six: Three Case Studies, will introduce and describe staff's views in each of these three schools towards environmental education specifically, curriculum change in general, and education at large before, during and after the first year of curriculum implementation (the 2002 school year) in Taiwanese junior high schools from the 2001 to 2003 school years.

CHAPTER SIX:
THREE CASE STUDIES

"Each individual school is unique, and yet at the same time is also very much like other schools."
Barbara Tye and Kenneth Tye (1992) in *Global Education: A Study of School Change*, p.8.

6.1 Introduction

Chapter Six introduces three case studies of school development over three school years (Aug. 2001- July 2004). It focuses on school staff views on environmental education and curriculum change before, during and after the new national curriculum implemented in Taiwanese junior high schools from August 2002.

The three case studies, will establish, firstly, a profile of each school's attitude towards, and preparedness for, the introduction of the new subject of environmental education. In the context of the curriculum change, what happened when an entirely new subject, environmental education, with its special cross-curricular and integrative demands, was compulsorily introduced? How would each school accommodate this challenge, and how, if at all, would each school's educational climate be affected by such a potentially transformative subject as environmental education?

Section 6.2 tells the story of Redbrick junior high school, Section 6.3 describes the development of Parkway junior high school, and Section 6.4 presents the chronicle of Riverside junior high school. Finally, a summary of the findings across these three schools is presented in Section 6.5. The categories of views will be established and illustrated in detail in the first case study, Redbrick. The other two case studies, Parkway and Riverside, will use the same structure and categories but include less descriptive detail.

6.2 Redbrick Junior High School

"Health, Honour, Diligence and Gratitude"

- Redbrick Junior High School Educational Goals

6.2.1 School context

The pink appearance of Redbrick is impressive because normally school buildings are grey in Taiwan. The fresh colour also indicates its short history. Redbrick is a new school, which started to have students enrolled from 1995, though it was established in 1993. It is also the newest of the three schools studied in this research. Therefore, the principal during this research was only the second at Redbrick.

From the outside, it is still a typical city school with a rectangular five-story red brick building fenced by a red brick wall. Streets surround the school on three sides and its fourth side is connected with a kindergarten. The pink blooms of the bauhinia trees on the sidewalk during October makes the school look even more beautiful. Entering the school gate and facing the school buildings, one sees a fountain standing inside a circular pond. A green field with trees and a path is located at the left hand side, with a fishpond on the right. The sports fields, including racing and basketball fields, and the gymnasium for tennis, badminton and volleyball are grouped together between the rectangular main building and the kindergarten.

According to their school curriculum plan submitted to the City Educational Bureau, most of the students in Redbrick came from families of farming or working class backgrounds with a significant proportion of single parent and/or poor families. The number of Taiwanese aboriginal students in Redbrick is higher than other schools in this city. Historically, the parents' board at Redbrick has always offered strong support for school development, especially for upgrading educational facilities. The teachers are relatively young, with the average age of less than 40 years old, as it is a new school. Before 2001, the infusion of Information Technology Education into every learning area was a school characteristic because Redbrick was its Teaching Resource Centre School.

Redbrick had a similar number of classes, students and teachers over each of the three years of this study (see Table 5.1).

6.2.2 Environmental education in Redbrick

In the 2001 school year (before the curriculum change), *recycling* was the major practice of environmental education in Redbrick. More than three quarters (10/13; 77%) of the school staff mentioned it in 2001/02 during the first round of interviews. According to the third round of interviews in 2003/04, the school recycled daily, which was more frequently than other schools in this city. During lunchtime, every class from Grades 7, 8 and 9 transferred their classroom recyclables to the grade recycling bins on different floors. Then, voluntary environmental protection students would bring the grade recycling bins into their campus recycling room to do further processing during nap time. The teachers interviewed said they and their students felt satisfied with their clean and tidy classroom environment. Other practices of environmental education were greenification and beautification of the school grounds, laboratory waste recycling, school grounds cleaning, competitions for classroom cleaning and decoration, and sometimes environmental protection poster making. Some practices of environmental education were broader i.e. no damage of school displays, managing equipment after activities, and cleaning classrooms and study desks after graduation to make a nice school environment.

At the level of classroom teaching, every staff member interviewed in 2002/03 (the first year of curriculum implementation) said that pre-reform, they had infused environmental education when their subject content was relevant to the environment. According to the interviews, the biology, health education and chemistry/physics teachers delivered knowledge relevant to ecology, pollution, development and conservation, and environmental diseases. The English teacher taught urban city pollution using English terms and the Chinese teacher taught about bamboo, sidewalk trees and sour oranges to impress students of the beauty of nature. The mathematics teacher showed the extent of pollution via calculation and the civic teacher taught news/laws relevant to pollution. The art teacher required students to collect recycled materials to do art assignments and the scout

training teacher asked students to recycle papers and use them. The teaching method normally used was lecturing and sometimes lecturing via media. The art and scout training teachers would have demonstration during their subject teaching.

After the curriculum change, the third round of interviews in 2003/04 (the second year of curriculum implementation) showed that this infusion strategy for teaching environmental education at the classroom level remained the same. Except for these practices, there was no trial specifically for environmental education in the first year of curriculum implementation. Although some trials were relevant to environmental education (labelling campus plants, designing a topic teaching via school community park, and conducting a special topic of a river visit), they were not designed for environmental education. According to this round of interviews, these were for the purpose of enhancing teaching in biology, curriculum integration and information technology education. However, the scene in Redbrick changed slightly in the second year of curriculum implementation due to the individual initiatives by two teachers. First, one practicing teacher was interested in environmental education and planned to study environmental education for her Masters Degree. She was enthusiastic and applied for recognition for Redbrick from Taiwan's Green School Partnership Network Project (TGSPNP) after Redbrick enrolled in it in the beginning of the 2002 school year. TGSPNP was the environmental education expansion project established by the Ministry of Education (MOE) in 2000 (see Section 2.4.2). Redbrick became one of the green schools of TGSPNP in Taiwan but did not have any further move to expand environmental education. Secondly, Redbrick was chosen by the City Educational Bureau, under pressure from the MOE, to conduct action research on environmental education in the second semester of the second year of curriculum implementation (Feb - June 2004). A new biology teacher was responsible for this action research: Ecological classroom design and its application to teaching. According to the interviews in 2004, the biology teacher used twelve plants to make the classroom green and beautiful. Students were divided into twelve groups and each group adopted one plant. After collecting basic information about the plant, they observed and recorded the plant's growth. Each group presented their observation and inspiration from the adopting process

after four weeks. Among five curriculum goals (environmental awareness and sensitivity, environmental knowledge and concepts, environmental ethics and values, environmental action skills and environmental action experiences) of *Guidelines of Environmental Education* (see Appendix 4), the first one of cultivating the awareness and sensitivity of the beauty in the environment was achieved at the end of this action research. In addition, the biology teacher conducted pre- and post- tests and found a positive influence of classroom greenification on student learning from his research.

There was little budget from TGSPNP but much more from another project, Taiwan Sustainable Campus Program (2 million NT dollars per school). This then led to a different motivation for schools to implement environmental education via these two projects. Because this practicing teacher wanted to do research on environmental education and the director of the Department of General Affairs wanted to apply for budget through Sustainable Campus Program, they visited successful green schools (mainly primary schools) in the city and tried to do something specific for environmental education in Redbrick. Therefore, late in the second year of curriculum implementation the general affairs director, on behalf of Redbrick, worked with three primary schools in their school community applying for 8 million NT dollars and submitted their cooperative plan to the MOE. The plan proposed that they would change to water saving faucets/closets, add movable visors in strong sunshine classrooms, add sound absorption materials in the noisy table tennis room, and establish compost bins at the top of their campus recycling room, if they gained the budget. They would also plan teaching to match these facilities as there were teaching materials and learning sheets available. Otherwise, they would remain in the pre-budget position.

In conclusion, the practice and teaching of environmental education in Redbrick did not change much after its official introduction accompanied by the new national curriculum. Whether Redbrick has big changes for environmental education in the future, or not, will entirely rely on the budget.

6.2.3 Views of environmental education

Over the three years studied (Sept. 2001 - June 2004), a consistent view (15/15) across the three rounds of interviews in Redbrick was that environmental education should be taught in schools. Thirteen interviewees gave the following reasons that schools should teach environmental education, each person offered more than one reason pre-reform in the 2001 school year (the number at the end is the number of interviewees that said this):

- We live inside the environment; (5/13)
- Education is a change agent and could raise public awareness on the issue of environment; (5/13)
- We need to respond to severe environmental degradation. (3/13)

Before the curriculum change, in the 2001 school year the view of 'what environmental education is' in Redbrick was mainly 'caring' for or 'knowing' about the environment. These views did not change much over the three years studied. Normally, the interviewees gave more than one opinion. Nearly all of the school staff (12/13) said in the first round of interviews that environmental education was a kind of caring for something relevant to the environment such as conservation, environmental protection and sustainable development. Secondly, they (7/13) expressed the view that environmental education was a kind of knowing something relevant to the environment i.e. gaining knowledge of nature and the environment in which we live, of the relationship/balance/interaction between people and the environment, and of the ecological balance. Only one staff member said 'doing' something to the environment, such as greenification and beautification of the school grounds, was environmental education. This interviewee said in a broader way that architecture safety, circumstance design and creating an environmental atmosphere were environmental education, too. Some other staff viewed environmental education as a broad area because it was not an independent subject in schools and many school subjects were relevant to it. For example, the principal said in 2001:

> Environmental education is broad; especially in the situation of no independent subject for it in schools currently … many subjects are relevant such as earth science, biology, and even Chinese. (Principal, 2001)

Whether or not environmental education should be an independent subject, the health education teacher said, after the curriculum change, that it should be taught via opportunistic education in existing school subjects rather than as an

independent subject. She believed that environmental education should be taught throughout students' daily lives:

> I would like to teach it via opportunistic education. The so-called environmental education should not be an independent curriculum or subject specifically for teachers to teach. It should be the way teachers teach their concepts about environmental education to students during daily life. (Health Education Teacher, 2002)

After the curriculum change, most of the Redbrick staff kept their pre-reform views but few teachers added some slightly different views. For example, the teachers of scout training in 2002 and health education in 2003 said that environmental education could develop students' recognition of their schools. In 2004, the Chinese teacher said that environmental education is the process to establish an ecological school; the environment officer said that environmental education could change students' thinking about the environment.

To sum up, the view of 'what environmental education is' was broad in Redbrick in the pre-reform time. Mainly they viewed environmental education as caring for the environment. After the curriculum change, these views were not changed, but several new views focused more on the clarification and development of values.

Teaching content and methods

Redbrick staff had multiple views on what should be taught in environmental education and these views did not change much over the three years studied. The following issues were their combined views pre-reform in the 2001 school year (the number at the end is the number of interviewees that said this):

- Environmental knowledge (8/13)
  conservation especially Taiwanese conservation, sustainable development/wise resource use, influences of environmental degradation to wildlife/environment/human health, pollution, local/global environmental issues, historical environmental changes and countries comparison;
- Environmental behaviour (8/13)
  daily life practices e.g. maintaining tidy environment including classroom environment (recycling, cleaning and habit cultivation), greenification/beautification and soil/water conservation;
- Environmental attitude (4/13)
  caring environment/wildlife and eco-thinking;
- Political implications (2/13)
  relationship between economy/technology development and the environment.

After the curriculum change, in addition to these pre-reform views, the mathematics teacher in 2002 suggested teaching laws to regulate students' behaviour. The biology teachers in 2003 proposed to teach controversial issues such as whether or not an incinerator or nuclear power plant should be established.

Teaching environmental education, in their view in the 2001 school year should be initiated by choosing small things and topics, the most common issues and from students' daily lives. Next, the teaching of environmental education should enlarge its field to school, community, society, country and the world. Pre-reform, the best ways, in their combined view, to teach environmental education were via the following strategies (the number at the end is the number of interviewees that said this):

- Experiential learning (8/13)
  visiting, experiencing through activities and learning by doing;
- Teaching via media (5/13)
  computer, video, slides and transparencies;
- Interpersonal communication (5/13)
  discussion, value clarification, presentation and reflection;
- Relevant news (4/13)
  news (from TV and newspaper) relevant to environmental issues;
- Infusion teaching (3/13)
  relevant (or every) school subject teachers infused materials related to the environment in their subject teaching;
- School activities (2/13)
  environmental education month, school tree election, flea market, recognising trees, don't buy movement, maintaining poster display or even campus safety.

Two staff suggested multi-methods with a combination of these suggestions. Four interviewees complained that the existing crowded curriculum gave them no time to teach environmental education. They could teach it only when their subject teaching was relevant to the environment, which is opportunistic education. After the curriculum change, the Chinese teacher in 2004 re-emphasised this opinion:

> Researcher: Did you ever think to teach more about environmental education in your subject teaching after the curriculum change?
>
> Chinese teacher: No, I'm too busy and could prepare Chinese just in time. The reason I taught environmental education a bit more in the past was because some articles were relevant to the environment such as 'The bamboo in the Si-Tao', 'Side walk trees' and 'Sour tangerine'. It is enough to teach it by opportunistic education as no time available during my subject teaching.

In the first round of interviews, the scout training teacher highlighted the role of law execution from the government. She said that the strict execution of laws from the government was necessary and more effective than school teachers' teaching environmental education in schools. Her view was shown as follows:

> Not only schools need to teach environmental education but also government should have laws and regulations matching school environmental education. Besides, the execution of laws must be strict … It might work if government could be more effective, otherwise it is hard to achieve the goals if only schools teach environmental education. (Scout Training Teacher, 2001)

After the curriculum change, the mathematics teacher in the second round of interviews suggested teaching environmental education via school regulations or governmental laws. In the third round of interviews, two administrators (the instructional director and environment officer) and the art, mathematics, biology and chemistry/physics teachers all said compulsory (law execution) would be more effective when teaching environmental education.

Before the curriculum change, five interviewees actively said 'out-of-school visiting' was a good method to teach environmental education. However, two teachers disagreed. They commented that visiting was not ideal due to the length of preparation time and administration, extra monetary cost to parents, etc. After the curriculum change, opinions in the second year of curriculum implementation were not more optimistic. Four staff said out-of-school visiting was good but too difficult to be used. Two administrators (principal and instructional director) said that visiting was just one of the methods to teach environmental education and it was best to do it through visiting nearby places. In the Redbrick principal's view, activities were better than visiting. Another three interviewees stressed the use of multi-media, especially the use of the Internet and video to replace out-of-school visiting. Only two teachers of a non-examinable subject (art and scout training) insisted that teachers needed to overcome all the difficulties (the lack of time and the difficult administrative procedures) to achieve visiting out-of-school. This said, Redbrick teachers, especially non-examinable subject teachers, were more positive than administrators about the conduct of out-of-school visits.

In summary, before the curriculum change, Redbrick staff believed that both environmental knowledge and behaviour should be the major content when

teaching environmental education. After the curriculum change, laws and controversial issues were added to the list of teaching content for environmental education which was relevant to political implications. Experiential learning, including out-of-school visiting, was seen as the best method to teach environmental education pre-reform. After the curriculum change, teaching via media, especially computer and video films, was viewed as the most practical way to teach environmental education in Redbrick as these methods could replace out-of-school visits.

Expected learning outcomes

Before the curriculum change, in 2001/02 three staff said that environmental knowledge would be the initial learning outcome of environmental education. However, a synthesis of views showed that the most expected learning outcome was behavioural change (10/13) such as recycling and classifying garbage well, not dropping but picking up litter, reusing and reducing waste, cleaning the environment and asking others to do it, and instigating greenification and/or beautification of the school grounds. The second preferred learning outcome a positive attitude towards the environment (4/13) i.e. treasure the environment and resources, pay attention to the environment, love their school grounds and classroom environment, and care for wildlife. One teacher even mentioned good human relationships should be a learning outcome, as environmental education was a broad area. The expected learning outcomes for environmental education were similar over the three-year research although one more teacher identified behavioural change after the curriculum change. In conclusion, behavioural change was an expected learning outcome for a majority of teachers and this did not change after the curriculum change in 2002.

Subjects/teachers relevant to the teaching of environmental education

Pre-reform, Redbrick staff identified the most relevant subjects or learning areas to teach environmental education as being biology, chemistry/physics, earth science and technology within the learning area of Science and Technology, especially biology (10/13). Second, was health education (6/13) within the learning area of Health and Physical Education and followed by geography, history and civics (2/13) within the learning area of Social Studies. Teacher

commentary suggested the subject rank order was based on the extent that the subject content was relevant to the environment. Two teachers said that mathematics was the least likely subject for the inclusion of environmental education. After the curriculum change, in the last two rounds of interviews these opinions remained the same.

Since the second round of interviews, all the interviewees (12/12) believed that homeroom teachers were in an ideal position to teach environmental education. The reason was homeroom teachers spent more time with students and their duties were relevant to the maintenance of a tidy environment. As to the teaching content, they said that homeroom teachers could teach many things relevant to students' daily lives such as garbage classification, recycling, homeroom greenification and beautification, homeroom and school grounds cleaning, reducing the use of plastic bags and disposable chopsticks/spoons, etc. These are mainly the aspect of 'doing' in environmental education. Sometimes, homeroom teachers could teach the aspect of 'caring' in environmental education such as respecting wildlife/people. Or if it were possible, homeroom teachers could establish an 'environmental education column' in their homerooms. They could have articles or newspaper clippings mounted in this column to teach the aspect of 'knowing' in environmental education. The pedagogy homeroom teachers used was mainly verbal requests, setting of personal example, and discussion of TV/newspaper news. Due to insufficient time, using the video/computer/Internet and setting an environmental topic for discussion in class meetings occurred less frequently. In short, biology was considered to be the most relevant school subject, and the homeroom teacher was in the best position to teach environmental education at Redbrick.

School educational goals and school reputation

In the 2003 school year (the second year of curriculum implementation in 2003/04), all the eleven staff interviewed believed that environmental education could enhance Redbrick's school educational goals (Health, Honour, Diligence and Gratitude), especially gratefulness and health. However, only nine of the eleven members thought that environmental education should enhance the reputation of the school. Two teachers did not see any potential. Among these

nine staff, three thought the potential of environmental education to increase the school reputation was 'small', three saw it as 'medium'. Two teachers were not asked this question. Only the Chinese teacher said environmental education could increase the school reputation to a large extent if it was done well, especially through community clean ups. Further, most of the staff (8/10), believed that parents would not view environmental education as a functional enhancement of the school reputation because parents did not understand what environmental education was. The comment from the health education teacher clearly reveals this thinking:

> Most of the parents have no idea about whether or not environmental education will play an important part in education for their children's future development. (Health Education Teacher, 2003)

Redbrick staff in this round of interviews all supposed that parents would value whether or not their children could attend the star senior high schools when considering the school reputation. Therefore, parents would prefer to have their children spend time learning more about examined subjects rather than doing activities irrelevant to the examination. For example, in 2003 the scout training teacher said:

> At junior high level, most of the parents value most whether their children can attend star senior high schools or not. Very few students with good academic performance joined boy or girl scouts legion in my school, because parents feel that attending scout activities would influence their children's academic learning and development. Many parents just don't let their children join it. (Scout Training Teacher, 2003)

In sum, the paradox that teachers thought environmental education could enhance school educational goals but not the school reputation shows a contradiction between the ideal and the reality in Redbrick. Theoretically, environmental education contributes to education at large, but its learning outcomes (behavioural change) could not be seen clearly to link to what parents valued (exam performance). Thus, the function of environmental education to increase school reputation was seen as very vague. Understandably, the strong influence of parental views about examinations and high status schools impeded the instruction in Redbrick.

Relationship between Redbrick and its local environment

In the last round of interviews in 2003/04, every interviewee, eleven in total, believed that an interactive and communicative relationship between Redbrick and its school community would be ideal. However, the view was not positive on whether or not environmental education could enhance this relationship. Of eight interviewees being asked this question, one teacher said 'Hard to predict' and three staff did not see any function of environmental education to enhance this relationship. The other two interviewees viewed as having a medium impact and another one said 'It depends on the activities'. Only the English teacher believed environmental education had the potential to enhance the school-community relationship and then only when done successfully. In short, the majority of the views of the extent to whether environmental education could enhance the interactive relationship between Redbrick and its school community were 'none' (3/8) to 'medium' (2/8).

The interactive relationship between Redbrick and its local environment was that people from the community attended night classes (English and computer); used the grounds for walk or exercise after school hours; community mothers helped to do road duty and school library management; and used the school grounds to run community activities. In addition, Redbrick conducted parent and primary teacher seminars to exchange opinions and further enhance the partnership. Thus, the interactive relationship between Redbrick and its local environment was mainly based on the conduct of activities via school grounds. This continued after the curriculum change. Because the view of environmental education enhancing this relationship was not positive, no new activity specific for environmental education was designed in Redbrick after the curriculum change.

Should environmental education be labelled?

According to the interviews in 2003/04, none of the Redbrick staff said they had ever used the term 'environmental education' with students before or after the curriculum change even when their subject teaching was relevant to the environment. Instead, during the first round of interviews, they reported that they used the terms 'environment', 'nature', 'environmental problems', 'environmental protection', 'environmental science', 'soil/water conservation', 'nature protection',

'ecological protection' and 'greenification'. After further exploration, nearly half (5/11) of the interviewees believed there was no need to have a specific term or name for environmental education. In contrast, the rest (6/11) of the interviewees said that teaching the term would help students' learning of environmental education though they had not done it. This said, there was no consistency in Redbrick on the issue of the identification of environmental education.

In the last two rounds of interviews, no staff said they considered environmental education when choosing textbooks after the curriculum change. Three teachers said either the government had done the textbook inspection job, or textbook editors had already infused environmental education into their textbooks. Therefore, there was no need to specifically consider environmental education when choosing textbooks. Over these two school years, there was no discussion of environmental education in their learning area meetings either. In addition, no one had ever tried to identify and enumerate what they had done as being relevant to environmental education in Redbrick. The instructional director said their school curriculum plan had documented the place or content in each learning area which was relevant to environmental education. This indicates that environmental education was not yet identified or labelled in Redbrick. Redbrick staff had never thought about this question though half of the interviewees saw the necessity to label it.

Formal/informal curriculum and formal/non-formal education

In the second year of curriculum implementation in 2003/04, more than four fifths (9/11; 82%) of the interviewees viewed the contemporary environmental education as existing more in the informal than formal curriculum in Redbrick. The other two interviewees commented that environmental education existed in both the formal and informal curriculum with different emphasises. Nearly half (5/11) of the interviewees said that environmental education existed more in formal education in society, while four opposed this view and said non-formal education. One teacher said 'Hard to tell' and another one said that environmental education existed in both the formal and non-formal education.

As to which part should teach more environmental education in schools, the view was consistent in Redbrick. Most of the staff (9/11) supposed that inclusion of environmental education in the formal curriculum would influence the majority of students in schools rather than just including it in the informal curriculum. For the same reason, near three quarters (8/11; 73%) of the school staff believed that formal education should take the responsibility in society to teach environmental education in Taiwan. However, two interviewees pointed out that family education (non-formal education) rather than school education (formal education) should cultivate good student good habits to treasure our environment.

In short, environmental education in schools, in the view of the Redbrick staff, is more visible in the informal than the formal curriculum. This indicates a lack of environmental education in the formal curriculum and leads to the thinking that it should be taught more in the formal curriculum in the future. In contrast, the view of the existence of environmental education in society is that it is visible in the formal rather than the non-formal education but they still stress teaching more in the formal education to reach as many students as possible.

Should environmental education use a voluntary or compulsory learning style?

Voluntary learning of environmental education is that students learn to behave well through the teaching of attitude cultivation, knowledge acquisition, or skill practice. Compulsory learning of environmental education is that students learn to make a behavioural change via school regulations or governmental laws, which would give punishments or fines when they do not perform well.

In the third round of interviews in 2003/04, only two interviewees in Redbrick said that the learning of environmental education was voluntary. Nearly half (4/11) of the interviewees viewed environmental education as compulsory and the rest (5/11) referred it as a combination of these two learning styles. They said that people would have good environmental behaviour voluntarily only after having cultivated these behaviours compulsorily. For example, schools required students do recycling and not to drop garbage, using punishment if necessary. Based on this, a majority (6/11) believed that compulsory learning of environmental

education would be more effective. However, nearly all the interviewees (10/11) pointed out that the life-long behavioural change after students had left school should be based on the voluntary learning of environmental education. Therefore, they emphasised the importance of voluntary learning in environmental education. This indicates that, theoretically, environmental education should be on a voluntary basis, but in reality it needs support from compulsory methods. In conclusion, Redbrick staff thought that the teaching of environmental education should raise students' willingness to behave well voluntarily, but sometimes they needed to have a compulsory requirement to enhance its effectiveness.

Subject status of environmental education

According to the third round of interviews in 2003/04 and in the second year of curriculum implementation, nearly all the teachers (10/11) considered that environmental education in pre-reform times had a much lower subject status than examinable school subjects (Chinese, English, mathematics, science and social studies). One teacher said 'It cannot be compared as it is not a subject'. More than four fifths (9/11; 82%) of the interviewees said that environmental education still had a lower status than non-examinable subjects (music, art and home economy). As to non-school subjects (law, gender and vocation education), four interviewees considered the status of environmental education was lower than, and the other four teachers said it was similar to, the status of non-school subjects. Three quarters (8/11; 73%) of the school staff said that the status of environmental education after the curriculum change had not changed and was still only similar to the time before the curriculum implementation. Three teachers said that its status was slightly increased with the term 'environmental education' introduced with the new curriculum, as teachers might pay more attention on this topic during their teaching. In sum, the effort the government made via curriculum change to increase the subject status of environmental education has not succeeded, at least in the Redbrick school curriculum.

Infusion strategy and suggestions to increase the teaching of environmental education in schools

Speaking about the infusion strategy linking environmental education and seven learning areas, two thirds (7/11; 64%) of the interviewees in the second year of

curriculum implementation said that the connection was 'insufficient'. Subject teachers tended to teach environmental education only when their subject's content was relevant to the environment. Thus, in 2003/04 they suggested that the most effective way to increase the teaching of environmental education in schools was the government request (6/11) by the Ministry of Education and /or City Educational Bureau because schools would be requested to do more about environmental education. The second suggestion was textbook edition (4/11) by having a systematic unit of environmental education inside textbooks. One interviewee said 'principal leadership' because the influence from the principal could last longer than a government request. In conclusion, to effectively increase the teaching of environmental education in Redbrick, a top-down administrative request would be needed.

Teacher development

According to the three rounds of interviews, there were very few environmental education workshops run by central/local government for school teachers over the three years studied. One citywide environmental education workshop was run in the first year of curriculum implementation, but it only allowed one teacher per school to attend. No internal workshop was run in Redbrick relevant to environmental education, before or after the curriculum change. According to the third round of interviews, many were done for the new curriculum (9/11), gender education (9/11) and information technology education (8/11). As to the speeches for students during weekly meetings, several conducted in each year studied were relevant to gender education and career development education. This indicates a different emphasis on the six *Important Issues* from that at the government level in this city. Environmental education was viewed as a daily practice and already run by either government or Redbrick. Thus, there was no teacher development specifically run for environmental education inside Redbrick either before, or after, the curriculum change. Sometimes information for environmental education workshops would arrive in schools but there was no obligatory requirement for attendance. Excepting the 2002 citywide workshop for environmental education, no external workshop happened for junior high schools after the curriculum change, in this city. In short, there was an obvious lack of teacher development for environmental education in Redbrick during the reform process.

Should competence indicators from Guidelines of Environmental Education be used to inform teachers' subject teaching?

The researcher compared the interviews with *Guidelines of Environmental Education* (see Appendix 4). A finding was that Redbrick staff did not use the terms from the Guidelines but did say something similar to the curriculum goals of environmental education, especially the first two goals (environmental awareness and sensitivity; environmental knowledge and concepts). For example, teaching via media and pictures to cultivate students' attitudes to love our environment is equivalent to the first goal of environmental awareness and sensitivity. Teaching knowledge of conservation and environmental protection is equal to the second goal of environmental knowledge and concepts.

More than four fifths (10/12; 83%) of the interviewees said, in the second round of interviews, that they knew of the existence of the *Guidelines of Environmental Education* or competence indicators (inside the Guidelines) before the curriculum change. However, only two thirds (8/12; 66%) of the school staff scanned it when attending workshops or when writing their learning area curriculum. In the third round of interviews, only the art teacher said she read it again after the curriculum change. When being asked 'Did you consult environmental education competence indicators to inform your subject teaching?' no staff had done so in Redbrick up to the second year of curriculum implementation. Among six interviewees asked about the necessity to do it, two interviewees said 'Better do it' and another one said 'Better do it when expanding environmental education'. In contrast, three interviewees said 'Not necessary'. Some teachers even did not see competence indicators as being meaningful to them because the indicators were too differentiated and could not replace teachers' personal educational philosophies. For example, the English teacher in 2003 said:

> It seems that the existence of competence indicators was because we want to have them existed. They were not meaningful in reality…too differentiated … It is not really necessary to use them when teaching … we all know what the goals students should achieve … teachers won't have changed specifically to match those competence indicators … Teaching won't be modified much just because the existence of the curriculum guidelines or the competence indicators of the *Grade 1-9 Curriculum* … I don't like the competence indicators and don't want to read them again. Every teacher has their personal educational philosophy during teaching and this is the major factor to influence teachers' teaching. Other factors probably have not much or no influence. (English Teacher, 2003)

Due to the minor part of environmental education in the new curriculum, the Redbrick principal did not see the necessity for teachers to compare its competence indicators to their subject teaching and she said in 2004:

> The content of environmental education is not much inside textbooks. Therefore, it is not necessary for teachers to compare the competence indicators specifically for environmental education. (Principal, 2004)

In sum, no teacher in Redbrick used the competence indicators from *Guidelines of Environmental Education* to inform their subject teaching after the curriculum change, in either 2002/03 or 2003/04. Thus, it was hard to see the influence from the Guidelines on teacher beliefs and practices.

From what is discussed above, the views of environmental education in Redbrick did not obviously change after the curriculum change, because within the school there was no pressure for change from either the government or the external examination: Basic Competence Test (BCT).

6.2.4 Views and attitudes about the curriculum change

In the first year of curriculum implementation in 2002/03, the Redbrick staff depicted the characteristics of the new national curriculum and offered the views as follows:

- Curriculum integration; (8/12)
- More activities and more lively (the new curriculum); (5/12)
- Topic teaching; (3/12)
- Teaching autonomy; (3/12)
- Flexible time. (2/12)

In this school year, the merits of the new curriculum in Redbrick were cultivating students' abilities (4/12) including critical thinking, creativity and computer literacy; more liveliness (3/12); multi-evaluation (2/12); and encouraging teachers to study further (2/12). The shortcomings were curriculum integration (10/12); no teacher development especially for curriculum integration (6/12); the connection problem between the old and new curricula (5/12); shortened implementation timeframe (3/12); and the qualitative evaluation inside multi-evaluation (2/12). Four staff referred to no change in teacher beliefs as one of the obstacles to the curriculum implementation.

In the first year of curriculum implementation, two thirds (8/12; 67%) of the staff said that they did not fully accept the new curriculum. Among six teachers needing to face the curriculum integration in their learning areas, four said the urgent issue when encountering the curriculum change was to prepare unfamiliar subjects. During the second year of curriculum implementation, just over a half (6/11; 55%) of the Redbrick staff, including the instructional director, still said that they were not optimistic about the curriculum implementation. Even the principal did not strongly express her optimism but only said 'Okay'. The instructional director complained that the government did not give real autonomy and provide supporting measures to schools, but simply required document production. She was quite unhappy about this curriculum change and said:

> It is not teachers who defy curriculum change but the obstacles do exist inside the new curriculum. It is not teachers who are not responsible but the government needs to have practical supporting measures to let teachers feel that they should do it and they are able to do it … I don't like at all our government's educational policy which has deviated from the reality … always asked schools and teachers preparing documents which were just surface issues and we all feel tired and annoyed … sounded good and ideally giving us autonomy but still checked this and that … there is no real autonomy at all at the end … the situation is still like the time in the old curriculum … besides, the government didn't do what they should do e.g. giving the uniform evaluation table to reduce the technical trouble in all schools. (Instructional Director, 2004)

Under principal's strong administrative leadership, the Redbrick staff were very positive and aggressively prepared for the curriculum change in the 2001 school year. The principal paid no attention to negative criticism from society. Instead, she guided Redbrick staff through running many trials in order to match the requirements of the new curriculum. Her determination could be seen from the following statement:

> It seems peculiar that currently lots of negative comments come from newspapers/magazines and teachers/parents. For administrators, however, the new curriculum absolutely should be implemented … we have no right at this stage to be negative like newspapers are … school education should look after both students' learning efficacy and teachers' teaching efficacy and it is not attached to the implementation of the *Grade 1-9 Curriculum* … to us, nothing negative but just do whatever we should do. (Principal, 2002)

Before the curriculum change, Redbrick ran many trials to practice the essence of the new national curriculum. For example, the art and music teachers tried team teaching, teachers from the seven learning areas tried curriculum integration via topic teaching designed for the dragon-boat festival and the community park. In addition, teachers from science and social studies tried curriculum integration within their learning areas. However, the team teaching, the topic teaching in the

community park, and the curriculum integration within learning area of science stopped in or after the first year of curriculum implementation. It was discussed whether or not curriculum integration for social studies should move back to individual subject teaching in the latter part of the second year of curriculum implementation in 2004. As to health and physical education, some teachers taught only health education, others only physical education, while others taught both together. This showed that Redbrick had respected individual teacher subject expertise when implementing the integration (requirement of the new national curriculum). Obviously, integration was difficult to achieve. In contrast, the dragon-boat festival topic has continued to be taught. This festival integrated topic involved the seven learning areas and became a new part of the school characteristics in Redbrick.

Of the six remaining *Important Issues*, two Law Education Tests (once per semester and for human rights education) were given to all of the junior high students before the curriculum change and carried on after the curriculum change. After the curriculum change, the Gender Education Test (once a year) for students has been administered since the 2002 school year. In addition, junior high school teachers in this city needed to pass the Information Technology Education Literacy Test in the 2003 school year. The influence from these two new tests could be seen from the *Issue*s priority at Redbrick. Nearly all interviewees (10/11) said in 2003/04 that information technology education (ITE) was executed well as a first priority in Redbrick. Most of them (7/11) commented that gender education was the second priority. While three interviewees said that career development education was the third priority, the principal identified it as the first priority due to the requirement from the Ministry of Education and the budget. The rest of the *Issues* were in ranked in different order of the priority by different staff.

In conclusion, no proper teacher development supporting curriculum integration (required from the learning areas of Science, Social Studies, Arts and Humanities, and Integrative Activities) from the government led to difficulty in implementing environmental education holistically in Redbrick. Additionally, a greater budget

allocation to other *Issues* led to only two interviewees ranking environmental education as the second priority implemented in Redbrick.

6.2.5 Views of education and a good school

In the second year of curriculum implementation in 2003/04, the major view (5/11; 45%) about education in Redbrick was 'personal abilities development' that guided students to recognise and develop their potential abilities. Other main views about education in this round of interviews could be divided into the following categories:

- Job preparation (teaching students basic knowledge/skill to survive in, and not to be a burden to, the society); (3/11)
- Knowledge transmission (transferring/increasing students' knowledge); (3/11)
- Morality/citizenship cultivation (cultivating students' virtue and healthy personality to be a good citizen); (3/11)
- Learning attitude (not only for examination), life philosophy and human relationship cultivation. (2/11)

This round of interviews showed a consistent view in Redbrick that all interviewees disagreed with teaching only examinable knowledge. Of the knowledge that should be taught, but not examined, the most frequently mentioned was human relationships (8/11). Moral education and environmental education were second (7/11). Thirdly, staff mentioned living abilities (5/11) to solve daily problems including using computers, cooking, cleaning, life planning and leisure. Life education (3/11) was the fourth most mentioned issue. Except for the art and scout training teachers, however, other staff including administrators, admitted that they taught more on examinable knowledge especially before term examinations and the Basic Competence Test (BCT). This said exam pressure on examined subject teachers in Redbrick was evident.

At different times over the three rounds of interviews, seventy five percent (9/12) of the interviewees said or agreed that preparation of the BCT would impede the implementation of environmental education in schools. Further, all the eleven staff in the last round of interviews said that environmental education was not much examined and in an attached way via other relevant examinable subjects i.e. science or social studies. Some teachers criticised paper-pencil tests as being not

adequate to evaluate the affective and behavioural requirements of environmental education.

When asked about the qualifications of a good school in 2003/04, the interviewees in Redbrick identified the following factors:

- Principal leadership; (9/11)
- Active and cooperative school staff (teachers and administrators); (8/11)
- A high standard of student behaviour and competitive performance; (7/11)
- Parent support and cooperation; (6/11)
- Finance (equipment/building/budget); (4/11)
- School educational goals and characteristics; (2/11)
- School location (quiet/noisy or commercial/cultural community). (2/11)

Surprisingly, principal leadership was not the most important qualification to composing a good school in Redbrick staff view, though it was the most frequently mentioned. The main opinion (5/10) of the most crucial qualification of a good school in Redbrick was an active/cooperative staff team including administrators and teachers, especially an enthusiastic administrative team. The Redbrick principal did not see her influence as the most decisive one, especially on curriculum leadership, though she had gained the reputation of good administrative leadership. An effective and proactive staff team was the most important requirement to a good school, in her view. She said in 2004:

> A good school needs a proactive school staff working with plans and aiming at students… As to the curriculum, I can't predominate a lot the direction of curriculum development. Thus, I don't want to lead the curriculum development in my school … I think the principal is one of the qualifications of a good school. However, in some schools, maybe the administrators and teachers are more influential than the principal towards a good school. (Principal, 2004)

Four interviewees referred to the number of students attending star senior high schools as a crucial qualification of a good school, while two disagreed. However, all the interviewees in 2003/04 believed that parents would address this factor much more when considering a school good or not. The following statements from the art teacher and the instructional director show their stress from parents:

> The most important qualification for a good school is the parents' value … however, parents value most, the ratio of students attending star senior high schools. (Art Teacher, 2003)

> Everything is secondary to the high ratio of students attending star senior high school … no parent would care what the school did if 50 students per year attended the first boys high school and it would be definitely a good school to them. (Instructional Director, 2004)

Redbrick streamed students, under parental pressure, from Grade 7 and spent more time teaching learning areas examined in BCT. This posed a challenge for the introduction of environmental education. In summary, the Redbrick school staff valued all-around student development, tempered by the fundamental need to achieve in examined subjects. They saw democratic teamwork by staff was the way to achieve this. This implies that Redbrick school staff have adapted their educational goals to match parental expectation.

6.2.6 The evolving school characteristics

Before the curriculum change (the 2001 school year), a focus on aboriginal arts including dance, cane work, and sculpture distinguished Redbrick as many students were aborigines. Staff interviewed were also proud of other school characteristics and offered their views as follows:

- Extracurricular activities (many choices including aboriginal arts with professional teaching); (7/13)
- Daily recycling and no use of disposable chopsticks/spoons in lunchtime; (6/13)
- Information technology education (teaching resources centre and one more period per week than other schools); (4/13)
- English teaching (English speakers and ability checking card); (4/13)
- Community connection (teaching swimming via community infrastructure, aboriginal arts teaching via community people, visiting community activities, and doing assignments); (3/13)
- Sports performance (winning competitions). (2/13)

After the curriculum change, Redbrick did not develop any school-based curriculum but produced six topic teaching units that were for six semesters over three school years to the Grade 7, 8 and 9 students respectively. In the second year of curriculum implementation, the staff interviewed said ITE and English speakers teaching English were their school characteristics. They applied to be the Seed School of ITE in the first year of curriculum implementation because the considerable budget could enhance their school development. To enhance student ability in ITE, the Redbrick principal insisted on one weekly period of ITE in the school timetable for Grade 7, 8 and 9 students, both before and after the curriculum change. For most schools, there was one period of ITE only for Grade 8 and 9 students before the curriculum change and only for Grade 7 students after the curriculum change.

Under the strong pressure of a trend to learn English in Taiwan, all citizens are required to pass the General English Proficiency Test (GEPT) developed by the Ministry of Education in 2000. School signs were required to be labelled in both English and Chinese from the second year of curriculum implementation (the 2003 school year) in this city. Due to the English background of the Redbrick instructional director, they had increased student numbers yearly to receive English speakers' English teaching since 2001 (the year prior to curriculum change). The school in 2003/04 cancelled one weekly period of extracurricular activities and gave it to English speakers English teaching in the second year of curriculum implementation. This decision was made when Redbrick was facing the citywide one period reduction in the junior high school curricula. Therefore, English speakers teaching English and ITE eventually suppressed other school characteristics in Redbrick.

The decision to remove extracurricular activities was done hastily, as Redbrick staff did not have time to discuss it after receiving the administrative order from the City Educational Bureau. It was only few days before the beginning of the new semester and they had to make the decision immediately. Because extracurricular activities was one of their school characteristics, the Redbrick principal said that they would let the Committee of School Curriculum Development discuss which period should be removed instead of extracurricular activities and get it back into the school timetable in the 2004 school year.

In the Flexible Curriculum (20% of the school timetable in the new curriculum), there were six periods per week but only for Grade 7 students in Redbrick in the first year of curriculum implementation. They were one period each for class/weekly meeting, compensation teaching (English), knowing Taiwan (social studies), life art (arts and humanities), computer practice and extracurricular activities. In the second year of curriculum implementation, the Flexible Curriculum had a one period reduction citywide and resulted in five periods per week for Grade 7 and 8 students. The Flexible Curriculum changed to one period each for class/weekly meeting and computer practice and three periods of compensation teaching (mathematics, English and social studies). From the design of the Flexible Curriculum timetable, obviously, Redbrick was pressured to

supplement the teaching and learning of certain learning areas when facing this shortened four-year curriculum implementation.

In conclusion, the reason that ITE and English speakers teaching English became the leading school characteristics was because of the social trend and administrative leadership in Redbrick including the principal and instructional director.

6.2.7 The findings from Redbrick – An overview

To sum up, some activities at Redbrick were relevant to environmental education (see Section 6.2.2) after the curriculum change but their purposes were not to develop it. Despite the efforts of a few enthusiastic teachers, there was little that could be identified as environmental education either at the school level or at an individual classroom level. School staff views of environmental education at Redbrick did not change significantly subsequent to the curriculum change (see Section 6.2.3).

As to curriculum change (see Section 6.2.4), although more than half of the interviewees were pessimistic towards the new curriculum in both years of curriculum implementation, the school educational climate for change was still lively. With principal leadership, the teachers had tried curriculum integration for the learning areas of Science and Social Studies. They had explored team teaching for the learning area of Arts and Humanities even though they viewed curriculum integration as the most problematic aspect of the new curriculum.

Staff considered an active/cooperative staff team to be the most crucial factor in the development of a good school (see Section 6.2.5). The staff viewed personal abilities development as the goal of education (see Section 6.2.5). All of the interviewees disagreed with the teaching of examinable knowledge alone. However, teachers of an examinable subject admitted they put more emphasis on examined-content. Human relationships, moral education and environmental education were important in the view of in education in Redbrick staff despite their focus on examinable knowledge. At the end of the research, English had

followed information technology education as a defining school characteristic (see Section 6.3.6).

6.3 Parkway Junior High School

"Safety and Health, Technology and Humanities, Liveliness and Aggressiveness, Ability and Achievement"

- Parkway Junior High School Educational Goals

6.3.1 School context

How enviable to have a large beautiful park just next to the campus of your school. In fact, altogether there are three parks close to the Parkway school. Parkway school staff are proud of their school location. Compared with other schools in the city, Parkway school grounds are large with pretty gardens. It is the oldest of the three case study schools and was established in 1965, before national education was extended from six to nine years.

The three-story B-shaped main building, in a horizontal way, circles two green areas: one with a fishpond and an arboreal arcade surrounded by lawns and trees; the other one with several paths and trees inside the lawn. Entering the school, one sees a big garden with a variety of trees and flowers in front of the B-shaped main building. This garden was situated with an octagonal pavilion with a fountain inside. Tennis courts and sports fields are behind the main building and connected with a park on the right hand side. An incinerator is located beside the boundary. This was one of the reasons for choosing Parkway in this research (see Section 5.6.1). It was a unique feature of schools in this city and inspired Parkway staff to think and do more with the environment. In the 2003 school year (the second year of curriculum implementation), however, Parkway initiated its school grounds renewal plan and first changed its school gate to another side facing the main street in May 2004 (at the end of this research). The school staff tried to gain more reputation for Parkway and attract more students studying there by rebuilding schoolhouse. After changing to the new school gate, bigger and more impressive than the old one, they would rebuild classrooms in the following school years to let Parkway look more modern. Therefore, the large and beautiful

garden behind the old school gate becomes a side garden in the Parkway new school grounds.

The average age of Parkway staff is more than 40 years which is older than that of new schools in this city. According to the school website, the number of students in Parkway has increased from seven classes to more than eighty since its establishment in 1965 although the number of students and classes has declined in the recent years due to many new schools, both public and private, being established in its neighbourhood. This change is shown in Table 5.1.

According to the description in Parkway school curriculum document, many students came from single parent families or families with a small-sized factory. The Parkway school website showed that students' performance was good in various fields, especially in sports and environment related activities. For example, the school was the international winner of baseball in 1979 and the national winner of volleyball in 1985 and 1986. Parkway won a nation-wide award for school excellence in expanding environmental protection education in 1991. It had won the first place in environmental protection education continuously for six years before 1991. In the late 1990s and early 2000s, Parkway was involved in 'energy education' which also brought it fame. These were other reasons for choosing Parkway to be one of the case studies in this research.

6.3.2 Environmental Education in Parkway

Before the curriculum change (the 2001 school year), many of the staff who were interviewed (9/13) described *recycling*, based on the contribution of a recycling organisation called Ts-Fu-Sr, as a long lasting practice of environmental education in Parkway. Some referred to the incinerator, campus plants and community parks as aspects of school performance of environmental education. The staff had developed teaching materials for environmental education such as plants guides (campus and parks plants) and energy education infusion materials for the academic subjects of the old curriculum. Therefore, biology teachers and some other subject teachers would sometimes guide students to recognise campus plants during their subject teaching. Broadly, the weekly competition for

classroom cleaning and tidy up, the competition for classroom decoration, the environmental protection poster making, and sometimes the speech contest of environmental protection were all relevant to environmental education.

Speaking about classroom teaching, all those interviewed in 2002/03 (the first year of curriculum implementation) said that they had taught environmental education in their subject teaching before curriculum reform. According to this round of interviews, the chemistry/physics teacher taught about various pollution and the harmfulness of detergent/waste batteries. The health education teacher reminded students of changes to the climate, environment, population and life style in the recent decades. The Chinese teacher guided students see the beauty of nature when teaching articles 'recognising a tree' and 'someone's bird'. The history teacher discussed with students the issues of groundwater, pollution sources, soil/water conservation, the role of the incinerator, and how to maintain historical artefacts. The mathematics teacher used statistics to teach electricity consumption, while the art teacher asked students to present posters about energy consumption as part of energy education. The scout training teacher required students make a plan to manage their camping and clean/protect their camping site. In addition to lecturing, the teaching methods they used were discussion (history), games (chemistry/physics), multimedia (scout training and health education) and experiencing activities (Chinese and scout training).

After the curriculum change, the teachers interviewed in the 2003 school year (the second year of curriculum implementation) indicated that they had not changed much their infusion strategy approach to teaching environmental education. Apart from the classroom teaching discussed above, the job of the incinerator and the recycling organisation (Ts-Fu-Sr) continued to be garbage classification and recycling. This work continued to build the school reputation. Parkway in the 2002 school year (the first year of curriculum implementation) had chosen environmental education to be their school-based curriculum and developed a document that detailed their program, the *Parkway Guidelines of Environmental Education*. In addition, the school had trialled timetabling environmental education as one weekly period of 'environmental protection education'. This was designed for Grade 7 students and developed to implement the school-based

curriculum in environmental education. Eight Grade 7 homeroom teachers were in charge of its teaching. However, no subject specialist teachers were involved in this teaching plan, and there was no formal teaching material (either from the central/local government or from the school) distributed to the homeroom teachers to help them teach environmental protection education. This situation caused difficulties because the homeroom teachers needed to develop their own teaching materials. Although the Department of Student Affairs in Parkway offered some materials for energy education and various materials could be found from bookstores and websites, it took the homeroom teachers a considerable amount of time to edit their own syllabus before teaching this timetabled period. From the questionnaire given to the eight homeroom teachers, it was apparent that quite understandably most of them used the environmental protection period for tests, to do clean ups, to supplement the teaching of their own subject, and to supplement their classroom management. This indicates no teacher could use this timetabled period to teach meaningful environmental education in Parkway.

Unfortunately, this period was removed in the 2003 school year when the one period reduction citywide happened in the second year of curriculum implementation. The reason given was that the environmental protection course belonged to the flexible time component of the new curriculum and its removal would not influence the existing Parkway school curriculum. Among four staff interviewed in 2004, the principal and the ex-instructional director said that Parkway would have been able to develop its own school-based environmental education teaching materials over time if they had kept the period in the school timetable. They expressed the view that Parkway had already designed not only its school-based Guidelines of Environmental Education but also infusion teaching materials for energy education in each of the learning areas. They asserted that therefore it should be no problem to expand this into a more systematic teaching unit for environmental education. However, the other two administrators from the Department of Study Affairs, especially the new instructional director, said that it would not be easy to achieve this goal. They asserted it would be a demanding job which would need considerable human resources to develop teaching materials for Grade 7, 8 and 9 students. For this

reason, they did not see the feasibility of developing their school-based teaching materials for environmental education when building up their school development.

In this school year, the Parkway environment officer ran a Battery Recycling Activity to cope with a governmental policy from the Environmental Protection Administration. This activity was conducted due to the pressure from the government rather than school itself. This said, no initiative was new for environmental education in Parkway in a grass roots way when implementing the new curriculum except for the trial of an environmental protection period in the previous school year. Parkway staff believed what they had done and were doing was mostly relevant to environmental education to some extent though they did not aim at doing it. The new instructional director in 2004 said much of what they had done in Parkway contained environmental education and it was difficult to design activities for environmental education purposefully.

> Environmental education is only part of the school education and the present instruction in schools has already contained it … Very difficult to emphasise environmental education all the time because it is a broad area … Many things we did are relevant to environmental education and it is difficult to emphasise environmental education purposefully. (Instructional Director, 2004)

According to the third round of the interviews in 2003/04, no teaching materials were ever developed for the incinerator in Parkway either before or after the curriculum change. Understandably, this outcome was the long lasting textbook-dominated teaching in schools and the ultimate goal to prepare for the external examination in Taiwan. School teachers were not encouraged to develop any curriculum irrelevant to the examination preparation. For example, the environment officer said in 2003 that parents would suggest teaching mathematics rather than environmental education.

> There might be some parents who believe that execution of environmental education could broaden student's view and ability … But most parents are concerned more about attending higher education … They would possibly complain and suggest to teach mathematics if school executed the teaching of environmental education properly. (Environment Officer, 2003)

Parkway received complaints from both the community and staff/students when the incinerator released a bad smell during cloudy and windless days. Therefore, some staff suggested removing the incinerator. However, administration, especially the Department of General Affairs (see Section 5.6.1), commented that the incinerator did reduce the amount of garbage in Parkway and its discharge was

within the safety requirement set by the government. Particularly, they renewed it partially several years ago. Hence, they would keep using it until the City Environmental Protection Bureau requested its removal.

In conclusion, after the curriculum change, Parkway chose environmental education to be their school-based curriculum and included a period in the school timetable. However, this trial failed one year later due to subject competition in a crowded curriculum when the number of teaching periods per week was reduced by the City Educational Bureau. No teaching materials and irrelevance to examination preparation were the reasons given for the removal of the curriculum and for the failure of environmental education to emerge as a new subject in Parkway.

6.3.3 Views of environmental education

Parkway school history of involvement in aspects of environmental education is impressive: it expanded environmental protection education much earlier than other schools; it had won many awards for energy education and environmental protection education; and finally it chose environmental education to be its school-based curriculum when implementing the new curriculum. Perhaps because of this, all of the Parkway school staff (15 in total) interviewed over the three rounds of interviews said that environmental education should be taught in schools. As to the issue of how to teach it, the history teacher said in the 2001 school year that environmental education should be infused in daily activities rather than as an independent subject in the school curriculum. The following statement is her view:

> I feel like environmental education should be taught unconsciously. Students learn it when coming into this environment … It should not be taught purposefully. It is meaningless when we tell students that we are teaching environmental education and what they need to do with it … We should just infuse environmental education into our daily lives … It should not be a curriculum for students learning it in classroom. When every teacher recognises its importance, they will design to teach it. For example, we administrators display students' paintings to do aesthetic education unconsciously. Then, students would like to make their own works. We don't need to tell them that we are going to teach aesthetic education and we need your paintings. I feel no need to do it in this way. (History Teacher, 2001)

In the 2002 school year (the first year of curriculum implementation), one new interviewee also offered this opinion.

In the first round of interviews, there were four main views on why schools should teach environmental education and some interviewees offered more than one opinion. More than half of the interviewees (8/13) expressed the opinion that education was a change agent to cultivate students' environmental literacy. They considered schools had the responsibility to teach environmental education. Other reasons were 'we live inside the environment' (3/13), 'environment would influence students' learning and their physical and psychological development' (3/13), and 'the awkward environmental degradation in Taiwan' (2/13). After the curriculum change, in addition to the pre-reform views the chemistry/physics teacher in 2003 raised a different reason for schools to teach environmental education. He said the evaluation from the super agencies would push schools to teach environmental education. This indicates that governmental evaluation has a strong influence on school education in Taiwan.

Based on their collective views of environmental education in 2001/02, the Parkway staff could be divided into two categories: those who emphasised knowing about (8/13) and those who emphasised caring for (7/13) nature/ the environment. Only one staff member referred to the greenification and beautification of the school grounds as environmental education. Some broader views were human relationships, classroom interior design, classroom interior facilities, the influences of campus/community design on student learning, and so on.

After the curriculum change, in addition to the pre-reform views the health education teacher in 2004 emphasised values clarification. She said environmental education was a process to change our life styles and to make the decision between achieving economic development and maintaining a beautiful environment. The principal in 2004 said that environmental education is a process to develop a green school. In sum, what was environmental education in Parkway pre-reform was both knowing about and caring for the environment. After the curriculum change, some staff placed some more emphasis on values clarification and school development.

Teaching content and methods

Before the curriculum change, the Parkway teachers interviewed in 2001/02 suggested teaching environmental knowledge (10/13), environmental behaviour (5/13) and environmental attitude (4/13). The importance of environmental laws (2/13) was raised under the umbrella of environmental knowledge by two interviewees. Put another way, teachers emphasised knowledge more than action, awareness or the political dimension of environmental education. After the curriculum change, in addition to the pre-reform views the Chinese, mathematics, civics and chemistry/physics teachers stressed teaching civics and good human relationships. The health education teacher suggested teaching an appropriate human life style (a simple one) and the issue of balance between economic development and the environment. The ex-instructional director suggested teaching more about the content of skills and practices in environmental education.

In the 2001 school year, the common view was to start from daily and easy issues when teaching environmental education. Overall, the Parkway staff suggested experiential learning (7/13), interpersonal communication (7/13), learning via media (5/13), news relevant to the environment (3/13), and infusion teaching (2/13) were appropriate methods for teaching environmental education. Three staff recommended the use of multiple methods (the combination of the above methods). Interestingly, examinations (3/13) and law execution from the government (2/13) were also raised in Parkway. After the curriculum change, in addition to the pre-reform views the health education teacher in 2004 placed more stress on values clarification; the environment officer in 2003 emphasised teacher-student discussion; the mathematics in 2003 and art teacher in 2004 recommended using the Internet when teaching environmental education. In 2003/04, three administrators (principal and two instructional directors) and two teachers (Chinese and mathematics) all said compulsory (law execution) would be more effective when teaching environmental education.

Pre-reform, six out of thirteen staff actively referred to ‘out-of-school visiting’ as a good method to teach environmental education, but two teachers said that it was not an ideal way. After the curriculum change, this view became more pessimistic. In the second year of curriculum implementation, four out of ten

interviewees said that out-of-school visiting was just one of the methods that could be used to teach environmental education. Five staff said out-of-school visits were too difficult to organise due to time and budget constraints. Only the Chinese teacher emphasised the need to overcome all the difficulties in order to achieve the visits.

In conclusion, before and after the curriculum change, Parkway staff believed that environmental knowledge should be the major content when teaching environmental education. However, civics and action-orientated issues in environmental education were stressed more after the curriculum change. In the pre-reform time, experiential learning and interpersonal communication were the two major suggestions on how to teach environmental education in Parkway. After the curriculum change, values clarification, teacher-student discussion, the Internet, and law execution were stressed more as the ways to teach environmental education. Out-of-school visiting were viewed as a good method in Parkway, before the curriculum change, to teach environmental education. These became impractical after the curriculum change due to the demands of time and budget.

Expected learning outcomes

In 2001/02, before the curriculum change, the main expected learning outcome of environmental education in Parkway was behavioural change (7/13) under the umbrella of loving and not spoiling the environment. Two teachers said that conceptual change and attitudinal change were enough to be the learning outcomes. Other broader learning outcomes were politeness, respecting others, and choosing a career related to the environment. The ex-environment officer said that the development and execution of laws would be more effective with the teaching environmental education in schools. After the curriculum change, eight teachers (one more than previously) stressed behavioural change. Some staff broadened the change from a personal to an interpersonal level. For example, the chemistry/physics teacher in 2003 said students should influence their families and friends to improve the environment. In conclusion, behavioural change is the most expected learning outcome for environmental education in Parkway and this view did not change over the three years of the study.

Subjects/teachers relevant to the teaching of environmental education

In the first round of interviews, the most appropriate subjects to teach environmental education were seen as the sciences, especially biology (8/13), and health education (4/13). The least selected subject was mathematics which was actively identified by only two teachers. These views remained the same after the curriculum change. All of the interviewees (13/13) since the second round of interviews said that the homeroom teacher was the most appropriate to teach environmental education. The teaching content the homeroom teacher could teach was daily cleaning, recycling, garbage classification, and water/electricity saving. The teaching methods they could use were basically oral requests and asking students to do more practice in these activities. In short, biology was seen as the most appropriate subject and the homeroom teacher as being in the ideal position to teach environmental education in Parkway.

School educational goals and school reputation

In the 2003 school year, all of the eleven interviewees said that environmental education could enhance Parkway school educational goals (safety and health, technology and humanities, liveliness and aggressiveness, ability and achievement), especially safety and health. However, only 10 out of 11 staff believed that environmental education could also add to the school's reputation. Among the nine interviewees asked about the extent of this enhancement, the collective view (7/9) was 'small' (4/9) and 'medium' (3/9). One teacher said 'no function'. Only the art teacher said that environmental education could increase the school reputation to a large extent but it would have to be well implemented. However, all of the eleven staff believed that the function of environmental education in increasing the school reputation was much weaker than the impact of a high ratio of graduates attending star senior high schools. For instance, the new Parkway instructional director said parents who were influential in her school expected exam-oriented teaching.

> Up to now, my obstacle is parents ... Exam-driven education requested from parents is the obstacle we can't overcome at the present time. For some reason, our school has lost some of its best students in the recent years. Because exam-orientated teaching is what parents expect and some parents have transferred their children to other schools. Some of the rest of the parents in our school community do not understand what their children should learn … some still care a lot the access to higher education and expect that their children can attend a good senior high school. This expectation seems to have continued to be very important. (Instructional Director, 2004)

Nearly half (5/11) of the staff in this school year also believed the potential for environmental education to increase the school reputation in their parents' views was 'not much' (3/11) or 'none' (2/11). In contrast, the other interviewees (6/11) said that it might but this depended on parental background which included socio-economic background and individual preference. However, there was a prerequisite: parents had to know what environmental education was. In conclusion, Parkway staff mainly recognised that environmental education could enhance their school educational goals rather than school reputation.

Relationship between Parkway and its local environment

In the 2003 school year, each of the eleven staff member believed that the interactive and communicative relationship between Parkway and its school community was excellent. Community people used the school grounds when exercising after school hours; helped with road duty and library management; and conducted other activities in the school grounds. Community mothers joined the recycling organisation (Ts-Fu-Sr) and helped with recycling in Parkway. When asked whether or not environmental education could enhance this relationship, six out of ten interviewees in 2003/04 said 'It could not' (2/10) or 'If it did this enhancement would be small' (4/10). One teacher had 'no idea' but three staff commented that environmental education would have enormous potential to reinforce the school-community relationship if environmental education was implemented successfully (especially recycling). However, several staff, especially the administrators, complained that students had to do a big clean up after the Parkway school grounds were opened to the public over weekends. For instance, the new instructional director said in 2004 that it was a burden having a close relationship with the school community.

> Our school grounds are open to the public to play tennis and other sports after school hours. The problem is that community people do not keep the sports field and toilets clean. Our students have to do a big clean up every morning. We are becoming furious and thinking about shutting our school grounds. However, community people would be angry if we did shut the door. It becomes our headache. We feel it is too much of a burden to have a close relationship with our community, except for some activities. (Instructional Director, 2004)

She said that, therefore, she did not attempt any planning to enhance the relationship between environmental education and her school community.

> This is a quiet and normal community. No big or special thing has happened to get our school further connected with the community on the issue of environmental education. Up to now, I haven't planned to connect environmental education with our community. (Instructional Director, 2004)

In sum, a dilemma existed in Parkway on the issue of opening the school grounds to public. It then led to the administrative thinking not to do more about environmental education with its local environment if it was not required.

Should environmental education be labelled?

According to the last two rounds of interviews, although Parkway staff valued environmental education and chose it to be their school-based curriculum, they did not really consider it when choosing a textbook. Only the health education teacher mentioned taking this into account and this was at the beginning of the curriculum implementation in 2002. In 2004, the principal said that textbook editors rather than teachers should consider and include environmental education into textbooks. He indicated that teachers did not discuss environmental education in the learning area meetings either before or after the curriculum change. Due to staff being overloaded from the year prior to curriculum implementation, their main concern from 2002 was restricted to their learning areas rather than six *Important Issues*, including environmental education. In the third round of interviews, Parkway staff reported they did not use the term 'environmental education' when teaching environmental issues either before or after the curriculum change. In the first round of interviews, instead, they said that they used the terms 'nature', 'environment', 'ecological balance', 'environmental crisis', 'environmental pollution', 'resource protection' and 'sustainability'. After further exploration in 2003/04, nearly half of the school staff (6/11) expressed the view that teachers 'Should mention this term' or 'It would help if mentioning this term'. The other half of the interviewees (5/11) did not see the necessity to name environmental education. Since the second round of interviews, no staff in Parkway said they had identified environmental education in detail by comparing the competence indicators from the national *Guidelines of Environmental Education* with their school curriculum, even after they had developed their own school-based environmental education guidelines. The principal and instructional director said their school curriculum plan had documented the place in each learning area which was relevant to environmental

education. In conclusion, environmental education was not clearly labelled in Parkway. Although half of the staff saw the need to label environmental education, they had never thought to do this in their teaching.

Formal/informal curriculum and formal/non-formal education

In the second year of curriculum implementation, Parkway staff said individually that environmental education existed more in the informal curriculum (9/11) in schools and the formal education (5/11) in society. However, there was no consensus of which curriculum should teach more about environmental education in Parkway. After the removal of the timetabled period of environmental protection education, four staff still said that environmental education should be taught more via the formal curriculum. Another four staff said that environmental education should be taught in both curricula. The fact that Parkway did a good job in the informal curriculum, especially teaching about recycling led to three interviewees saying that environmental education should be taught more in the informal curriculum. However, nearly half the staff (5/11) said that environmental education should be taught more in the formal education because it could reach more students than the non-formal education. This situation persisted after the timetabled period of environmental protection education had been removed in Parkway school timetable for one year.

Should environmental education use a voluntary or compulsory learning style?

In the third round of interviews in 2003/04, nearly half (6/11) of the interviewees referred environmental education as voluntary learning. Four staff said that environmental education was a combination of voluntary and compulsory learning. Only one interviewee said 'compulsory'. When being asked which learning style would be more effective in learning environmental education, nearly half of the interviewees (5/11) said compulsory learning. However, almost every interviewee (10/11) emphasised that the life-long learning of environmental education should be voluntary and it would be more important to environmental education. The reason Parkway view environmental education as voluntary learning was possibly because they did environmental protection education for a long time and gained a reputation so as to have more confidence with their

students. However, Parkway staff still stressed the need to supplement voluntary with compulsory strategies when teaching and learning environmental education in Taiwan.

Subject status of environmental education

According to the interviews conducted in 2003/04, nearly all Parkway staff (10/11) considered the subject status of environmental education was much lower than examinable school subjects before and after the curriculum change. One staff said 'It cannot be compared, as environmental education was not a subject'. Even when comparing it with non-examinable subjects, the main view (6/11) was that environmental education had a lower status. As to the non-school subjects (law/gender/vocation education), the main opinion (6/11) in Parkway was that environmental education had a similar status. Eight of the eleven teachers said that the status of environmental education had not changed after the curriculum change. Three teachers said that its status had increased slightly after the introduction of the term 'environmental education' from the new curriculum. They said the Parkway staff therefore put more effort into routines such as garbage classification and recycling. In conclusion, although Parkway staff valued environmental education to a great extent, chose it to be their school-based curriculum, and even allocated one period to it; staff considered that the subject status of environmental education after the curriculum change had not increased.

Infusion strategy and suggestions to increase the teaching of environmental education in schools

In the second year of curriculum implementation, the prevalent view (7/11) in Parkway in 2003/04 was that teaching environmental education in schools via the infusion strategy was 'sufficient' because teachers were overloaded with a crowded curriculum. Nevertheless, those interviewed still offered suggestions on how to increase the teaching of environmental education in schools. The main suggestion (6/11) was testing environmental education in the external examination: Basic Competence Test (BCT). The other two individual suggestions were the government request (3/11) and principal leadership (2/11). In sum, due to the exam-driven instruction in schools, testing environmental education in BCT would be the most effective way to increase its teaching in Parkway.

Teacher development

As well as the only one citywide workshop about environmental education in 2002, the Parkway environment officer had attended a workshop on energy education. According to the three rounds of interviews, no other external workshop relevant to environmental education had happened in Parkway over the three years studied. In addition, Parkway did not run internal workshops specifically for environmental education. Staff noted that internal workshops were conducted for the Grade 1-9 Curriculum (8/11), gender education (5/11), career development education (4/11) and information technology education (3/11). Because Parkway was the Centre School of Career Development Education, they conducted more workshops for this *Issue* than other schools and other Issues. This indicates that internal teacher development is job-orientated in Parkway. In conclusion, although environmental education was the Parkway school-based curriculum, there was still a lack of teacher development on it.

Should competence indicators from Guidelines of Environmental Education be used to inform teachers' subject teaching?

In the second round of the interviews in 2002/03, nearly three quarters (8/11; 73%) of the Parkway staff said they knew of the existence of *Guidelines of Environmental Education* before the curriculum change. Only half of the interviewees (6/11; 55%) had scanned or read it because of job relevance (new curriculum task force in Parkway). According to the third round of interviews, no staff read it again after the curriculum change. In addition, no interviewee had used the competence indicators of the *Guidelines* to inform their subject area teaching in the first and second year of curriculum implementation. In this round of interviews, seven staff when asked about the necessity to use the indicators said 'It was necessary' or 'Better' to doing this job. However, they expressed the difficulty of doing it without sufficient time and a requirement from the school or government. With regard to the implementation of environmental education, the Parkway staff attitude was that they had done what they could do and could not do anything different in the future. For example, the new instructional director speaking in 2004 said that many of the routines for environmental education in Parkway were under going and this job was done properly.

> Environmental protection in schools has been done for a long time, so far many routines are under going and were done properly … the Ministry of Education probably won't need to require other things … every school is doing recycling … schools already do whatever they can do and probably can not do anything more different. (Instructional Director, 2004)

In conclusion, many of the Parkway staff believed that competence indicators of environmental education could enrich teachers' area teaching when implementing the new curriculum. However, after the curriculum change, the lack of time and requirements from the government led to the fact that no interviewee did it.

To sum up, although Parkway chose environmental education to be their school-based curriculum and develop their school-based Guidelines of Environmental Education, the views of environmental education in Parkway basically did not change in a large-scale after the curriculum change. It seems that the changes in Parkway need to follow the societal educational climate change such as an evaluation of school-based curriculum from the government or testing environmental education in BCT.

6.3.4 Views and attitudes about the curriculum change

In the first year of curriculum implementation in 2002/03, the Parkway teachers' views of the characteristics of the new curriculum were: a focus on curriculum integration (9/11); more liveliness/activities (6/11); creative teaching with a variety of methods (4/11); multi-evaluation (4/11); provision for different textbooks (4/11); the addition of competence indicators (3/11); infusion of *Important Issues* (3/11); school-based curriculum development (2/11); more learning area meetings and teachers cooperation when progressing school development (2/11).

While many staff (9/11) in Parkway referred to the major characteristic of the *Grade 1-9 Curriculum* as curriculum integration, the environment officer in 2002 said that it was not fully new but a term with greater stress in the new curriculum.

> Talking about curriculum integration, many teachers commented that they already did it more or less in the past … The integration should have been done without using the term 'curriculum integration' … this term is stressed much more strongly at the present time. (Environment Officer, 2002)

In addition, the health education teacher commented that curriculum integration in the new curriculum had not achieved its stated goal as it did not reduce the repetition of certain content from different learning areas. She said in 2002:

> Editors only grouped several chapters from the relevant subject textbooks in the old curriculum and combined them into a new textbook … I don't think the textbook edition has achieved the goal of 'curriculum integration' … I feel that it is impossible to make it … the reason to have integration is to reduce the repetition, but we still can find numerous repetitions from different learning areas such as counselling from 'integrative activities' is repeated within 'health and physical education' and the function of family from 'integrative activities' overlaps with some parts from 'social studies' and 'health and physical education'. I don't feel we have the real 'curriculum integration' in the new curriculum. (Health Education Teacher, 2002)

In the 2002 school year in 2002/03, the most agreeable merit of the new curriculum according to the Parkway teachers (5/11) was creative/multiple teaching approaches through teaching media especially computers and learning work sheets and activities which supplemented lectures. Four staff referred to multi-evaluation (more than one form of assessment) as a merit, but two teachers criticised that it was too subjective and that only paper-pencil tests were objective evaluation instruments. Another merit was that students had more opportunities to think and express themselves, which would help to cultivate students' abilities to solve problems (3/11).

In 2002/03, the Parkway teachers saw the main deficiency of the new curriculum as curriculum integration (8/11) especially when no teacher development had been offered from universities or in-service training systems. Among six teachers needing to face the curriculum integration in their learning areas, four said the urgent issue when encountering the curriculum change was to prepare unfamiliar subjects. Second, five of the eleven teachers saw a problem with the connection between the old and new curricula. Third, three teachers noted there was a gap between the new curriculum and the external examination BCT. This was because the BCT could not properly evaluate the ten core competencies; they saw the design of the Grade 1-9 Curriculum as too ideal. Fourth, two administrators referred the lack of change in teacher beliefs as one of the obstacles to the curriculum implementation.

In the first year of curriculum implementation, eight of the eleven interviewees said that they did not fully accept this curriculum change due to the deficiencies

mentioned above. Even the principal said the reason they had to accept the new curriculum was because of pressure from the centralised Taiwanese education system. He said in 2003:

> People expanding this reform are hurrying in their mind. Our education system is a centralised one. Once the Ministry of Education gives an administrative order, we all need to implement the new curriculum … If you don't accept it, you would be labelled as rebellious … The government has used many strategies and conducted workshops to push everyone inside schools to accept it. So, even though you don't like to accept it, you still need to accept it. Otherwise, you must have to retire immediately. (Principal, 2003)

During the second year of curriculum implementation, however, just under half of the interviewees (5/11) were pessimistic towards the curriculum implementation, which was down from 8/11 the previous year.

After the curriculum change, Parkway had tried curriculum integration in the learning area of Social Studies from the first to the second year of curriculum implementation. It had kept individual subject teaching for biology and chemistry/physics (Science), health education and physical education (Health and Physical Education), art and music (Arts and Humanities). They did not attempt to do so many trials of curriculum integration within learning areas as some other schools did. It seemed that Parkway had more respect for the expertise of individual subject teachers when implementing the new curriculum. This indicates the school climate in Parkway as being slightly conservative when implementing curriculum integration in learning areas from the new curriculum.

As to the priority of the *Important Issues* implemented in Parkway, two *Issues* were said to be the first priority: information technology education (ITE) (3/10) and environmental education (EE) (3/10). Environmental education was one of the first priorities because Parkway had implemented environmental protection education for a long time. From another aspect, two staff viewed career development education (CDE) as the first priority because Parkway was the Centre School of CDE in the city. It was their job and responsibility to develop and expand CDE. One teacher said 'Don't know' and the other one said 'Law education' as their response to this question of priority. In addition, energy education was frequently stressed in Parkway in the late 1990s and the early 2000s. They were chosen by the Ministry of Education to conduct a Demonstration Program of Energy Education in 2001. Parkway teachers infused

energy education into their subject teaching individually to show the possibility to achieve the infusion strategy. This implies energy education has represented environmental education in Parkway.

In conclusion, Parkway tried curriculum integration only for the learning area of Social Studies rather than other integrated learning areas. They tried the infusion strategy rather than theme-based curriculum integration with energy education. Parkway staff did not try curriculum integration specifically for environmental education though it was their school-based curriculum.

6.3.5 Views of education and a good school

In the third round of interviews in 2003/04, the Parkway teachers were asked about their view of the major goal of education. The prevalent view was that it was to cultivate students' surviving/living abilities (8/11) in society. Those abilities included how to solve problems, how to think, how to get along with other people, how to use and search for knowledge, how to choose leisure, how to plan their life and future, and so on. Other views were that it was to cultivate a healthy personality/mind (2/11) and to change students' temperament to a better level (2/11). Two staff stressed that whole-person education should be the ultimate goal in education.

In this round of interviews, none of the interviewees supported the idea of teaching only examinable knowledge but they said they would still place more emphasis on the examinable content. The only exception was the home economy (non-examinable subject) teacher but even she still taught more examinable content when teaching Chinese or civics (examinable subjects). This indicates that school instruction is strongly influenced by the examination in Taiwan. All the Parkway teachers interviewed identified living abilities (11/11) and moral education (11/11) to be the most important non-examinable knowledge. Other issues mentioned by a few teachers were environmental education (5/11), physical/mental health (4/11) and life education (2/11). At different times during this research, eighty percent (8/10) of the interviewees said or agreed the BCT would impede the implementation of environmental education in schools. In

addition, all the eleven staff in the last round of interviews said that environmental education was not much examined during examinations.

In the second year of curriculum implementation in 2003/04, nearly all of the Parkway teachers (9/11) noted that an important element of a good school was principal leadership/communication. Also important were motivated, enthusiastic and cooperative school staff (7/11); community recognition and parental support (5/11); school characteristics and educational goals (4/11); good communication between administrators, teachers and parents (3/11); healthy administrative systems (2/11) and students' learning willingness (2/11). Five interviewees referred to new buildings, equipment and classroom facilities as one of the qualifications of a good school but two staff said that it should just come and follow up with enthusiastic staff.

In this round of interviews, the predominant view of the most decisive qualification to compose a good school in Parkway was the principal leadership (7/11). Two staff mentioned that the number of students attending star senior high schools could be one of the qualifications to make a good school but one teacher provided the opposite view. However, all of the eleven interviewees said that parents would value it more than they did. The parental and societal pressure demanding a school with high academic competition ability is shown from the following statements:

> It's better to have less academic competition pressure to attend star senior high schools so that every school need not work so hard to achieve only this purpose … However, the reality is that parents strongly care about it and will check this outcome so that everyone is in a panic working towards it … no choice … no matter city or country, every school works very hard currently. It is really an abnormal phenomenon in Taiwan. (Home Economics Teacher, 2004)

> The principal would receive pressure from teachers, parents and attending higher education. The last one was the most influential … The social value would evaluate the principal by the number of students attending star senior high schools … the principal had to take the ultimate responsibility of the school development. (Principal, 2004)

Parkway did not have a streaming system for Grade 7 students under the inspection of the City Educational Bureau. However, they did in Grades 8 and 9 and tried to increase the number of graduates attending star senior high schools. This indicates the dilemma and negotiation in Parkway between the ideal and the reality in education.

6.3.6 The evolving school characteristics

In the first round of interviews in 2001/02, when being asked about the school's characteristics, Parkway staff offered the following views:

- Ts-Fu-Ser (a club doing recycling by community involvement); (7/13)
- Incinerator (garbage classification); (4/13)
- Extracurricular activities (recorder, chorus and Japanese); (4/13)
- Cultural education (dragon and lion dances); (3/13)
- Vocational education (bakery/beauty treatment/plumber/electrician); (2/13)
- Beautiful campus (large gardens and many parks nearby). (2/13)

In the 2001 school year, *energy education* was remarkable in Parkway. It was a shared result of the excellent work of the Ts-Fu-Ser group and the presence of the incinerator (both had existed in Parkway for more than ten years). According to the interviews over the three years studied, Ts-Fu-Ser was a club with an enthusiastic membership of teachers, community people and students. Every class first did garbage classification and then delivered the classified garbage to the Ts-Fu-Ser to carry out further classification and a recycling process. The rest of garbage was sent to the incinerator to be burned out as much as possible. Therefore, the garbage truck from the City Environmental Protection Bureau took away only a small amount of garbage. The frequency of this visit in Parkway was much less than other schools in the city. They had gained many awards in the past and even won the reputation of the Excellent School of Energy Education in Taiwan in 2001, which was the year before the new curriculum was implemented at the junior high level.

Based on their previous performance, Parkway in 2002 chose environmental education to be their school-based curriculum when implementing the new curriculum. Energy education has been a topic and part of the content of their school website since the year before the curriculum implementation. Parkway developed its own school-based Environmental Education Guidelines according to the national *Guidelines of Environmental Education.* In this document, they designed three topics; environmental protection education, ecology education and energy education; for Grade 7, 8 and 9 students respectively. There was one weekly period of environmental protection education via the Flexible Curriculum for Grade 7 students in their school timetable in 2002/03. This period was removed in 2003/04 due to the citywide one period reduction. The reason the

City Educational Bureau required this change was a decreased educational budget from the central government. Parkway chose to relinquish this period as it would have least influence on their existing school curriculum. As indicated in Section 6.3.2, this trial has been designed for environmental education purposefully after the curriculum change. It is repeated here because environmental education is also one of the school characteristics in Parkway. After removing this period, the staff still viewed environmental education as their long-lasting and remarkable school characteristic.

The new instructional director (from the second year of curriculum implementation) felt the need to look for new school characteristics in Parkway. She noted that recycling and garbage classification had been done citywide since the 1990s. Thus, this was no longer a unique school characteristic in Parkway. She said that recorder playing was the contemporary school characteristic in Parkway because students won many prizes and liked it. Parkway staff started to emphasise English learning because the City Educational Bureau stressed it and Parkway was in charge of many citywide English competitions and workshops. They had initiated cooperation with the university nearby to enhance students' English reading. In the second year of curriculum implementation, the new Instructional Director said that she would like to expand humanities - music, art, and literature (Chinese/English), rather than environmental education to be Parkway's new school characteristics, especially English.

The Flexible Curriculum (20% of the school timetable) in Parkway during the first and second year of curriculum implementation was mainly distributed to learning area supplementary teaching such as English, Chinese, Social Studies, and sometimes Arts and Humanities (see Table 8.1). The rest of the time was distributed to class/weekly meetings, computing, and extracurricular activities for either Grade 7 or 8 students. One period of environmental protection education was specifically designed for Grade 7 students in this Flexible Curriculum in the 2002 school year but was removed in the 2003 school year. Therefore, the Parkway school-based curriculum, environmental education, was still taught in a similar way as the old curriculum. It was done more obviously in the informal curriculum such as lunchtime and cleaning time (the aspect of 'doing' in

environmental education) and less obviously in the formal curriculum i.e. infused teaching in every learning area (the aspect of 'knowing' in environmental education).

In conclusion, environmental education was a distinguishing school characteristic in Parkway in the pre-reform time. After the curriculum change, Parkway still kept working on environmental education but felt the need to look for new school characteristics such as music and English, especially the latter. The reason for Parkway school characteristic moving to English was because of the strong social trend including the government leadership and Parkway administrative leadership, especially the instructional director.

6.3.7 The findings from Parkway - An overview

To sum up, although Parkway staff valued environmental education (see Section 6.3.2) and chose it to be their school-based curriculum, the profile of this new subject was still not high at the end of the study despite the development of a school-based curriculum. With the exception of the weekly period of environmental protection education in the 2002 school year, there was little that could be identified as environmental education at the both school and classroom level. Therefore, the views of environmental education (see Section 6.3.3) at Parkway did not change dramatically following the curriculum change.

As to curriculum change (see Section 6.3.4), although the attitude towards the new curriculum in Parkway gradually became more optimistic over the two years of curriculum implementation, the school educational climate remained somewhat conservative. Curriculum integration was viewed as the major characteristic but also the biggest shortcoming of the new curriculum. The staff tried curriculum integration only for the learning area of Social Studies.

Principal leadership was viewed as the most decisive factor to a good school (see Section 6.3.5). All the staff stressed teaching living abilities and moral education rather than examinable knowledge as the goals in education (see Section 6.3.5). Nevertheless, they reported they emphasised examined-content when facing

examinations. At the end of this research, English had surpassed environmental education to become a new school characteristic (see Section 6.3.6) in Parkway.

6.4 Riverside Junior High School

"Love and Concern, Cultivation of Talents:
local concern with worldview, happy learning with adaptive development, self-loving to love others and regulating by others to self-regulating, using technology to do active exploration, reflection and practice."

Riverside Junior High School Educational Goals

6.4.1 School context

Rivers are always interesting places for humans to explore. Riverside is located beside a river, the border between the city and the countryside, with a street between them. Historically, this is a place of the earliest settlement in this city area with lots of human resources. Riverside is quite an old school, established in 1968. Different from other schools in the city, it has offered special education since 1989 to look after retarded children. The school established an autism resource class in 1994, which was changed into a resource class of learning disablement in 1998. Since 1999, Riverside has established a resource class for dropout students returning to mainstream education.

The light yellow U-shaped main building, three-storied with one wing much longer than the other, faces the river and circles a sports field on its open side. Beautiful poinsettia flowerpots, hang from the railing of the corridor at every level of the building, making it a neat and pretty environment. Walking into the school gate, one sees two rows of tall coconut palms standing along the school wall and the main building, each with a small lawn at its base. A road at the left leads to Riverside auditorium and a path with a fishpond is at the right.

A well-known temple is close to Riverside and famous for its architecture and long history. History teachers in the late 1990s started to run outdoor education classes and guide students visiting this temple. Later, river workshops were conducted during weekends or summer/winter vacations. A biology teacher

guided students to become familiar with their community environment in 2000/01. Riverside teachers were inspired first by the temple and then the river to develop the so-called school-based curriculum before the implementation of the new national curriculum in 2002. In the late 1990s, they published two books introducing the temple's architecture/history and the riverbank plants. These publications are linked into the school website. This was the reason to choose Riverside to be one of the case studies in this research (see Section 5.6.1). However, the key person for developing these teaching resources was not a teacher but an administrator, the ex-instructional director. He suggested and encouraged teachers to complete this task in order to enhance the school's reputation. The ex-instructional director had left this position one year prior to this research commencing in Riverside; therefore, teachers received less support in the teaching of environmental education via these books.

The average age of Riverside staff was around 40 years old at the time of this research. With staff retirements and new staff arrivals from the year prior to the curriculum implementation, the average age of Riverside staff had reduced to less than 40 years old by the end of this research. The number of classes and students in Riverside decreased somewhat over the years of the research (see Table 5.1) due to a reduction in the population in its school community.

6.4.2 Environmental Education in Riverside

In the first round of interviews in the 2001 school year, more than half (6/11) of the interviewees said what Riverside had done was relevant to environmental education to some extent, because it was a broad area and hard to separate from education at large. Raising sheep, holding a community concert, producing books about the local environment, community clean ups, a wind band, and orientation workshops were all relevant to environmental education. As to what was specific for environmental education, four teachers mentioned garbage classification and recycling had been undertaken prior to the curriculum change. The school had won first place for tidy school grounds at junior high level in 2001. Second, some of the teachers said community involvement (3/11) including the production of books about the temple/river in Riverside school community, outdoor education via the books and community clean ups. Thirdly, the sheep (2/11) raised on the

Riverside sports field was viewed as addressing the affective domain in environmental education. School staffs were very impressed that the school grazed a sheep. Other practices relevant to environmental education were the weekly competition for classroom cleaning and tidy up, the competition for classroom decoration, and the environmental protection poster making.

At the level of classroom teaching, in the 2002 school year (the first year of curriculum implementation) every staff interviewed said that they infused environmental education in their subject teaching before the curriculum change. According to this round of interviews, the biology teacher guided students to recognise campus plants. The Chemistry/physics teacher taught about a variety of issues such as the greenhouse effect, noise and energy. The English teacher led students to be aware of special plants and energy consumption when teaching about national parks and fast food. The health education teacher taught pollution and conservation. The history teacher described the historical changes on the land. The art teacher induced students to appreciate the beauty of nature through paintings. The counselling teacher referred human relationship as environmental education in his subject teaching. The mathematics teacher mentioned garbage when teaching statistics. The scout training teacher guided students to observe orientation, choose camping site, and clean up their community. Apart from lecturing, they would use pictures (English), equipment (chemistry/physics), video (art), and discussion/activities (counselling and scout training) to enhance their teaching.

After the new curriculum was implemented, those interviewed in the 2003 school year reported that the infusion teaching of environmental education at the classroom level did not increase because not every subject textbook included environmental education as part of the content. As to outdoor education, temple visiting was still conducted regularly. In contrast, the river workshop and visiting had stopped in the year prior to the curriculum implementation. According to this round of interviews, the reason for these two different results was that the number of history teachers was greater than biology teachers in Riverside. Teachers in the learning area of Social Studies had an agreement and three of them took turns to conduct the temple visits. In contrast, there was only one biology teacher in

Riverside. In the year prior to the curriculum change, the biology teacher had become an administrator and overloaded, and then he transferred to another school in the first year of curriculum implementation. In the same year, the new biology teacher was soon promoted to be the Riverside instructional director and was also overloaded. In the second year of curriculum implementation, the new biology teacher (the instructional director) wanted to carry on the river workshops and visits. However, he said it was not easy because he was the only biology teacher and so had no other biology teachers who could help him. This said, human resources were important in Riverside when conducting activities. The examples of the temple and river visits provide evidence that the implementation of environmental education in Riverside relied on enthusiastic staff who were involved in its teaching. As to the sheep, it was sent away in late 2001 after the principal transferred to another school, and this indicates the influence from different principals when implementing environmental education.

In the second year of curriculum implementation, a Loving Society was established in the Riverside Extracurricular Activities Program. Its aim was to look after Riverside's grounds and this Society was made the responsibility of the environment officer. Although there was no teaching of environmental education at the classroom level, students in Loving Society did a good job of keeping their school grounds clean and tidy. The new instructional director did think of the possibility of establishing a Horticulture Society in extracurricular activities before this research was completed in June 2004. He said students could gain first-hand experience by participating in activities in this Society to achieve the goal of gaining action experience in environmental education.

> … such as horticulture society. It would offer opportunities in a long time frame and get students involved in experiencing environmental education gradually … the implementation of environmental education could be achieved in this way, otherwise where and how can students get involved in environmental education if without concrete practices? (Instructional Director, 2004)

The class of Special Education in Riverside had a Horticulture Curriculum. The class teacher guided students in cultivating various flowers and plants in a greenhouse in front of their classroom. The Riverside instructional director believed that they could expand this greenhouse into a Horticulture Society for the mainstream students, if any teacher was interested in doing it. However, the

reason for not establishing a Horticulture Society was that it was not the focus of school development in Riverside at that period of time. Additionally, the instructional director said teachers' views on the importance of this Society would influence the possibility of its establishment. He said:

> Only if the horticulture society would be an emphasis or future direction of the school development, otherwise it would hardly be established. Besides, it depends on teachers' views whether or not this society is absolutely important and need to be developed. (Instructional Director, 2004)

After the curriculum change, there was incidental teaching of environmental education in Riverside. In the second year of curriculum implementation, the chemistry/physics teacher referred to two modules of topic teaching, detergent and recycled materials, in his learning area as trials in environmental education. The real purpose of developing these modules, however, was to infuse information technology education rather than environmental education into the learning area of Science and Technology. In the latter part of the second year of curriculum implementation, the new director of the Department of Student Affairs received a city administrative order *Three-Year Plan of Enhancing School Environmental Education* from the Ministry of Education (MOE). He raised discussion of this plan in Riverside's principal-director meetings. Therefore, the principal, instructional director, and director of student affairs in Riverside all recognised the necessity to implement environmental education properly in their school. They said that they would seriously face this issue as the MOE might conduct an evaluation of the implementation of this plan. This implies the importance of government leadership when implementing environmental education in Taiwan. The director of student affairs planned to discuss it first in his department, and then develop a draft plan before having further discussion in the principal-director meetings at the end of the 2003 school year. However, no draft plan was developed before that semester was ended in June 2004. The director said that he was too busy and had no time to plan it. The principal said that Riverside would make such a plan but it was not an urgent issue in that semester. She did not want to place too much pressure on her subordinates. This indicates that Taiwanese junior high school staff, being busy and overloaded, attend first to urgent issues such as the requirements and evaluations from the government.

In conclusion, Riverside staff developed the teaching of environmental education, prior to the curriculum change, and achieved two curriculum goals of *Guidelines of Environmental Education*: environmental awareness and sensitivity; environmental knowledge and concepts. In pre-reform times, they achieved these goals via visits to the nearby temple and river, workshops, and producing two books about their community. Because of the restriction of human resources, the teaching about the river could not be continued. However, the temple visits continued to be conducted after the curriculum change due to the support from enthusiastic Social Studies teachers. This implies the importance of manpower, and whether or not staff are keen on the expansion of environmental education in Riverside.

6.4.3 Views of environmental education

According to the three rounds of interviews, every interviewee (17 in total) in Riverside believed that schools should teach environmental education, and none of them changed this view over the three years studied. However, pre-reform, two staff said that environmental education should not be taught specifically in the school curriculum because it was a part of education at large. For example, the ex-instructional director in the 2001 school year said environmental education could be taught in any time and at any place.

> I don't think it is to teach environmental education in schools … it is more important that students can feel the environment surrounding them. This is the major purpose for us to edit the book "The Beauty of Han-Si" so that our students can really learn the wildlife from our school community … I do not deny to teach environmental education because we could teach it in any time and at any place … Education is to build up the environment to let students feel about it and we might need to teach something afterwards. (Ex-instructional Director, 2001)

The ex-principal in 2001 also said school education should contain environmental education because it could not be a school subject.

> Schools need not to teach environmental education purposefully because it cannot be an independent school subject. If you asked whether should schools teach environmental education or not? Yes, schools should teach it. Because it couldn't be an independent subject, teachers should just infuse the concepts of environmental education into their subject teaching ... Our normal school education should contain the teaching of environmental education. (Ex-principal, 2001)

In the 2001 school year (before the curriculum change), the main reason in Riverside why schools should teach environmental education was 'we live inside the environment' (7/11). Two staff mentioned that education was a change agent

to cultivate students' environmental literacy. One teacher said that severe environmental degradation was a reason. The general view in Riverside showed environmental education was first 'caring' for (7/11), and then 'knowing' about (6/11) the environment. One teacher referred to the school grounds greenification as environmental education. Two staff commented that everything relevant to the environment would be environmental education. The ex-principal even said that environmental education was hard to separate from education at large.

In the 2002 and 2003 school year (after the curriculum change), most of the staff kept their pre-reform views and several added slightly different opinions. The scout training teacher in 2002 and 2004 stressed the importance of execution of laws as it could help to expand school environmental education. The principal also said in 2002 and 2004 that environmental education was to influence others' action to improve our environment. The history teacher in 2003 referred to the cultural and human resources as part of environmental education. In short, environmental education was the caring for and knowing about the environment in Riverside in the pre-reform time. After the curriculum change, other views were added and these focused more on the action and humanities aspect of environmental education.

Teaching content and methods

Before the new curriculum was implemented, the interviewees' combined views in 2001/02 showed that environmental knowledge (12/12) was stressed the most as the teaching content of environmental education in Riverside. Environmental behaviour (6/12) was the next area, and environmental attitudes (4/12) were the third priority. Only one teacher mentioned the political implications of the teaching content. Other contents were school community, spiritual protection and urban planning. After the curriculum change, in addition to the pre-reform views several staff raised some broader views in Riverside. The English teacher in 2002 and 2004 highlighted the importance of teaching national environmental policies and a personal thinking shift (from economic development to conservation). In 2004, the scout training teacher stressed teaching about harmonious interactions between people; the instructional director emphasised increasing the teaching content which could lead to students' attitudinal change. In sum, environmental

knowledge was the main teaching content suggested in the pre-reform time. After the curriculum change, attitudinal change, governmental policies, harmonious human interaction and personal thinking shifts were added to the list of teaching content of environmental education at Riverside.

In the pre-reform time, the combined suggestions of the teaching methods of environmental education in Riverside were experiential learning (8/12) with emphasis on experiencing activities and learning by doing rather than visiting, media teaching (5/12), interpersonal communication (2/12), and TV/newspaper news relevant to the environment (2/12). One staff member stressed that family education should be the root of environmental education and school education was just its extension. Therefore, he emphasised that governmental policy execution was the most effective way of achieving this. After the curriculum change, in 2003/04 the instructional director and four teachers (health education, history, English and art) all said compulsory (law execution) would be more effective when teaching environmental education. Other opinions were the history teacher in 2003 suggested topic teaching, the principal in 2004 emphasised participation in activities, and the scout training teacher in 2004 insisted learning by doing. Visiting, especially out-of-school visiting, was recommended by two teachers in the pre-reform time but only the instructional director in 2004 discussed overcoming difficulties to achieve out-of-school visits after the curriculum change. He was not confident however about this method because it required teachers' cooperation and relied on teachers' willingness to conduct it.

In sum, in Riverside staff views, environmental knowledge was the most recommended teaching content in environmental education in the pre-reform time. After the curriculum change, governmental policies and attitudinal changes were added to the list of teaching content of environmental education. Before the curriculum change, experiential learning via experiencing activities was the teaching method suggested most in environmental education. After the curriculum change, the teaching methods suggested were still participation in activities and learning by doing in environmental education. The new suggestion was teaching environmental education via a topic teaching and/or law execution.

Expected learning outcomes and subject/teachers relevant to the teaching of environmental education

Before the curriculum change, the expected learning outcome of environmental education in Riverside was behavioural change (8/11). Two staff also stressed it after the curriculum change. The most likely subjects to teach environmental education were first science with emphasis on biology (11/11), then health education (3/11), social studies (2/11) and integrative activities; especially scout training (2/11). The least likely subject for teaching environmental education was mathematics (6/11). These views remained the same after the curriculum change. From the second to third rounds of interviews, all Riverside staff believed that the homeroom teacher would have a major role in teaching environmental education. The content homeroom teachers could deliver was mainly relevant to the aspect of 'doing' in environmental education such as recycling and garbage classification. The teaching methods homeroom teachers adopted were basically oral requests and giving students more practice. In conclusion, in Riverside staff views, the most likely school subject to teach environmental education was biology, and the most proper position to teach it was the homeroom teacher.

School educational goals and school reputation

In the last round of interviews in 2003/04, every interviewee (10 in total) commented that environmental education could enhance Riverside's school educational sub-goals (local concern with worldview, happy learning with adaptive development, self-loving to love others and regulating by others to self-regulating, using technology for active exploration, reflection and practice), especially on the first and third goals.

As to the school reputation, nearly all the interviewees (9/10) said that environmental education could increase it to some extent. The other said 'No function at all'. When asked the extent of environmental education in increasing the school's reputation, two thirds of the staff (6/9) said it would be from small (4/9) to medium (2/9). In contrast, the remaining three staff supposed environmental education had strong potential to increase school reputation though it was not yet achieved. This indicates an optimistic attitude towards environmental education at Riverside. However, every staff member said that

environmental education was much less effective than the high ratio of graduates attending star senior high schools to increase their school reputation. In addition, more than half of the staff (8/10) supposed that in the view of parents, environmental education had little (4/10), no (2/10) or only medium (2/10) effectiveness in enhancing a school's reputation. One teacher had no idea about this issue, while the other two staff interviewed supposed that parents would value environmental education. In short, Riverside staff believed that exam performance in BCT would be much stronger than environmental education to bring a greater reputation to schools.

Relationship between Riverside and its local environment

In the 2003 school year, every Riverside interviewee (10/10) referred to an interactive relationship as being the ideal between a school and its community. The existing relationship was mainly built on the routine activities of exercise, road duty, library management, and community groups running activities within school grounds. A different and inspiring one was that Riverside developed their outdoor education via the teaching of biology, art and social studies. Teachers used their community temple, river and farther places (science museum and railway station in the city) to deliver special topics in their teaching. Visiting the temple started in the pre-reform time and became part of the regular Social Studies teaching activities after the curriculum change. River outdoor education started before the curriculum change but was stopped in the year prior to the curriculum implementation. Use of the museum and railway station was developed after the curriculum change. The main view (6/9) of the function of environmental education enhancing the interactive relationship in Riverside was from small (3/9) to medium (3/9). Only the mathematics teacher referred to it as a strong catalyst, but noted it would take a very long time to achieve the ideal stage. Another two teachers said 'Depends on the extent of execution'. In sum, Riverside staff did not really see the potential of environmental education to strongly enhance the relationship between the school and the school community.

Should environmental education be labelled?

Since the second round of interviews, except for the English teacher did it once at the beginning of the curriculum implementation, almost no staff said they

considered environmental education when choosing a textbook. Three staff said that textbook editors had already included environmental education into their textbooks and therefore there was no need to consider it. According to these two rounds of interviews, they did not discuss environmental education in their learning area meetings after the curriculum change. In addition, no staff identified environmental education in detail in the Riverside school curriculum though it was written inside this document. In the third round of interviews, none of them said they used the term 'environmental education' when their teaching related to the environment before and after the curriculum change. During the first round of interviews, staff reported that they often used the terms 'nature', 'environment', 'ecology', 'resource', 'conservation', 'environmental pollution' and 'environmental protection'. After exploring this issue, more than half (6/10) of the staff said 'Should mention the term' or 'It would help if mentioning the term'. In short, environmental education was not identified or labelled in Riverside after the curriculum change. Half of the Riverside staff (6/10) saw the need to label environmental education, but no one had ever thought about the issue of whether or not environmental education should be labelled.

Formal/informal curriculum and formal/non-formal education

According to the interviews in the second year of curriculum implementation, Riverside staff viewed environmental education as existing more in the informal curriculum (9/10) in schools and the formal education (6/10) in society. Half (5/10) of the staff interviewed said that environmental education should be taught more in the formal curriculum, and the other half (5/10) said the informal curriculum in schools. Most of the Riverside staff (8/10) believed that environmental education should be taught more via formal education rather than non-formal education in society.

Should environmental education use a voluntary or compulsory learning style?

Half (5/10) of the interviewees in 2003/04 said environmental education was a voluntary learning style, though three said that the contemporary learning of environmental education in Taiwan was compulsory. Two teachers expressed the view that environmental education should be a combination of voluntary and

compulsory learning. However the major view (5/10) in Riverside saw compulsory learning as being more effective. Only half of the Riverside staff (5/10) said that voluntary learning of environmental education would life lasting for students, as they were not confident with their students. However, the more important learning style in environmental education was still voluntary (6/10). In short, though compulsory strategies would be more effective, Riverside staff still highly value voluntary learning of environmental education.

Subject status of environmental education

According to the interviews in 2003/04, the subject status of environmental education remained similar (7/10) and did not increase after the curriculum change. Three interviewees said that its status was increased a little. However, one of them commented that this change was influenced by social change rather than curriculum change. All the interviewees said that the status of environmental education was lower than that of the examinable subjects before and after the curriculum change. Compared to non-examinable subjects, two main views were that the status of environmental education was lower (4/10) or similar (3/10). The English teacher said 'It cannot be compared', while the two other teachers regarded its status as being slightly higher than non-examinable subjects because environmental education would be examined in the relevant subjects. There was no consensus in Riverside when comparing environmental education with non-school subjects (law/gender/vocation education). Three main views were that environmental education had a lower (3/10), similar (4/10), or higher (3/10) status. In short, the introduction of environmental education via the curriculum change did not increase its status in Riverside.

Infusion strategy and suggestions to increase the teaching of environmental education in schools

In the last round of interviews in 2003/04, four fifths of the Riverside staff (8/10) said that the infusion teaching of environmental education into the seven learning areas was 'insufficient'. The two leading ways suggested at Riverside to increase the teaching of environmental education in schools were principal leadership (3/10), and government request (3/10). Two other suggestions were testing it in BCT (2/10), and textbook edition (2/10).

Teacher development

The three rounds of interviews showed, except for the one citywide environmental education workshop in 2002, that neither external nor internal workshops were run for environmental education at Riverside. Most of the teacher development focused on gender education (9/10), counselling (9/10), information technology education (6/10) and the new curriculum (2/10). Further, in each year special speeches during weekly meetings were run for students on gender education and career development education, rather than environmental education. The reason was that the MOE required schools to run speeches for these two *Issues* and offered schools a budget to do so.

Should competence indicators from Guidelines of Environmental Education be used to inform teachers' subject teaching?

In the second round of interviews, two thirds (8/12) of the staff said they knew of the existence of *Guidelines of Environmental Education* before the curriculum change. Only half of the interviewees (6/12) had glanced at or read it pre-reform because of attending workshops, preparing tests, or writing curriculum documents. The third round of interviews showed that no one checked the *Guidelines* again after the curriculum change. In addition, no staff used the environmental education competence indicators to inform their subject teaching. When being asked about the necessity to do this, more than half of the school staff (7/10) said it should be done, at least theoretically. But, no one really did it because there was no requirement to do so from either the school or the government.

To sum up, Riverside developed outdoor education via the community temple and river in pre-reform time. They referred to this outdoor education as environmental education. After the curriculum change, however, they did not choose environmental education to be their school-based curriculum, and did not keep building up the connection with environmental education via this outdoor education. Thus, the views of environmental education in Riverside did not change much after the curriculum change.

6.4.4 Views and attitudes about the curriculum change

In the 2002 school year (the first year of curriculum implementation), curriculum integration was mentioned frequently at Riverside (8/12), though some staff (3/12) did not believe that it was associated with the new curriculum. For instance, the English teacher in 2003 referred to curriculum integration as a global trend and said:

> Curriculum integration is just a contemporary trend and tendency … the differentiated knowledge is a sign of progression leading to experts and expertise … knowledge should not be integrated just because we want to integrate them. It should be integrated when knowledge is really relevant and correlated. (English teacher, 2003)

In this school year, some major combined views on the characteristics of the new curriculum in Riverside were multiple teaching, evaluation and learning (8/12); the autonomy of school and teachers (5/12); the need for teachers self-development (4/12); more activities and more lively the new curriculum (3/12); competence indicators (2/12); and better school organisation (2/12).

Again in 2002/03, the major combined view of the merit of the new curriculum in Riverside was more liveliness and activities (4/12). The two biggest shortcomings of the new curriculum were no teacher development (8/12) from in-service system to training universities, and too hasty (8/12) implementation of the new curriculum, especially the accelerated four-year implementation timeframe. More than one third of the interviewees (5/12) believed that curriculum integration was the most problematic issue, especially with limited supporting measures. In the second year of curriculum implementation, the ratio of the interviewees with this view increased to four fifths (8/10). All the six teachers who needed to face the curriculum integration in their learning areas said the urgent issue when encountering the curriculum change was to prepare unfamiliar subjects. In addition, one third of Riverside staff (4/12) said that the new curriculum was not designed well. One quarter of the interviewees (3/12) said that the gap between curriculum goals and the Basic Competence Test would ruin the merits of the new curriculum. As to the marketing textbook edition, four staff in Riverside made the criticism that there were too many versions of textbooks and the production was too slow. Two interviewees complained of the shortened implementation timeframe leading to the connection problem between the two curricula. Two

staff described the lack of change in teacher views as one of the obstacles to curriculum implementation.

In the first year of curriculum implementation, one third of staff (4/12) said 'okay' or 'no problem' to the new curriculum. However, half (6/12) of the staff interviewed said 'not fully accepted' and two teachers even said that they refused to accept it. The Riverside principal was also not very happy with the curriculum change. She claimed in 2002 that a mismatch existed between the curriculum change and curriculum implementation.

> I can accept the goals of curriculum change but some strategies need to be re-adjusted. The government needs to give schools more freedom. The Ministry of Education being the decision-maker should let schools know clearly what to do? What is the direction in the future? What are the goals of education after the curriculum change? … There is a mismatch between the curriculum change and its implementation. **(**Principal, 2002)

One year later, the scene did not become better as only one staff was optimistic, while more than half (6/10) were pessimistic and one third (3/10) held views in between towards the new curriculum.

Riverside staff conducted curriculum integration only in the learning area of Social Studies but they worked across the seven learning areas for their school festivals. The priority of implementation of the *Important Issues* was first information technology education (8/10). Secondly, was gender education (4/10) and third career development education (2/10).

In summary, complaints about this curriculum change were more than compliments in Riverside. The staff attitudes towards the new curriculum did not become more optimistic in the second year of curriculum implementation. Although Riverside tried curriculum integration for the learning area of Social Studies and their school festivals, they did not try curriculum integration for environmental education.

6.4.5 Views of education and a good school

In the third round of interviews in 2003/04, the major view about education in Riverside was teaching students the surviving/living abilities (6/10) in society and offering chances for their practice. The second major view was whole-person

education (5/10) guiding students to grow better in every dimension and to live happily. The third view about education was moral/civic education (4/10) cultivating students' virtues and healthy personality to be a good citizen. The fourth was learning and gaining good human relationships (3/10).

In this round of interviews, all the ten interviewees in Riverside said that they should not teach only examinable knowledge. Only two staff (computer and scout training) did not teach more on the examinable content. The rest of school staff admitted that they taught more, especially before examination. The most important non-examinable knowledge in Riverside was living abilities (6/10) including politeness, human relationships, respecting people especially elders, common sense, how to solve problems, and knowledge and skills to survive in society. The following two categories were other necessary, non-examinable knowledge:

- Moral education (healthy personality/life view/world view); (5/10)
- Gender education and environmental education. (3/10)

At different times during this research, eighty five percent (11/13) of the interviewees said or agreed the BCT would impede the implementation of environmental education in schools. In addition, all the ten staff in the last round of interviews said that environmental education was not much examined during examinations.

The combined views of the qualifications to build a good school in Riverside were listed as follows:

- Principal; (9/10)
- Cooperative staff team including administrators and teachers; (9/10)
- Finance (campus environment, classroom facilities, equipment); (7/10)
- Student moral/living education (good daily behaviour and less violence); (6/10)
- Supportive administration system; (3/10)
- School educational goals and characteristics; (2/10)
- Cooperative parents. (2/10)

Two main views of the most important qualification of a good school were an enthusiastic staff team (5/10) and principal leadership (4/10) in Riverside. Although two staff viewed the number of students attending star senior high

schools as being a crucial qualification, one teacher did not agree on this point. However, all the interviewees believed that the ratio of their graduates attending star senior high schools would be the most important consideration for parents to evaluate a school being good or not. The environment officer, who had recently transferred from another city, said that the academic competition pressure in her previous school suppressed their good results in the trial scheme of the new curriculum. In parental views, a school's high academic competition ability was seen to be the ultimate requirement for their children studying there. She said:

> Another school with high ratio of graduates attending star senior high schools was close to my school. Many parents sent their children studying there. Therefore, the number of their students was much more than ours. However, that school was frequently warned and inspected by our City Educational Bureau due to their illegal streaming system. Although the trial result was good in my school after completing the trial scheme of the *Grade 1-9 Curriculum* from the Ministry of Education, parents still did not want to send their children studying in my school. Mainly parents thought that happy learning did not strongly help the future development of their children especially when accessing higher education. (Environment Officer, 2004)

Under parental pressure, Riverside had to emphasise the academic teaching when implementing the new curriculum. In conclusion, although half of the Riverside staff referred to the goal of education as whole-person education, the strong examination culture in Taiwanese society pushed them to focus on teaching the examinable subjects.

6.4.6 The Evolving School Characteristics

Before the curriculum change, raising a sheep on their sports field was a unique feature of the school to Riverside staff. Nearly half (5/11) of the school staff referred to it as their special school characteristic. It was the idea of the ex-principal, who agreed to let Riverside join this research program. He left for another school soon after this research was commenced in August 2001, and for reasons unknown to the researcher the sheep was sent somewhere else after the principal left. Some other school characteristics in Riverside established by the ex-principal still carried on, such as the community concert. Except for the sheep, the following items were the school's distinct characteristics in the first round of interviews, in the staff's combined views were:

- Books about local environment (the temple and river); (5/11)
- Community concerts including drama (Chinese, English and Japanese) and music; (4/11)

- Wind band; (4/11)
- Community service (cleaning community environment); (3/11)
- Two-day orientation workshop; (2/11)
- Vocational education. (2/11)

After the curriculum change, Riverside staff did not develop any school-based curriculum but produced two topic teaching units that were for two semesters within a school year to all of the students. During the first year of curriculum implementation, extracurricular activities with two periods per week (as opposed to one weekly period in other schools) brought reputation and second place of the school characteristics citywide to Riverside. In the second year of curriculum implementation, they increased the number of societies (from 12 to 17) in their Extracurricular Activities Program so as to develop a new school characteristic in Riverside.

In the third round of interviews, half of the staff (5/10) believed that English and information technology education (ITE) were the long-term school characteristics they were pursuing in the second year of curriculum implementation. First, Riverside had a sister school in Canada since the first year of curriculum implementation. The Canadian school looked for a Taiwanese sister school through the help from the city government. Therefore, the City Educational Bureau distributed the administrative order to schools to build a bridge between Canada and Taiwan. Riverside applied to be the Taiwanese sister school and won from many other applicants in the city. In addition, Riverside gained an English special project in the second year of curriculum implementation. They planned to cultivate students with good English ability in order to visit this Canadian sister school in the future. The purpose was to get the International Exchange Students to become a special school characteristic. Secondly, Riverside applied to be a Seed School for ITE during the second year of curriculum implementation. The instructional director said that Riverside would apply for the ITE budget continuously to improve their computer facilities and develop teaching materials for different learning areas. They chose Science and Technology to be the learning area to develop infusion teaching materials for ITE. Thus, two special topics, detergent and recycled materials, had been developed via this ITE project by the end of this research.

Before the curriculum change, outdoor education involving the community temple and river via history and biology teaching in Riverside was a distinguished school characteristics among junior high schools in the city. After the new curriculum was implemented, outdoor education involving the river was stopped, but that involving the temple was still one of the school characteristics in Riverside.

Except for extracurricular activities and class/weekly meetings, the content of the Flexible Curriculum in Riverside school curriculum was supplementary teaching for certain examinable learning areas (see Table 8.1). This design indicates that Riverside was under strong academic competition pressure. In conclusion, the school characteristics in Riverside evolved along with the curriculum implementation from outdoor education in its local environment to extracurricular activities, English and information technology education.

6.4.7 The findings from Riverside - An overview

To sum up, despite Riverside school staff having already developed books and workshops for learning about their local environment before the curriculum change, they did not choose environmental education to be their school-based curriculum (see Section 6.4.2). They had stopped having regular river workshops. Except for the regular work done on garbage classification and recycling, there was little that could be identified as environmental education either at the school level, or at an individual classroom level. After the curriculum change, teachers understanding and perception of the value of environmental education (see Section 6.4.3) did not change dramatically at Riverside.

As to curriculum change (see Section 6.4.4), the attitude towards the new curriculum in Riverside was not overly optimistic in both the first and second year of curriculum implementation. Curriculum integration was viewed as the major characteristic of the reform but deficiency as well. The staff tried curriculum integration only for the learning area of Social Studies.

An enthusiastic staff team and principal leadership were identified as the two most important factors contributing a good school (see Section 6.4.5). Teaching student living abilities in society and providing whole-person education were

described as the two main goals of education (see Section 6.4.5). All of the interviewees disagreed with teaching only examinable knowledge. Most of them stressed the importance of living abilities and moral education. At the end of this research, extracurricular activities, information technology education, and especially English overtook outdoor education in the local environment as key school characteristics at Riverside (see Section 6.4.6).

6.5 Summary

Chapter Six described the school development from September 2001 to June 2004 in three urban junior high schools in Taiwan. Section 6.2 introduced the views of Redbrick staff towards environmental education, curriculum change, education, a good school, and the evolving school characteristics. Before and after the curriculum change, recycling was referred to as the main practice of environmental education in Redbrick and the infusion teaching of environmental education at the classroom level has been done whenever possible. In the first year of curriculum implementation, no specific trial was run for environmental education. However, the scene was more positive in the second year of curriculum implementation. A practicing teacher helped Redbrick gain not only the recognition from the TGSPNP but also the chance to do an action research specifically for environmental education. After that, Redbrick worked with three primary schools applying for 8 million NT dollars for the project from the Sustainable Campus Program. Whether Redbrick would do more about environmental education, or not, entirely relied on whether or not they gained this budget.

The major view towards environmental education in Redbrick was caring for something relevant to the environment. The main reason for schools to teach environmental education was because ‘we live inside the environment’. Two main suggestions for the teaching content of environmental education were environmental knowledge and environmental behaviour. The main recommendation of the ideal teaching method was experiential learning which focused on experiencing activities and learning by doing. After the curriculum change teaching via media, especially computer and video films, was viewed as

the most practical way to teach environmental education in Redbrick. The expected learning outcome in Redbrick was behavioural change in students' daily lives. Although the view for the most likely school subject to teach environmental education was biology, all interviewees said that the homeroom teacher would be in an ideal position to teach it, especially the aspect of 'doing' in environmental education. All of the school staff commented that environmental education could enhance their school educational goals, but not every interviewee saw its potential to increase their school reputation. The views of the potential of environmental education to increase Redbrick school reputation were small to medium. The reason was that environmental education could not suppress the function of student performance in external examinations. Every interviewee said that the interactive relationship between Redbrick and its school community would be ideal, but only one teacher viewed environmental education as having the potential to strongly enhance this relationship. In addition, the existing relationship between Redbrick and its local environment did not yet involve the teaching of environmental education. Thus, no interviewee ever used the term 'environmental education' to students, before or after the curriculum change, when their subject/area teaching was relevant to the environment. Neither did they consider environmental education when choosing textbooks, or discuss it in their learning area meetings. Further, they viewed environmental education as existing more in the informal curriculum than the formal curriculum in Redbrick. In their view environmental education should be taught more via the formal curriculum in the future. They considered the teaching of environmental education existed more in formal education and stressed the contribution of reaching every student from formal education when teaching environmental education in the future. As to the learning style of environmental education, Redbrick staff viewed it as a compulsory, or a combination of voluntary and compulsory, learning. They believed that students would voluntarily have good environmental behaviour after being compulsorily required to cultivate good habits with governmental laws and school regulations because compulsory ways would be more effective. However, all interviewees still believed that only voluntary learning could exist and stay longer in student's lifetimes. Thus, they said that the connection between environmental education and the seven learning areas via infusion strategy was 'insufficient' when teaching environmental

education. Consequently, they suggested government request and textbook edition as the ways to increase the teaching of environmental education in schools. After the curriculum change, the status of environmental education had not increased in Redbrick. The subject status of environmental education was similar to the time before the curriculum change: environmental education was lower than both examinable and non-examinable school subjects and no higher than non-school subjects (law/gender/vocation education). No Redbrick staff had used competence indicators of environmental education to inform their area teaching. Very few workshops for environmental education were conducted externally and internally.

As to the curriculum change, Redbrick staff referred to curriculum integration as the major characteristic, and shortcoming, of the new national curriculum. Cultivating students' abilities was a major merit of the new curriculum. Redbrick staff were keen to do trials of curriculum integration coping with the requirements of the new curriculum, but nothing specifically was done for environmental education. However, they related the topic teaching in their community park and a special topic of information technology education in their community river to environmental education. Although all the interviewees said that environmental education was important and should be taught in schools, environmental education was not the first priority among six *Important Issues* in their school. The first and second priorities of the *Issues* in Redbrick were Information Technology Education and Gender Education. Most of the Redbrick staff did not fully accept the new curriculum in the first year of curriculum implementation and the scene did not become more optimistic in the second year of curriculum implementation.

The major view of education in Redbrick was 'personal abilities development' aimed at guiding students to recognise and develop their potential abilities. The most crucial qualification of a good school was an active and cooperative staff team including administrators and teachers, and most especially an enthusiastic administrative team. Before the curriculum change, the school characteristics in Redbrick were information technology education, aboriginal arts, and English speakers teaching English. After the curriculum change, the teaching of

information technology education and English speakers teaching English were stressed more strongly and had progressed.

Section 6.3 described the school development of Parkway junior high school over the three years studied. Before the curriculum change recycling, energy education, the incinerator and Ts-Fu-Ser, and the two plant guides for campus/parks were the practices of environmental education in Parkway. Environmental education was taught in an infused, or supplementary, way at the classroom level. After the curriculum change, these approaches carried on and Parkway did two trials specifically for environmental education. First, they developed the Parkway Guidelines of Environmental Education for their school-based curriculum. Second, they distributed one weekly period to Grade 7 homeroom teachers for the teaching of Environmental Protection Education. Although this period was removed in the second year of curriculum implementation, this trial could be seen as the initial emergence of environmental education in the Parkway school curriculum.

The major view of what environmental education is in Parkway was both knowing about, and caring for the environment. The predominant reason to teach environmental education in school was ‘education is a change agent to cultivate students’ environmental literacy’. Environmental knowledge was the most recommended teaching content for environmental education in Parkway. Experiential learning and interpersonal communication were the two teaching methods most advised, and the expected learning outcome of environmental education was behavioural change. The most likely school subject to teach environmental education was science, especially biology. The most ideal position to teach environmental education in schools was the homeroom teacher. Nearly all the interviewees saw the potential of environmental education to enhance their school educational goals and school reputation, but opinions on the extent to which environmental education could increase Parkway school reputation was small to medium. The ideal relationship between Parkway and its school community was an interactive and communicative one. However, the view of the extent to which environmental education could enrich this relationship was from none to small. Parkway staff did not consider environmental education when

choosing textbooks and did not discuss it during their learning area meetings either before or after the curriculum change. They did not use the term 'environmental education' when their subject teaching was relevant to the environment, though some of them saw the necessity to name it. In the Parkway staff view, environmental education existed more in the informal curriculum in schools and in the formal education in society. Two main views were that environmental education should be taught more either in the informal curriculum or both the curricula in schools. They mainly believed that formal education should take the responsibility to teach more about environmental education in society. Parkway staff viewed environmental education as voluntary learning, which could bring life long influence to students. However, they still believed that the compulsory strategies in environmental education would be more effective when teaching it. Parkway staff saw the status of environmental education as lower than either the examinable subjects or the non-examinable subjects in the school curriculum. Because they did a good job in recycling and energy education, they saw the status of environmental education as similar to the non-school subjects. The connection between environmental education and the seven learning areas via infusion strategy was viewed as 'sufficient' in Parkway. The main suggestion to increase the teaching of environmental education in schools was to test it in the external examination: BCT. There were very few external or internal workshops for environmental education in Parkway. No staff in Parkway ever used the competence indicators of environmental education to inform their subject teaching, though they saw the necessity to do it.

As to the curriculum change, two main characteristics of the new curriculum in Parkway were curriculum integration and more liveliness/activities. Curriculum integration with no teacher professional development was viewed as the biggest shortcoming of the new curriculum. They referred to creative/multiple teaching methods as a merit of the new curriculum. Except for the curriculum integration done for the learning area of Social Studies, Parkway did not conduct other trials after choosing environmental education to be their school-based curriculum. The two *Important Issues* viewed as the first priority in Parkway were information technology education and environmental education. Parkway staff were not

happy with the new curriculum when implementing it in the first year, but they became slightly more optimistic in the second year of curriculum implementation.

The major view about education in Parkway was to cultivate students' surviving/living abilities in society. They refused to teach only examinable knowledge but still emphasised it, especially to help students to prepare for examinations. The most crucial qualification to creating a good school was principal leadership. Before the curriculum change, the Parkway school characteristic was energy education or, more broadly, environmental education. After the curriculum change, they developed the humanities, especially English, more to be their new school characteristic.

Section 6.4 delineated the views of Riverside school staff towards environmental education, curriculum change, education, a good school, and school characteristics. Before the curriculum change, recycling, community involvement (books, outdoor education of temple/river, community cleaning up) and raising a sheep were the major practices of environmental education in Riverside. At the classroom level, environmental education was taught in an infused way when subject content was relevant to the environment. After the curriculum change, Loving Society (one society in extracurricular activities) was the trial relevant to environmental education. The staff discussed the governmental request Three-Year Plan of Enhancing Environmental Education at the level of principal-director meetings and tried to do something specific for environmental education. However, no draft plan was developed by the end of this research, as this plan was not urgent or mandated immediately from the government.

Two main views of environmental education in Riverside were caring for, and knowing about the environment. The main reason to teach environmental education in schools was 'we live inside the environment'. All Riverside staff recommended environmental knowledge when teaching environmental education. The main teaching method of environmental education was experiential learning, and environmental behaviour was the most expected learning outcome. The most relevant subject seen to teach environmental education was biology and the homeroom teacher was considered the most ideal position to teach it in schools.

All Riverside staff believed that environmental education could enrich their school educational goals, but not everyone saw its potential to increase their school reputation. The extent of environmental education increasing school reputation was only small to medium in Riverside. The interactive relationship between Riverside and its school community was seen as ideal in Riverside. Although Riverside conducted outdoor education in its local environment, the extent of environmental education to enrich this interactive relationship was still only viewed as small to medium. Before and after the curriculum change, Riverside staff did not consider environmental education when choosing textbooks and did not discuss it in their learning area meetings. They did not use the term 'environmental education' to their students when their subject teaching was relevant to the environment, though some of them saw the need to name it. Riverside staff mainly viewed environmental education as existing more in the informal curriculum in schools and suggested to teach more about it in both the formal and informal curricula. Although environmental education was seen as existing more in the formal education in society, they stressed that formal education should teach more about environmental education in society. Riverside staff mainly viewed the learning of environmental education as voluntary, but did not see its potential to last life long time in students' lives. They were not confident in their students and suggested combining compulsory strategies to achieve a voluntary behaviour change in the end. After the curriculum change, Riverside staff did not see any change in the status of environmental education in the school curriculum. The subject status of environmental education, in the Riverside staff view, was lower than the examinable subjects, and no higher than the non-examinable subjects. There was no consensus when comparing environmental education with non-school subjects. Three main views were that environmental education had a lower, similar, or higher status than the law/gender/vocation education in the school curriculum. The connection between environmental education and the seven learning areas via infusion strategy was viewed as 'insufficient' in Riverside. Two suggestions for increasing the teaching of environmental education were principal leadership and government request. Except for the 2002 citywide workshop for environmental education, there was no external or internal workshop conducted for this *Issue* at Riverside. After the curriculum change, no Riverside staff used competence indicators of

environmental education to inform their subject/area teaching, though most of the interviewees saw the necessity to do this.

The major characteristic of the new curriculum was curriculum integration in Riverside, but it was viewed as the most problematic policy. More liveliness and more activities were referred to as the main merit of the new curriculum. Two shortcomings were no teacher development, especially for curriculum integration, and too hasty curriculum implementation. Riverside staff conducted curriculum integration only in the learning area of Social Studies, but across seven learning areas for their school festivals. Information technology education was the first priority of *Important Issues* at Riverside. The second priority belonged to gender education and career development education. After the curriculum change, the view of the new curriculum in Riverside was not optimistic and it became more pessimistic in the second year of curriculum implementation.

Two major views about education in Riverside were teaching students surviving/living abilities and whole-person education. All Riverside staff refused to teach only the examinable knowledge, but examinable subject teachers still stressed it more before examinations. The two most crucial qualifications to create a good school were: an active staff team and principal leadership. Before the curriculum change raising sheep, community concerts, and books on the local environment were the main school characteristics of Riverside. After the curriculum change extracurricular activities progressed well; information technology education and English became the other two major school characteristics of Riverside.

The next chapter, Chapter 7, will synthesise data from these three case study schools to answer the first three research questions. It will synthesise the findings of this research towards the understanding of the introduction of the new subject of environmental education in Taiwanese junior high schools. The impact of the two important features of the new curriculum, curriculum integration and school-based curriculum development, on school staff views and practices will also be discussed. Chapter Eight will then discuss the relationship between the literature and the case studies to answer the fourth research question.

CHAPTER SEVEN:
SYNTHESIS OF THE CASE STUDIES

"Schooling does mirror society in the sense that the sources or engines of change within schools are located outside of the educational system in the larger society, then social change within the society generates opportunities for educational change."
Lee Anderson in Barbara Tye and Kenneth Tye (1992) *Global Education: A Study of School Change*, p.xviii.

7.1 Introduction

Environmental education is now widespread in national educational policies, curriculum documents, curriculum development initiatives, and conservation strategies (Rickinson, 2001). However, many countries, including Taiwan, choose a cross-curricular implementation strategy in their curriculum documents (see Section 4.4). There is no separate subject called *Environmental Education* and all teachers are responsible for its implementation. Therefore this thesis investigated the views of staff in three typical Taiwanese junior high schools about the large-scale curriculum change in 2002, including the infusion strategy to implement environmental education. The three urban case study schools were Redbrick, Parkway and Riverside junior high schools. Redbrick was a new school with good performance on recycling. Parkway had an incinerator and implemented environmental protection education well. Riverside had published two books on their local environment. These individual characteristics are relevant to environmental education and were among the reasons those schools were chosen to be studied (see Section 5.6.1, and Sections 6.2.1, 6.3.1 and 6.4.1).

This chapter will synthesise data from the three case studies in Chapter Six. Section 7.2 will answer the first research question about the role and place of environmental education in the pre-reform school curricula. Section 7.3 will respond to the second research question about the influences of the introduction of environmental education, as required in the new national curriculum, on school curricula. Section 7.4 will discuss the third research question about the impact of the new national curriculum on teacher views and practices in environmental education. Because the introduction of environmental education into Taiwanese junior high school curricula occurred in the context of overall curriculum change,

Section 7.5 will discuss the nature of the curriculum change at large including the school staff's general response, the deep structure of schooling, and the subject status in schools. Section 7.6 will discuss the shift to curriculum integration and school-based curriculum because these two reform features are exactly the essence of environmental education. This chapter will conclude with a summary in Section 7.7.

7.2 The Role and Place of Environmental Education in the Pre-Reform School Curricula

Data from the three case study schools showed that environmental education had an adjunct role and an ambiguous place in these three schools' pre-reform school curricula. The reasons for this situation are discussed in the following sections.

7.2.1 A place in the informal curriculum

According to the first and third round of interviews, in the pre-reform school curricula environmental education existed more in the informal than formal curriculum (see Sections 6.2.3, 6.3.3 and 6.4.3). This included lunchtime, nap time (homeroom teachers request a few students to do recycling or cleaning while others were taking a nap), cleaning time, intervals between periods, and homeroom teacher time in the morning. For example, in these schools students needed to bring their own chopsticks and spoons for use at lunchtime. The purpose of this was to reduce the amount of garbage generated, and to protect forest resources. Garbage classification, recycling, and school grounds greenification/beautification were done regularly in all three schools. In addition, Redbrick recycled the toxic waste from laboratories (see Section 6.2.2). Parkway incinerated garbage after completing classification to reduce its total amount of garbage (see Section 6.3.2). The Riverside ex-principal raised a sheep on the school sports field so that students could observe this sheep eating grass during intervals between periods (see Section 6.4.2). Many teachers referred to this as a unique event for environmental education in Riverside. In conclusion, school staff across each of the three schools mentioned these events, while existing in the informal rather than formal curriculum, specifically as being environmental education in their schools.

7.2.2 A place through opportunistic education

One of the three recommended methods (Guo, 1990) to teach environmental education at the classroom level in Taiwanese schools was opportunistic education (see Section 2.4.3). The intention was to infuse environmental education into the school curriculum and to teach it in relevant school subjects such as science (chemistry, biology), social studies (geography) or even mathematics. In the first year of curriculum implementation, every interviewee from these three schools claimed that in the pre-reform time they had taught environmental education to some extent, especially when their subject content was relevant to the environment (see Sections 6.2.2, 6.3.2 and 6.4.2). However, this teaching consisted mainly of the transmission of environmental knowledge and cultivation of environmental awareness with some action related to environmental protection. For instance, science and health education teachers introduced knowledge of energy, pollution and conservation. Sometimes they raised awareness of the problems between economic development and environmental protection. Language teachers, especially of Chinese, raised students' awareness of the relationship between humans and nature and of respecting life, and suggested students learn from nature. English teachers taught English terms relevant to the environment in order to highlight the importance of environmental education. Social studies teachers helped students to understand environmental laws, historical lessons and geographical characteristics so as to cultivate students' environmental attitudes and achieve their behavioural change. Mathematics teachers guided students to calculate the extent of pollution or energy use so that their environmental awareness would be strengthened. As to environmental action, art teachers required students to use recycled materials or campus plants to do creative paintings, or to make posters or handcrafts. Scout training teachers requested students during camping out to clean up the campsite and protect wildlife. In sum, environmental knowledge, attitudes and action were taught in the pre-reform time via opportunistic education but in an attached way. Each subject teacher taught something relevant to the environment without systematic planning and with no connection between subjects.

7.2.3 The theme of environmental protection

In the pre-reform time, environmental education in Taiwanese junior high schools was manifested mainly through the theme of *environmental protection* such as garbage classification, recycling, maintaining clean and tidy school grounds, and greenification/beautification (see Sections 6.2.2, 6.3.2 and 6.4.2). This situation is exactly Walker's (1997b) 'e' theory of environment, that is to do beautification of the school grounds, while the 'E' theory of environment would be the integration of the theme of the environment in the school curriculum. According to the third round of interviews in 2003/04, the teachers did not use the term 'environmental education' during their subject teaching. In the first round of interviews, they reported often using the terms 'nature', 'environment', 'environmental problems', 'environmental crisis', 'environmental protection', 'environmental science', 'conservation', 'ecological balance', 'greenification' and 'sustainability'. No school staff interviewed ever tried to relate what they did, no matter whether in the formal or informal curriculum, in their schools to environmental education (see Sections 6.2.3, 6.3.3 and 6.4.3). Thus, in these three schools it could be seen that environmental education was not labelled or identified in the pre-reform school curricula.

7.2.4 The relationship between the case study schools and TGSPNP

In February 2000, the Ministry of Education initiated Taiwan's Green School Partnership Network Project (TGSPNP) (see Section 2.4.2). In the pre-reform stage, the implementation of TGSPNP in its first one and half years was to run workshops for governmental and school staff, to maintain a 'Taiwan Greenschool' website for information exchange, to design six checklists for local educational bureaus and/or schools to do a campus survey or self-evaluation, to publish a biweekly electronic newsletter to release information, to conduct a Green Curriculum Design Competition to build up a database of teaching materials, and to conduct a survey to investigate the needs and expectations of the local educational bureaus and schools (Liang & Chen, 2001). In the beginning of this study, September 2001, around 70 schools were voluntarily signing onto the website to be one of the Green Schools in Taiwan (Wang, 2002). In the first round of interviews in 2001/02, none of the school staff in the three schools

studied mentioned this project and there appears to have been no involvement in it at all.

In summary, in the pre-reform stage the status of environmental education in Taiwanese junior high school curricula was vague and indistinct as it was done more via the informal curriculum, opportunistic education and as part of the theme of environmental protection. Although the interviewees said environmental education ***was*** being done in a daily basis, it often was not identified as 'environmental education'.

7.3 The Influence of the Introduction of Environmental Education (as Required in the New National Curriculum) on School Curricula

International studies show that environmental education has been valued, increasingly, in the school curriculum since the 1960s, although it is difficult to incorporate into existing schooling patterns. The ongoing problem is the holistic and integrative nature of environmental education. The findings of this study will show that in Taiwan there was a similarly minor influence of the introduction of environmental education, from the prescribed new national curriculum, onto the school curricula. These minor influences will be discussed in the following sections.

7.3.1 A choice in the development of school-based curriculum

According to the national objective of freeing up the Taiwanese curriculum (de-regulation in Section 2.3.3), schools could make their own decisions about developing their school-based curricula via the so-called Flexible Curriculum or Alternative Learning Periods. In accordance with the *General Guidelines of Grade 1-9 Curriculum of Elementary and Junior High School Education*, the Alternative Learning Periods are 20%, or less, of the total learning (timetabled) periods per week, or even per school year if necessary. However, schools can choose to design activities for the entire school or all the grades, plan the so-called school-based curriculum to correspond with a school's particular characteristics, provide optional courses for learning areas such as English and mathematics,

implement remedial teaching programs, or conduct group counselling or self-learning activities. Only Parkway chose environmental education to be its school-based curriculum, and only this school highlighted the status of environmental education in its school curriculum (see Section 6.3.2). This decision was based on its brilliant performance on recycling and energy education in the past. Parkway school staff had kept building up their school development via this theme. In contrast, Riverside did not make the same decision; although it had already developed books with local knowledge of its community temple and river, and it had run outdoor education via these books in the pre-reform time (see Section 6.4.1). As for Redbrick, its performance had been good in information technology education in the pre-reform time because it was a Teaching Resource Centre School for information technology education (see Section 6.2.1). Like Parkway, Redbrick school staff kept building up their school development on this existing theme, but here it was information technology education, after the curriculum change.

Parkway, in its 2002 school year (the first year of curriculum implementation) developed a document for its school-based curriculum: environmental education (see Section 6.3.2). The Parkway Guidelines for environmental education included three topics (environmental protection education, ecology education and energy education) for Grades 7, 8 and 9 respectively. Inspiringly, Parkway distributed one weekly period of environmental protection education to Grade 7 students in their school timetable in this school year. Unfortunately, this period of environmental education was removed from the 2003 school year (the second year of curriculum implementation) under the city government policy of one period reduction. According to the interviews in 2003/04, it was hard to get this period back onto Parkway's school timetable without a central governmental order for the evaluation of the school-based curriculum. Four Parkway interviewees were asked about the possibility of developing a systematic syllabus for each topic in their school-based environmental education curriculum, if that weekly period was reintroduced into their school timetable. Two staff said that it should be possible to develop a unique syllabus for the Parkway school-based environmental education curriculum, but other staff said it would not be possible to achieve this goal due to a huge need for preparation and human resources. In fact, Parkway

performed excellently on energy education in the pre-reform time. Even after the curriculum change, they still linked a section of energy education rather than environmental education in their school website. This reveals that environmental education was concerned with 'environmental protection' in Parkway including how to save water and electricity.

In contrast, no obvious change in environmental education happened in the school curriculum at Redbrick or Riverside. They did not develop a school-based curriculum, but instead they developed several topic teaching units (see Sections 6.2.6 and 6.4.6). Thus, they followed what they did in environmental education in the pre-reform time such as garbage classification, recycling and greenification/beautification of the school grounds. Occasionally they cooperatively conducted activities such as recycling of waste batteries to match the governmental policy from the Environmental Protection Administration (see Section 6.3.2). This policy was implemented in the second year of curriculum implementation with a large grant from the schools' competition in Taiwan.

In conclusion, the prior school performance in environmental education often influenced a school's choice to develop a school-based curriculum specifically for environmental education in Taiwan. However, this was not always so - Riverside did not choose environmental education to be its school-based curriculum though their prior performance was relevant to environmental education.

7.3.2 A choice of textbooks and discussions about environmental education in learning area meetings

In the pre-reform time, a uniform textbook system was run in Taiwanese junior high schools (see Section 2.3.4.3). Teachers used the same textbook nation-wide for their subject teaching. Normally a learning area meeting was run at the beginning and the end of each semester. After the curriculum change, teachers received the freedom (the so-called teacher autonomy) to choose a textbook from several versions, or to edit their own textbooks if they liked. The frequency of the learning area meeting was increased to at least once a month. Because there were many textbook publishers, Taiwanese teachers chose already published books rather than edited new texts themselves. According to the last two rounds of

interviews, no staff in these three case study schools really considered environmental education when choosing textbook. Only two teachers had considered it once, in the beginning of the curriculum implementation, but did not do so again in the following year (see Sections 6.2.3, 6.3.3 and 6.4.3). No staff specifically discussed environmental education, either, during the monthly learning area meetings. Normally, they focused on their own learning areas because these areas were obviously more important than those infused *Important Issues* including environmental education. A couple of interviewees in these three schools said, during the interviews in the 2002 and 2003 school year, that the editors had already considered and included environmental education when editing the textbooks (see Sections 6.2.3, 6.3.3 and 6.4.3). Thus, it was not necessary for teachers to consider environmental education when choosing textbooks. Teachers might discuss *Important Issues* only if it is required to be part of their classroom teaching. For example, Riverside's chemistry/physics teachers discussed information technology education when developing the teaching modules for detergent and recycled materials.

To sum up, after the introduction of environmental education into school curricula, the teachers did not consider environmental education when choosing textbooks, and did not discuss it when conducting learning area meetings in the three case study schools.

7.3.3 Incidental environmental education

Some environmental education type programs began as whole school activities and competitions after the curriculum change. Teachers normally referred to these programs as environmental education when being asked if there was anything new for environmental education in their schools. Education ***in*** and ***about*** the environment became a spin-off of school activities and class competitions.

School level activities

Although school activities could sometimes be relevant to environmental education, the purposes behind them were not always solely the development of environmental education. For example, Redbrick ran a trial via its outdoor

education day in the first year of curriculum implementation (see Section 6.2.2). It was a topic teaching unit about Redbrick's community park and involved the integration of all learning areas, especially science (biology). Students recognised plants' names inside the park and competed with each other through playing games. In the second year of curriculum implementation, Redbrick school staff referred to it as a trial of environmental education, but they admitted that the stated purpose was to develop a topic teaching of curriculum integration rather than environmental education. Secondly, for instance, in 2002/03 Redbrick developed one outdoor education project involving its community river, and in 2003/04 Riverside developed two modules of topic teaching relevant to detergent and recycled materials (see Sections 6.2.2 and 6.4.2). However, the real purpose was to develop teaching modules for the infusion of information technology education (ITE). Both Redbrick and Riverside were a Seed School of ITE and were allocated a budget in the 2002 and 2003 school year. Hence, they needed to submit teaching modules for the outcomes of the ITE project. In another example, Parkway in 2004 conducted a Battery Recycling Activity during the second year of curriculum implementation (see Section 6.3.2). They mentioned it when asked if any trial had been run for environmental education in Parkway. However, this activity was requested by governmental policy rather than school development. In addition, every school needed to cope with this policy. This evidence implies that most of the Taiwanese junior high schools would not develop school activities and/or teaching units specifically for environmental education but would relate them to environmental education by hindsight. This confirms the literature and shows a lack of appreciation of the crucial importance of environmental education - education ***for*** the environment (Palmer, 1998; Walker, 1997a).

Class involvement competitions

There are many class competitions at the grade level in Taiwanese junior high schools which fall within two categories. First, there are the academic competitions: calligraphy, Chinese writing/grammar, and Chinese/English speeches. The non-academic competitions are basketball, tugs-of-war, funny games, painting, classroom decoration, classroom cleaning and tidy up, classroom order, festival poster making, assignment display of winter/summer vacation, and so on. When asked which of these activities were relevant to environmental

education, school staff said the weekly competition for classroom cleaning and tidy up, the competition for classroom decoration, the environmental protection poster making (sometimes), and the speech contest of environmental protection (less frequently) (see Sections 6.2.2, 6.3.2 and 6.4.2). There were few new competitions after the curriculum change and they were not specifically designed for environmental education. For example, Redbrick science teachers ran a slow bicycle riding competition in the first and second year of curriculum implementation. It was designed for the topic of 'force' in science and aimed at having fun during a school festival day in Redbrick, whereas no new competitions really happened in either Parkway or Riverside.

Issues of the priority given to environmental education

How schools should cope with the requirement to address the six *Important Issues* (information technology education, environmental education, gender education, human rights education, career development education and home economy education) was, of course, raised along with the curriculum change. The six *Issues* were required by the new national curriculum to be infused into seven learning areas. However, workshops, seminars and speeches were run for only certain *Issues*, rather than all of them. This action led to the issues of priority in the three schools studied. When staff were asked about the issues of priority among six *Important Issues* in 2003/04, it was information technology education that was accorded the first place, rather than environmental education in these three schools (see Sections 6.2.4, 6.3.4 and 6.4.4). The internal professional development workshops run in these schools also show that environmental education was not the first priority for school-based teacher development. For example, in 2004 the Redbrick principal said that information technology education, career development education, law education and gender education was allocated with funding and accorded special *Issue* status by the government. Thus, workshops and speeches were run more for these *Issues*, than environmental education in Redbrick. Similarly, the Parkway ex-instructional director commented in the same year that the government required schools to conduct workshops in information technology education and gender education rather than in environmental education. The Riverside principal also said in 2004 that many workshops such as gender education and counselling were routine, and

were required by the government. This suggests that governmental policy to expand the six *Important Issues* would influence the priority schools gave to environmental education.

Environmental education included in school curriculum documents

From the 2001 school year, the year before the curriculum implementation occurred at the junior high level, every Taiwanese junior high school needed to form a Committee of School Curriculum Development to discuss and decide the school calendar, including school activities, for the next school year. The yearly document of the school curriculum, submitted to the Local Educational Bureau, contains the seven learning areas' yearly curriculum plans. At least at the level of documentation, it needs to demonstrate that environmental education (and other *Important Issues*) is clearly integrated, by infusion, into the school curriculum as required in the new Taiwanese national curriculum after the curriculum change. Therefore, every learning area curriculum should include the relevant 'competence indicators' of environmental education. Textbook publishers are also requested to infuse environmental education when editing textbooks for the seven learning areas. Normally, a teaching handbook from the publisher is edited with these competence indicators for environmental education. School teachers could use it to edit their learning areas' curricula once a year. Thus, the influence of the introduction of environmental education on the school curriculum is clearly seen from this document. In other words, the school curriculum from the three case study schools, like every other school in Taiwan, will document where in each learning area environmental education is relevant (see Sections 6.2.3, 6.3.3 and 6.4.3). As to the teaching of environmental education at the classroom level, it would have to rely mostly on subject teachers' beliefs to implement it.

Environmental education by non-mandatory government leadership

Late in the 2003 school year (the second year of curriculum implementation), an administrative order *Three-Year Plan of Enhancing Environmental Education* from the Ministry of Education (MOE) reached every school in the city studied. This administrative order encouraged, rather than compulsorily required, individual schools to design a school-based environmental education expansion plan from 2004 to 2006. The Environmental Protection Administration and the

MOE would evaluate the implementation of this plan of school-based environmental education at irregular times and give rewards to the schools with good performance. Only Riverside discussed this event in their principal-director meetings, while Redbrick and Parkway did not discuss it at this level (see Sections 6.2.2, 6.3.2 and 6.4.2). The Riverside instructional director commented that they would really face the need to implement environmental education in the following years. The Riverside principal also said that they would do it, but not in a hurry. As this requirement was non-mandatory, schools made a rather relaxed attempt to do something about environmental education. School staff said that they did do it in school-wide activities but did not actually plan for it in the true meaning of environmental education - education ***for*** the environment. Thus, this plan had not been completed in Riverside before this research was ended in June 2004.

By contrast, as discussed in Section 6.2.4 there were two Law Education Tests (one per semester) for students in every Taiwanese junior high school within each school year in the pre-reform time. The aim was to enhance students' awareness and understanding of the law. This test belonged to human rights education and was continued after the curriculum change. However, a new test for students was designed after the curriculum change. The Gender Education Test (once a year) has begun since the 2002 school year in the city studied, though many school staff did not see it was effective. In addition, the Information Technology Education Literacy Test was conducted for school teachers in this city in the 2003 school year. This indicates that the MOE valued these three *Issues* to a great extent, and at least did something to highlight their importance in schooling.

The relationship between the case study schools and TGSPNP

Over the three years studied, the Taiwan's Green School Partnership Network Project (TGSPNP) continued and its influence reached the schools studied. For instance, Redbrick registered into this network in September 2002 but did not take any further step of recognition (see Section 6.2.2). In January 2004, Redbrick applied for recognition from TGSPNP via help from a practising teacher, who planned to study environmental education for her Masters degree in the next school year. In February 2004 the City Educational Bureau chose ten schools registered in TGSPNP in this city, including Redbrick, to do further expansion of

the Green School Project. The reason the Bureau led this plan was the requirement from the Ministry of Education, because schools in this city did not actively progress well in TGSPNP. The Bureau planned to upgrade these schools to be exemplar green schools in this city. With local government leadership and/or pressure, Redbrick conducted an action research in March-April 2004 (see Section 6.2.2). Afterwards, Redbrick applied for further recognition from TGSPNP in December 2004. In contrast, Parkway and Riverside did not register into TGSPNP over the three years studied.

In conclusion, the introduction of environmental education from the new national curriculum did give an official curriculum status to environmental education in the Taiwanese junior high school curricula. Environmental education was written into Redbrick, Parkway and Riverside's school curriculum documents. Because environmental education was not mandated, only Redbrick joined the TGSPNP, only Parkway chose environmental education to be their school-based curriculum, and only Riverside discussed the Three-Year Plan at the principal-director meeting level. None of the staff in these three schools really considered environmental education when choosing textbooks neither did they discuss it in their learning area meetings. Environmental education appeared as an incidental consideration when developing school activities/competitions or teaching modules. It was also not the first priority in these three schools to implement environmental education among six *Important Issues*. Thus, the influence of the introduction of environmental education from the new national curriculum was minor and the implementation of environmental education in junior high school curricula did not change much compared to the pre-reform time.

7.4 The Impact of the New National Curriculum on Teacher Views and Practices in Environmental Education

Data from the three case study schools show there was little impact from the new national curriculum on teacher views and practices in environmental education after the curriculum change. In the following sections, and in accordance with the Sections 6.2.3, 6.3.3 and 6.4.3, teacher views will be discussed first, and classroom practices later.

7.4.1 Teachers' views in environmental education

In these three schools' staff views in environmental education, basically, did not change much after the curriculum change. Some crucial and fundamental views in environmental education did not change at all over the three years studied. For example, across these three rounds of interviews all the interviewees said before and after the curriculum change that environmental education was important and should be taught in schools. In 2001/02, the major reasons schools should teach environmental education were 'we live inside the environment' (15/37) and 'education is a change agent' (15/37). The close relationship between humans and the environment relies on school education to enlighten and clarify its importance and this is indispensable for our future citizens. The third main reason was 'the severe environmental degradation' (6/37) in Taiwan, leading to an urgent need to teach environmental education in schools. Another reason, in Parkway, was that environmental education would influence students' learning and psychological development, whereas no one mentioned this view in Redbrick, though it was mentioned in the second year studied in Riverside. After the curriculum change, these views did not change but other reasons for schools to teach environmental education became broader such as the establishment of school recognition, the connection building between students' learning and their daily lives, the evaluation from the government, and the need to teach it in the twenty first century.

The definition of environmental education

In the first round of interviews, pre-reform, one third (12/37; 32%) of the school staff in these three case study schools said that environmental education was a broad area. In their views, environmental education could vary from the teaching of environmental knowledge to the cultivating of environmental attitudes; from doing recycling and beautification and making school grounds green to designing classroom decoration and school buildings; from cultivating good sanitary habits to developing good human relationships. Environmental education also involved influence from the school community on teaching and learning. In short, these views focused on *knowing* about, *caring* for, and *taking action* for the environment. In the pre-reform time, more than four fifths (32/37; 86%) the interviewees referred to either knowing about or caring for, or taking action for

the environment as their perceptions about environmental education. In fact, nearly three quarters (26/37; 70%) of the interviewees said caring for the environment by conservation, environmental protection and sustainable development. More than half (21/37; 57%) of the school staff mentioned knowing about the environment and nature, and the relationship, interaction or balance between humans and the environment. Only around one tenth (3/37; 8%) of the school staff offered taking action for the environment by making school grounds green, beautiful and clean. The broad perception of environmental education led to the view that everything done in schools could be relevant to environmental education. Based on this idea, more than one tenth (6/37; 16%) of the school staff in these three case study schools said in the pre-reform time that environmental education should not be taught specifically (or as a school subject) in the school curriculum. In their views, environmental education should be taught practically in daily routines or infused into existing school subjects. Environmental education was just a part of education at large and was easily mentioned during every subject's teaching. This scene did not change, and more interviewees expressed this view after the curriculum change.

However, a slight tendency towards the clarification and development of *values* and *action* happened to the views of environmental education within these three schools after the curriculum change. Several staff stressed that environmental education should be a process of values clarification leading to decision-making on attitudinal change, life style change, and the dilemma between economic development and conservation. Environmental education was also a process of school development to establish a green or ecological school. In addition, environmental education was action-orientated to influence others' actions improving our environment.

In sum, teachers' views on the definition of environmental education, before the curriculum change, focused more on knowing about and caring for the environment, and especially the latter. After the curriculum change, teachers' views placed slightly more emphasis on values clarification, action cultivation, and the development of green/ecological schools.

What should be taught in environmental education?

Most of the school staff did not change their views much on the teaching content of environmental education after the curriculum change. Mainly, in the first round of interviews, school staff in these three schools suggested teaching environmental knowledge, behaviour and attitudes. Four fifths (30/38; 79%) of the school staff suggested teaching knowledge about nature, wildlife, pollution, conservation, protection, influence to health, local and global issues, landscape changes of the environment over time, and international countries' comparisons (8/13 in Redbrick, 10/13 in Parkway, and 12/12 in Riverside). Among them, five teachers (13%) highlighted the need to teach and raise students' awareness of political issues around the environment and economic development. This indicates that a minority of the teachers were aware of the importance of decision-making in environmental education. Half (20/38; 53%) of the interviewees suggested teaching environmental behaviour via daily-life practices such as recycling and cleaning, making school grounds green and beautiful, and saving water and electricity. One third (12/38; 32%) of the staff suggested teaching and cultivating environmental attitudes such as caring for the environment and respecting wildlife; recognising the relationship between humans and nature; and establishing eco-thinking by giving up the ancient concept in Chinese culture 'mankind can conquer nature'. Thus, the major suggestion, in the pre-reform time, of what should be taught in environmental education was teaching about knowledge in these three schools.

After the curriculum change, several staff re-stressed the teaching of the complexity and attitude/action cultivation of environmental education. Few suggestions were added such as teaching civics, laws, governmental policies, and controversial issues to regulate student's behaviour and to clarify students' values. By teaching more skills and the impact of inappropriate life styles in environmental education, some staff emphasised more attitude and action cultivation.

In conclusion, in the pre-reform time school staff in these three schools mainly suggested teaching knowledge first and behaviour second in environmental education. Attitudinal cultivation was not a major suggestion in the pre-reform

time when teaching environmental education; however, it was re-emphasised along with the action cultivation after the curriculum change.

How to teach environmental education?

In the first round of interviews, the most frequently suggested method (23/38; 60%) to teach environmental education across these three schools was what could be called experiential learning: visiting, experiencing activities especially camping out in the subject of scout training, and learning by doing (8/13 in Redbrick, 7/13 in Parkway, and 8/12 in Riverside). However, out-of-school visiting was viewed as an ideal method to teach environmental education in Redbrick (5/13) and Parkway (6/13), although not in Riverside (2/11), because it was difficult to conduct. Secondly, was media teaching (15/37; 41%) via using video, slides, computer and transparencies. The third method was interpersonal communication (14/38; 37%), i.e. values clarification, discussion, and oral or document presentation. Fourth, was teaching via news (9/37; 24%) such as TV and newspaper. More than one tenth (6/37; 16%) of the school staff said that environmental education should be infused into the teaching of every subject. Because the public highly valued examinations in Taiwan, three Parkway staff (3/38; 8%) suggested testing environmental education by examination. In contrast, Redbrick made this suggestion after the curriculum change, while Riverside did not suggest it at all.

After the new curriculum was implemented, teachers stressed some suggestions such as teaching via media, especially computers and the Internet, in Redbrick and Parkway; activities participation in Redbrick and Riverside; values clarification and moral education in Parkway; learning by doing and topic teaching in Riverside. In the last round of interviews, the view of out-of-school visiting to teach environmental education became more pessimistic after the curriculum change. Only four staff across these three schools (2/11 in Redbrick, 1/11 in Parkway, and 1/10 in Riverside) insisted that schools should overcome difficulties to enable out-of-school visiting when teaching environmental education.

In summary, experiential learning in the pre-reform time was the most recommended strategy to teach environmental education. Along with the

curriculum implementation, school staff across these three schools stressed more the importance of media, especially computer and Internet, and activities participation (inside experiential learning) when teaching environmental education.

What student learning outcomes are expected in environmental education?

The ideal and expected learning outcome of environmental education in the three case study schools was mainly action-orientated behavioural change. For example, in the first round of interviews 10/13 in Redbrick, 7/13 in Parkway and 8/11 in Riverside resulted in slightly more than two thirds (25/37; 68%) of the school staff saying this in the pre-reform time. After the curriculum change, this view was not changed at all and another four interviewees (one in both Redbrick and Parkway and two in Riverside) also pointed out its importance. These environmental behaviours included performing well on garbage classification and recycling, saving water/electricity, and preparing chopsticks/spoons when dining out. In addition, students should not drop but pick up garbage, not spit chewing gum, not eat betel nut, not damage the school grounds, and not use plastic bags. After the curriculum change, the importance of influencing others' thinking and action became another focus.

In conclusion, school staff in these three schools emphasised more and more behavioural change along with the curriculum implementation. Change in behaviour was the ultimate learning outcome of environmental education in the schools studied.

Who should teach environmental education?

According to the first round of interviews, the subjects in the formal curriculum with the most potential to teach environmental education were said to be: biology (81%) and science including chemistry/physics (59%), earth science (54%) and technology (38%). Other school subjects were, in rank order, health education (49%), geography and history (35%), Chinese (30%), civics (27%), art (22%), scout training and home economy (19%) and finally English and music (14%). None of the school staff mentioned mathematics, and nearly one quarter (24%) of the interviewees believed that it was the least likely subject to teach

environmental education. The reason the subjects were ranked in this way was the proportion of subject content seen to be relevant to the environment. Mathematics might be relevant only when doing calculations on the theme of pollution. Despite this, more than two thirds (26/37; 70%) of the interviewees commented that every school subject could and should teach environmental education because it was so important. After the curriculum change, interviewees across these three schools still kept their pre-reform views on this issue.

Since the second round of interviews, all of the interviewees in these three schools referred to the homeroom teacher as the ideal role to teach environmental education in Taiwanese junior high schools. Except for the subject/area teaching, Taiwanese homeroom teachers at the junior high level need to look after everything for every student in his or her homeroom class during school hours. Sometimes, the homeroom teacher still needs to be concerned about students' family lives and give suggestions or advice to both students and parents after school hours. In addition to the homeroom teacher time in every morning (7:30 – 8:15AM), they need to look after lunchtime, nap time, cleaning time, self-learning time and sometimes the intervals between periods. Thus, homeroom teachers spend most of their time with students and have more authority over students' behaviour.

As to the teaching content of environmental education, homeroom teachers could teach the concepts and skills of garbage classification, recycling, saving energy, classroom decoration, news, cleanness/tidiness in both classroom and school grounds, and human relationships. Responsible for many duties, the pedagogy homeroom teachers used was basically oral request, opportunistic education, setting personal example, giving rewards, conducting team competitions inside the homeroom class, exchanging opinions with other homeroom teachers and topic discussion during class meeting. Homeroom teachers would hardly have time for using media such as video, computer or Internet. Even if it were possible, some teachers, especially in Parkway, questioned the effectiveness, as the teaching from homeroom teachers would not be systematic without a textbook or teaching material. In addition, the knowledge homeroom teachers gave to students would not be deep enough. But, all of the interviewees believed that

homeroom teachers have more influence on students' actions than subject/learning area teachers.

In sum, biology is the most likely subject in Taiwanese junior high schools to teach environmental education. At the level of behavioural change or skill training, the importance of homeroom teachers is not to be ignored when teaching environmental education in schools. Their influence on students is even stronger than subject teachers in Taiwanese junior high schooling.

Should the infusion strategy linking environmental education and seven learning areas be made more effective?

School staff views are varied among these schools as to whether or not the connection between seven learning areas and six *Important Issues* should be strengthened, especially environmental education. For example, in the third round of interviews, 64% of school staff in Redbrick (7/11) and 80% in Riverside (8/10) expressed the view that there was a need to enhance this connection between environmental education and learning areas. In contrast, only 36% of school staff in Parkway (4/11) expressed this view. However, another three Parkway staff (27%) said that the infusion connection could be enhanced a few years later but not at the present time. The reason was that all staff first needed to face and adapt to the changes of their own subject (or learning area) teaching when encountering this curriculum change. They might have time and energy to think how to enhance the teaching of environmental education after the new curriculum had properly settled down.

In conclusion, more than two thirds (22/32; 69%) of the school staff in these three schools said that the infusion strategy linking environmental education and seven learning areas should be made more effective at the present time or in the near future.

Should environmental education be taught more in the formal or informal school curriculum?

In the last round of interviews in 2003/04, more than four fifths (27/32; 84%) of the staff across these three schools (9/11 in Redbrick, 9/11 in Parkway and 9/10 in

Riverside) said that environmental education existed more in the informal curriculum in schools. In the pre-reform time, environmental education was done more visibly via the informal curriculum such as garbage classification, recycling, maintaining clean/tidy classroom and school grounds, and special events like waste materials recycling. All of these activities were actually done in cleaning time, lunchtime, nap time, intervals between periods, or homeroom teacher time in the morning. None of the activities would be done via the time of subject or learning area: the formal curriculum. Therefore, more than half of the school staff (56%) in these three case study schools (9/11 in Redbrick, 4/11 in Parkway and 5/10 in Riverside) said that environmental education should be taught more in the formal curriculum in schools. However, one third (31%) of the school staff (2/11 in Redbrick, 3/11 in Parkway and 5/10 in Riverside) argued for teaching environmental education more in the informal curriculum. Only four school staff in Parkway (13%) emphasised that environmental education should be taught equally in both the formal and informal curriculum, whereas no school staff in Redbrick and Riverside stressed this view.

In summary, the major view in these three case study schools was that environmental education should be taught more in the formal curriculum than in the informal curriculum.

Should environmental education be taught more in the formal or non-formal education?

In 2003/04, half (16/32; 50%) of the staff across these three schools (5/11 in Redbrick, 5/11 in Parkway and 6/10 in Riverside) said that environmental education existed more in the formal education in society, while more than one third (38%; 12/32) said non-formal education (four interviewees in each of these three schools). In pre-reform time, some staff commented that it should not just rely on school education to achieve a successful environmental education. Before, during, and after students received school education, there is family education, social education and adult education. Environmental education should be life long encompassing the individual student's whole lifetime. Along with the curriculum implementation, this view was not changed and some more school staff also emphasised its importance. However, two thirds (21/35; 66%) of the

school staff (8/11 in Redbrick, 5/11 in Parkway and 8/10 in Riverside) still said that environmental education should be taught more in the formal education, as it would then reach every student.

In sum, the majority of the school staff (66%) in these three schools stressed the importance of the formal education when teaching and expanding environmental education.

How to meet the challenge of connecting environmental education to the local environment?

In the second year of curriculum implementation, all of the 32 interviewees across the three schools said that the sound relationship between schools and their communities should be mutually interactive in every dimension. However, the interactive and collaborative relationship they had during and after the first year of curriculum implementation was similar to that in the pre-reform time (see Table 8.2). Mainly, there were the meetings of parents' boards with administrators, school grounds access for the community after school hours, school use of community facilities for instruction, community mother involvement for school duties, and school activities attended by community members. There were 27 interviewees across these schools who were asked whether or not environmental education could enhance the interactive relationship between their schools and communities. The replies were different from each school. For example, nearly one fifth (5/27; 19%) said 'no function' but this view was mainly from Redbrick (3/5) and Parkway (2/5). No one in Riverside expressed this view as they had achieved outdoor education via their community temple and river. Around a quarter (7/27; 26%) of the school staff said that the function of environmental education was 'small' but no one in Redbrick expressed this view. This opinion was mainly from Parkway (4/7) as they achieved recycling rather than teaching via the community. In contrast, no one in Parkway said the function of environmental education was 'medium', while two in Redbrick and three in Riverside resulted in 19% of the school staff (5/27) saying it. Only five interviewees (19%) across these schools positively said that environmental education had tremendous potential to enhance the relationship between their schools and communities but needed to be done very successfully. However, this

view mainly was from Parkway (3/5). The other five staff said either 'Don't know', 'Hard to predict' or 'Depend on the activities or the extent of the implementation of environmental education' (3/5).

In sum, the main view of whether environmental education could enhance the relationship between schools and school communities was small to medium across these three schools. It seemed there was still a long way to go in these schools to the view environmental education would enrich the relationship between the schools and the community. The enormous potential of the local environment to enrich and enhance the implementation of environmental education in schools would happen only after all the school staff believed in and were demonstrating it. What the teachers did in their schools showed a lack of the belief of the crucial importance of local environment involvement in the education ***in*** and ***for*** the environment.

How can the teaching of environmental education be increased?

According to the second round of interviews in 2002/03, there were six major suggestions to increase the teaching activities, to some extent, of environmental education in schools. They were government request, principal leadership, testing in BCT, textbook edition, workshops and parental support. In 2003/04, the view of the most influential and effective strategy to increase teaching activities of environmental education was however different in these three schools. For example, 55% of the Redbrick school staff (6/11) believed that a government request would be the most effective strategy to have more teaching activities of environmental education in schools. At Parkway though 55% of the school staff (6/11) expressed the view that a government request would not lead to the real influence and suggested testing in BCT instead. There was no consensus on this view in Riverside because 30% of the school staff (3/10) said principal leadership and three other groups (2/10 each) suggested individually a government request, testing in BCT and textbook edition to include environmental education.

Whether or not teachers would teach more about environmental education after attending environmental education workshops, the views were similar among these three schools. For instance, most of the school staff expressed the view that

the influence from teacher professional development would not be high. They ranked it in the fourth, fifth, or even the sixth place in the order among the six suggestions. This was exactly the finding of Gribbes (1994) when he investigated the effectiveness of teacher professional development in environmental education. He found a low degree of curriculum change at both personal classroom and whole school levels after attending an in-service zoo education program.

In 2003/04, most of the school staff in these three schools said they had not ever thought to teach environmental education in some way differently from the pre-reform time. In Riverside, however, the instructional director did think about the possibility of developing a horticulture society in their extracurricular activities. The art teacher thought to seek chances to have more outdoor education. In Parkway, the Chinese teacher thought to use a tape recorder to let students listen to natural sounds when teaching some articles relevant to the environment. However, they have not put their ideas into their subject teaching yet. Mainly school staff considered teaching more about environmental education only when their subject teaching was relevant to the environment. This is really a paradoxical situation in Taiwanese junior high schools, because all interviewees stress the importance and necessity to teach environmental education in schools.

Should teachers use the competence indicators from the Guidelines of environmental education to inform their subject teaching?

In 2000, the *Guidelines of Environmental Education* was released along with the *General Guidelines of Grade 1-9 Curriculum of Elementary and Junior High School Education*. In the second round of interviews, nearly three quarters (74%) of the school staff (10/12 in Redbrick, 8/11 in Parkway and 8/12 in Riverside) said that they knew of the existence of *Guidelines of Environmental Education* or competence indicators (inside the Guidelines) of environmental education. However, only 57% of the interviewees (8/12 in Redbrick, 6/11 in Parkway and 6/12 in Riverside) had either scanned or read it. The reasons they glanced at, or read it, were attending workshops, applying for teaching jobs or being members of the school task force before the curriculum implementation. According to the third round of interviews, the Redbrick art teacher had read it another time after the curriculum change, but no staff across the three schools had read it again when

this research ended at the end of the second year of curriculum implementation. In addition, no teacher had ever used the competence indicators from the Guidelines to inform their subject teaching. When being asked about the necessity to do so, 17 out of 23 the school staff (74%) in these three schools (3/6 in Redbrick, 7/7 in Parkway and 7/10 in Riverside) expressed the view that, theoretically, it should be done. However, none of the school staff did so as they were not required by the government and had no time or energy available to do so.

Should the learning of environmental education be done voluntarily or compulsorily?

Voluntary learning of environmental education is students learning to make behavioural changes through school instruction. In contrast, compulsory learning is students learning to behave well through punishments or fines by school regulations or governmental laws. The view of voluntary learning may imply that schools are responsible for and should teach more environmental education with a variety of strategies. In contrast, compulsory learning may imply that schools should only cope with the strict governmental law execution rather than design trials by school teachers.

Findings of this study showed that behavioural change (28/37) was the expected learning outcome of environmental education across these three schools. As to how to achieve the goal of behavioural change, the views of whether the learning of environmental education should be voluntary or compulsory were varied. For example, in 2003/04 more than one third (13/32; 41%) of the school staff across these three schools believed that the learning of environmental education should be done in a voluntary way. However, Parkway's school staff were more optimistic than Redbrick and Riverside, because six interviewees in Parkway (but only two in Redbrick and five in Riverside) shared this view. One quarter (8/32; 25%) of the school staff (4/11 in Redbrick, 1/11 in Parkway and 3/10 in Riverside) viewed the contemporary learning of environmental education in Taiwan was a kind of compulsory learning and should be done in this way. Another one third (11/32; 34%) of the school staff (5/11 in Redbrick, 4/11 in Parkway and 2/10 in Riverside) expressed the view that the learning of environmental education was a combination of voluntary and compulsory learning. They suggested starting from

compulsory strategies and then moving towards achieving an end goal of voluntary learning.

In this round of interviews, when asked which way would be more effective, the view was consistent from one school to another. For example, 6/11 in Redbrick and 5/11 in Parkway and 5/10 in Riverside, resulted in half (16/32; 50%) of the school staff replying compulsory learning. There was slightly more than one third (12/32; 38%) of the school staff (4/11 in Redbrick, 4/11 in Parkway and 4/10 in Riverside) saying voluntary learning. However, when asked which way would bring students life long behavioural change, nearly four fifths (25/32; 78%) of the school staff said only voluntary learning could achieve this outcome. This view was consistent for Redbrick (10/11) and Parkway (10/11), while only half of the Riverside staff (5/10) held it. This indicates that teachers in Redbrick and Parkway were more confident than Riverside with their students. Therefore, the more important strategy for the learning of environmental education was still voluntary learning (24/32; 77%) across these three schools (9/11 in Redbrick, 9/10 in Parkway and 6/10 in Riverside). The pattern of the replies shows that Riverside staff still had less confidence to their students than the other two schools.

In sum, school staff across these three schools believed that only voluntary learning in environmental education could lead to lifelong behavioural change, which is the ultimate goal of environmental education. However, based on the Taiwanese case, compulsory learning in environmental education is needed at some stage. This also indicates that the grass roots way to teach environmental education in schools will lead to an ideal school-based change, but compulsory requirements from the government may be still needed to strengthen it.

What is the subject status of environmental education in the school curriculum?

In Taiwan, environmental education was not a school subject in the pre-reform time and was still not a proper school subject or learning area after the curriculum change. It is one of the six cross-curricular *Important Issues*. In 2003/04, when being asked about the subject status of environmental education in the pre-reform

time, nearly all (30/32; 94%) of the interviewees (10/11 in Redbrick, 10/11 in Parkway, and 10/10 in Riverside) said that it was much lower than examinable subjects (Chinese, English, mathematics, science and social studies). One teacher each in Redbrick and Parkway resulted in 6% of the interviewees saying that the status of environmental education could not be compared as it was not a proper school subject. As to the non-examinable subjects (art, music, physical education, scout training, and counselling), more than half (19/32; 59%) of the school staff (9/11 in Redbrick, 6/11 in Parkway, and 4/10 in Riverside) still said that environmental education had a lower status. One third (10/32; 31%) of the interviewees (4/11 in Redbrick, 3/11 in Parkway and 3/10 in Riverside) said that the subject status of environmental education was lower than the non-school subjects (law/gender/vocational education). In addition, nearly three quarters (23/32; 72%) of the school staff (8/11 in Redbrick, 8/11 in Parkway and 7/10 in Riverside) said the subject status of environmental education after the curriculum change was still similar to its status before the curriculum change. The rest of the school staff (9/32; 28%) in these three schools (3/11 in Redbrick, 3/11 in Parkway and 3/10 in Riverside) said that its status was slightly increased with the term 'environmental education' being introduced in the new curriculum. However, they still commented that there was no difference in reality as the practice of environmental education in schools was just the same as that before the curriculum change. Thus, the government intention to increase the subject status of environmental education in junior high school curricula, through an infusion strategy, was not achieved after the curriculum change, at least in these three schools.

Is environmental education able to enhance the goals of education?

In the third round of interviews in 2003/04, all of the 32 interviewees in the three schools said, not surprisingly, that environmental education could enhance their school educational goals in some way, directly or indirectly. However, answers were not so positive about whether or not environmental education could increase their school reputation. Among 29 interviewees being asked this question, the major view of this function in these three case study schools was similar; from small (11/29) to medium (8/29). For example, Redbrick was small (3/9) to medium (3/9) and two teachers said there was 'no function'. Parkway was also

small (4/10) to medium (3/10) and one teacher commented 'no function', either. Riverside was again small (4/10) to medium (2/10) and one teacher did not believe in its potential. Only slightly more than one tenth (4/29; 14%) of the interviewees (1/9 in Redbrick, 1/10 in Parkway and 2/10 in Riverside) see an enormous potential of environmental education to increase school reputation, but they all said that it must be done successfully. This indicates an obvious gap, or paradox, existing in these three schools between the function of environmental education to enhance their school educational goals and school reputation. If environmental education could enhance their school education goals, theoretically, it should also increase their school reputation. However, it did not happen in this way as parents did not value environmental education as much as the students' performance in the external examination: BCT. It could be seen that the dominant and decisive view on the requirements of a school's reputation was from parents rather than school staff in Taiwan.

This discussion shows that no obvious or dramatic changes happened in the teachers' views in environmental education at the junior high level, at least in the three schools studied. The impact from the new Taiwanese national curriculum on junior high school teachers' thinking is minor.

7.4.2 Teachers' practices of environmental education

The changes in the practices of subject teachers' classroom teaching of environmental education were quite minimal after the curriculum change. This will be discussed under two headings: opportunistic education and teaching strategies for environmental education.

Opportunistic education

Opportunistic education could be viewed as a precursor of education by infusion when Taiwanese scholars, especially Guo (1990), suggested teaching environmental education in the formal curriculum using this strategy in schools (see Section 2.4.3). In the pre-reform stage, Taiwanese junior high school staff usually taught environmental education through opportunistic education, whenever subject content relevant to the environment, in their subject teaching (see Section 7.2.2). According to the interviews over the three years studied,

many teachers in these three schools said that the new curriculum just added an academic term or jargon 'environmental education' onto what they had already done for the environment. This situation was seen to remain the same before, during, and after the first year of curriculum implementation. As well as the textbook content relevant to the environment, they would frequently teach environmental education via social events, TV news and international disasters such as earthquakes, floods, droughts, typhoons, pollution, mud slides and environmental diseases. This opportunistic type of education for environmental education was carried on after the curriculum change. Although many school staff in these three schools admitted that environmental education should be taught more in the formal curriculum, they commented that it was very hard to achieve this goal within the crowded curriculum.

Teaching strategies for environmental education

Teaching strategies in these three schools did not change dramatically with the curriculum implementation. From the three rounds of interviews, the strategies comprised lecturing, or lecturing via media (pictures, models, OHP, computer, video, VCD and DVD) and sometimes via teacher-student discussion to clarify values. Once in a while, team or cooperative learning would be conducted when time was available. In comparison, outdoor education occurred less frequently in all three schools, especially at the classroom teaching level. The so-called experiential learning was the most recommended teaching method (23/38) for environmental education in these three schools (8/13 in Redbrick, 7/13 in Parkway and 8/12 in Riverside). This included visiting, camping, experiencing activities, and learning by doing. However, these methods were basically conducted by homeroom teachers rather than subject teachers. In Taiwan, homeroom teachers have to accompany students when visiting or camping out-of-school once per school year. In addition, homeroom teachers would request students daily to carry out garbage classification, recycling, and classroom and school grounds cleaning to achieve the goal of 'learning by doing'. They also guided students experiencing school activities inside school grounds occasionally, or per semester. In fact, only Parkway ran out-of-school camping once a year, while both Redbrick and Riverside did not mention it. Although out-of-school visiting was recommended as the ideal teaching strategy for environmental

education, this was mainly viewed as being an unrealistic method with little chance for use in Taiwanese schooling. The major reasons behind this view were the crowded curriculum with very little available time, plus long administrative preparation and extra monetary cost to parents. Additionally, safety became another obstacle to conducting out-of-school visits and fieldtrips, especially because several severe traffic accidents have happened to some Taiwanese junior high schools during the period of this research.

According to the three rounds of interviews, the most expected learning outcome of environmental education was 'behavioural change' in all three schools. Paradoxically, the most suggested teaching content of environmental education was 'environmental knowledge'. In fact, the teaching strategy (lecturing or lecturing via media) was more relevant to knowledge transmission than attitude cultivation, let alone action participation. As influenced by the exam-driven instruction in Taiwanese junior high schools, subject teachers' opportunistic teaching strategy for environmental education did not alter at the classroom level after the curriculum change. The teachers' vague notions of opportunistic teaching as a strategy appeared to provide few suggestions as to how the disjunction between knowledge-based input and behavioural-based output might be bridged. This is exactly the barrier which Ma and Lee (1996) described, the tendency to emphasise education ***about*** the environment, rather than education ***in*** and ***for*** the environment at the primary and secondary levels. It is also the gap most frequently reported between advocated practices and teaching realities in environmental education (Robertson & Krugly-Smolska, 1997).

In sum, teachers' views and practices in environmental education remained similar and did not show obvious changes in these three schools after the curriculum change. Environmental education is one of the planned changes, built into the new Taiwanese national curriculum. Whether the curriculum change succeeded, or not, would influence the implementation of environmental education in schools. Thus, there is a need to understand the responses of school staff towards the curriculum change at large. The following sections will discuss school staff views and responses to the curriculum change and implementation in the three case study schools.

7.5 The Response of Junior High School Staff to the Curriculum Change

There were several changes in Taiwanese junior high schools after the curriculum change. First, was the forming of Committee of School Curriculum Development which involved more teachers discussing the direction and planning of the school development. Second, the frequency of learning area meetings was increased from twice per semester to once per month. Third, teachers needed to choose a textbook once a year. Fourth, evaluation included qualitative data describing students' performance in words.

There is no systemic analysis and study of the comparison between the relative merits of launching one major change and a steady stream of little changes (Hall & Carter, 1995). Undoubtedly, the 2002 curriculum change in Taiwanese junior high schools was a dramatic change at a single time, rather than a series of little changes. Inherently, there is a tendency in human nature and agency to seek stability and homeostasis; this normally resists change or is pessimistic about it. Thus, small changes could be fertile trigger points, while big changes may ultimately result in hardly any change at all due to resistance (Paechter, 2000). However, there are individual differences and individual rates of change according to individual teachers or individual schools. This reflects the fact that each individual school is unique, and yet at the same time is also very much like other schools (Tye & Tye, 1992). This tendency was evident in the three Taiwanese case study schools. The following sections will describe the overall response of Taiwanese junior high school staff to the 2002 curriculum change.

7.5.1 The general response to the curriculum change

The three Taiwanese junior high schools showed a rather uniform response from school staff generally towards the curriculum change. During the first year of curriculum implementation, most of the teachers were not very happy with the curriculum change and curriculum implementation. However, they did try their best to cope with the change under the changeable educational policies and the least supporting measures from the government. For example, more than two thirds (24/35; 69%) of the interviewees said that they did not accept, or did not

fully accept, this curriculum change. There were 23%, 23%, and 23% in Redbrick (8/12), Parkway (8/11) and Riverside (8/12), respectively. The reasons were the too short and squeezed timeframe (from nine years reduced to four years), the connection problems between the old and new curricula, the undesirable design and planning of this curriculum change, the very minimal supporting measures, the lack of teacher professional development especially for curriculum integration and the infusion of *Important Issues*, the gap between curriculum design and the external examination Basic Competence Test (BCT), the unfeasible qualitative evaluation with a high number of students, and the expensive textbooks with slow publication speed and multiple versions. Even during the second year of curriculum implementation, more than half (17/32; 54%) of the school staff still said that they were pessimistic about the new curriculum and curriculum implementation. There were 19%, 16%, and 19% of the interviewees in Redbrick (6/11), Parkway (5/11) and Riverside (6/10) who stated this opinion. In contrast, some school staff said that there were merits in the new national curriculum such as multiple and creative teaching, a more lively curriculum, more activities in schools, multiple evaluation, and students' abilities cultivation (especially creative thinking). Thus, more than one quarter (9/32; 29%) of the school staff replied 'optimistic'. This view was held by 13% at Redbrick (4/11), 13% at Parkway (4/11) and 3% at Riverside (1/10). More than one tenth (5/32; 16%) of the school staff said their views were in-between. This opinion was 3%, 3%, and 10% in Redbrick (1/11), Parkway (1/11) and Riverside (3/10). It seemed that school staff at Redbrick and Parkway were more optimistic than those at Riverside towards the new curriculum and its implementation.

Another example was the urgency that school staff needed to face when meeting this curriculum change (see Sections 6.2.4, 6.3.4 and 6.4.4). Except for the Chinese, English and mathematics teachers who faced no curriculum integration, the school staff in these three schools (4/6 in Redbrick, 4/6 in Parkway, and 6/6 in Riverside) expressed concerns about the increased pressure to learn more about the other relevant subjects grouped into their learning area to achieve the goal of curriculum integration, especially in Social Studies. The reason was that these schools had tried curriculum integration in the learning area of Social Studies rather than Science and Technology (see Sections 6.2.4, 6.3.4 and 6.4.4). The

teachers of Social Studies, including history, geography and civics, were all under pressure to prepare new and unfamiliar teaching content. In 2003, after the new curriculum was implemented at the junior high level, the Ministry of Education did not insist on requiring schools to do curriculum integration within learning areas especially Social Studies and Science and Technology, which are examined in the BCT (see Section 2.3.4.3). Textbook editions, therefore, returned to the individual subject-based type book, especially biology and chemistry/physics in Science and Technology. Another urgent need for these school staff was to upgrade their computer abilities because a citywide test of computer literacy was run for all of the junior high school staff in the second year of curriculum implementation (see Section 6.2.4). This pressure came from the government.

In conclusion, most of the school staff followed what they did in the pre-reform time in their teaching practices after the curriculum change, because the external examination, BCT, run to the first-year graduates of the new curriculum did not have any change (there was still testing of Chinese, English, mathematics, science, and social studies).

7.5.2 The involvement of the deep structure of schooling in the curriculum change

In the first year of curriculum implementation, nearly one quarter (8/35; 23%) of the school staff in these three schools considered that the concepts and/or values of school teachers were not changed along with the curriculum change (see Sections 6.2.4, 6.3.4 and 6.4.4). It was seen as one of the obstacles to achieving successful curriculum implementation. This view was especially common between the principal and directors of each school studied. Principals in the three schools said that the most crucial factor to achieving a good school was a good staff team (including administrators and teachers) rather than just the principals themselves. The time a Taiwanese junior high school principal works in an individual school is no more than eight years, while teachers could be there more than 30 years. Understandably, these principals would express the view that a good school could not rely only on principal leadership especially in the democratic, industrialised, commercialised, and highly differentiated Taiwanese society. Most importantly, the parental and social views about education

(examination success being the first priority) are highly influential on school development in Taiwan. Examination is actually the ultimate form of harm to Taiwanese junior high schooling. For example, all of the 32 interviewees in 2003/04 said that Taiwanese parents would evaluate a school's performance by the number of its graduate students attending the star senior high schools. Everything done in schools will have to pursue this ultimate goal, which is to increase the number of students attending star high schools. Otherwise, parents would transfer their children to study in other so-called 'good' schools. Teachers could face unemployment if the total number of students declined and the school became smaller. Due to this anxiety, teachers prefer to gain a visible and immediate reputation for their schools. Anything needed to be done on a long-term scale, or especially invisibly, will have lower priority in Taiwanese junior high schools.

This consideration explains why every school is similar to every other school in many aspects in Taiwan. That is why Tye and Tye (1992) claimed that all schools are embedded in a society-wide 'deep structure'. A deep structure is determined by the basic values and assumptions widely shared throughout a society which would shape the education system of that society in the most fundamental aspects. In Tye and Tye's view, the deep structure of schooling is nationwide, changes very seldom, and only when the society at large is already leading the way. Therefore, it is unlikely that educational reforms will engage the deep structures of the schools, if teachers do not have a fundamental shift of mind in the use of information related to their own practices, and if parents' values about education are not changed, either. The Taiwanese case studies confirm this view.

7.5.3 Curriculum change and subject status in schools

Historically, in many countries curriculum initiative has moved increasingly from individual or group endeavour to government instigation (Paechter, 2000). However, this move cannot guarantee its success in the end. For example, it seems that the basic hierarchy of school subjects did not change after the 2002 curriculum change in Taiwanese junior high schools, though the original 21 subjects were grouped into seven major learning areas. According to the third round of interviews in 2003/04, examinable learning areas (Chinese, English,

mathematics, science and social studies) still keep their high status in Taiwanese junior high school curriculum, especially Chinese, English, and mathematics. Non-examinable learning areas (health and physical education, art and humanities, and integrative activities) continued to have low status after the curriculum change. This Taiwanese experience of the unchanging hierarchy of school subjects is actually similar to what happened to England, where the school curriculum, with the introduction of the National Curriculum for England and Wales, also left the basic hierarchy of school subjects unaltered (Paechter, 2000).

As another example, one of the goals of the new Taiwanese national curriculum is to balance the status hierarchy among school subjects or learning areas after the curriculum change. In the pre-reform time, the weekly maximal lecture periods for different subject teachers were varied and regulated in *Elementary* and *Junior High Schools Curriculum Frameworks* (see Section 2.3.4.1) such as 16 periods for homeroom teacher (but 14 periods for Chinese homeroom teacher); 18 periods for Chinese teacher; 20 periods for English, mathematics and science teacher; 22 periods for social studies teacher; and 24 periods for non-examinable subjects (home economy, art and music) teacher. In the new national curriculum, it is regulated as 21 periods for the seven learning area teachers and 15 periods for homeroom teachers. The Ministry of Education intended to upgrade the status of non-examined learning areas by teaching an equal number of timetabled periods as the examined learning areas. However, Chinese teachers argued for having fewer periods than other learning areas in the first and second year of curriculum implementation. In the third year of curriculum implementation (the whole junior high level adopted the new system in the 2004 school year), Chinese teachers still taught the same number of learning periods per week (14 for homeroom teachers and 18 for learning area teachers) as the time in the old curriculum. The population of Chinese teachers is the largest among all the learning areas and thus their voice was much louder. This fact implies that the effort the government made to balance the subject status among all seven learning areas was not fully achieved. It is clearly seen as a political negotiation which happened during the decision-making process and a battle over subject teachers' material interests (see

Section 3.5.4.2) over the subject status in the Taiwanese junior high school curricula.

7.6 The Shift to Curriculum Integration and School-Based Curriculum

The nature of environmental education is interdisciplinary and holistic in application and is an approach to education as a whole rather than a subject (see Section 4.2). The shift to curriculum integration and school-based curriculum, which were key features of the 2002 curriculum change in Taiwanese junior high schools, offered the chance to properly implement environmental education into schools. Whether or not the curriculum integration and school-based curriculum could succeed, would influence the implementation of environmental education in schools. However, this shift did not really achieve the planned and expected change. The reasons will be discussed in detail in the following sections.

7.6.1 Curriculum integration

In the first year of curriculum implementation, data from the case study schools showed that nearly three quarters (25/35; 71%) of the teachers interviewed (8/12 in Redbrick, 9/11 in Parkway and 8/12 in Riverside) saw curriculum integration as the main characteristic of the new Taiwanese national curriculum. However, two thirds (22/35; 66%) of the school staff commented that curriculum integration was a shortcoming of this curriculum change. There were 28%, 23%, and 15% of the school staff in Redbrick (10/12), Parkway (8/11) and Riverside (5/12) of this opinion. They believed that junior high education belonged to a differentiated curriculum rather than an integrated curriculum because integration could not reach the professional knowledge of each individual subject. During the second year of curriculum implementation, this view was re-enforced and became the biggest obstacle impeding the successful curriculum implementation in Taiwan. According to the last round of interviews, many junior high schools, including the schools studied, were back to subject teaching, especially biology and chemistry/physics in the learning area of Science. For example, four fifths (25/31; 81%) of the school staff in these three schools stated this opinion. There were 23%, 32%, and 26% in Redbrick (7/10), Parkway (10/11) and Riverside (8/10)

respectively. The reason for the failure of curriculum integration was the lack of sufficient teacher professional development nation-wide in either in-service or pre-service teacher education. There were workshops run in the summer vacation after the first year of curriculum implementation for subject teachers to supplement their learning area teaching, but not on a national scale and not mandated. Departments in the teachers' colleges were still biology, chemistry, physics, earth science (Science) and history, geography, civics (Social Studies). These departments did not make any changes to cope with curriculum integration for this large-scale curriculum change. Pre-service teachers were only encouraged, rather than required, to study more than one major.

The topic teaching along with the new curriculum does bring in chances for schools to do trials, especially for curriculum integration. Many schools did try to do curriculum integration via school festivals or sports days. Normally these two activities, in the pre-reform time, were combined and held once a school year in conjunction with games, competitions and static display of students' learning outcomes. The teachers involved in these activities were mainly the homeroom and physical education teachers, with exclusion of subject teachers. From the first year of curriculum implementation, many schools, including these three case study schools, required teachers from every learning area to design activities and/or learning sheets to achieve the goal of curriculum integration via topic teaching for the school festival or sports day. In Sections 6.2.6, 6.3.6 and 6.4.6, for example, Redbrick designed six activities of topic teaching each per semester to Grades 7, 8 and 9 within three school years. Riverside designed two activities of topic teaching each for all students for the first and second semester per school year. In contrast, no design for topic teaching occurred in Parkway as they chose environmental education to be their school-based curriculum.

In conclusion, what the curriculum integration did in these three case studies was to put all the seven learning areas together doing something relevant to the topics they chose. There was actually no curriculum integration specifically for environmental education in these three schools.

7.6.2 School-based curriculum

The school-based curriculum is an important aspect of the new Taiwanese national curriculum. However, only one tenth (4/35; 11%) of the school staff in the three schools studied, in the first year of curriculum implementation, referred to it as a characteristic of the new curriculum. Mainly, this view was from Parkway (3/4). No staff mentioned school-based curriculum in Redbrick, and only one teacher mentioned it in Riverside. Even in Parkway, one of the three staff said the school-based curriculum was a shortcoming rather than a merit of the new curriculum. During the second year of curriculum implementation, most of the staff across these three case study schools were still unfamiliar with this term. Only Parkway developed their school-based curriculum via environmental education, while Redbrick and Riverside did not specifically develop the so-called school-based curriculum. The reason these three schools did not pay much attention to school-based curriculum was because it was not mandated that they needed to do so. It is regulated, in the *General Guidelines of Grade 1-9 Curriculum of Elementary and Junior High School Education*, that schools could use 20% or less of the timetabled periods per week for a Flexible Curriculum to design grade and/or school level activities, curriculum and/or activities relevant to the school characteristics (school-based curriculum), optional courses for learning areas, remedial teaching programs, group counselling or self-learning. The *General Guidelines* encourage every school to develop their own school characteristics or school-based curriculum, but this is not mandatory. Considering the deep structure of this exam-driven society, it is understandable that schools would not put much effort on anything irrelevant to examination preparation.

7.7 Summary

Change takes time as well as effort and makes demands on both human and material resources. It has been seen that the 2002 curriculum change to three Taiwanese junior high schools has not made a fundamental change in their values and actions, especially in environmental education. This chapter discussed the findings across the three schools to address why the intended change was not achieved. Section 7.2, Section 7.3 and Section 7.4 discussed the findings in regard to answering the first three research questions. These sections described

and explained the adjunct role and ambiguous place of environmental education in the pre-reform school curricula, the minor influence of the introduction of environmental education (as required in the new national curriculum) on the school curricula, and the minimal impact of the new national curriculum on teacher views and practices in environmental education.

Section 7.5 discussed generally the response of Taiwanese junior high school staff to this curriculum change, emphasized the importance of the deep existing structure schooling in society, and described the unaltered subject hierarchy in the Taiwanese junior high school curricula. Section 7.6 discussed and explained why the shift to curriculum integration and school-based curriculum via this curriculum change did not achieve the planned change. Chapter 8 will suggest that these are crucial themes of fundamental importance if environmental education is to be introduced successfully. Indeed, schooling which has not developed a robust and pervasive tradition in these areas is unlikely to be a fertile seeding ground for the growth of environmental education. The next chapter will discuss and compare these findings with the literature to evaluate the themes when introducing the new subject of environmental education into schools.

CHAPTER EIGHT:

THEMES IN CURRICULUM CHANGE: INTRODUCING THE NEW SUBJECT OF ENVIRONMENTAL EDUCATION

"The establishment of Geography was a protracted, painstaking and fiercely contested process."
Ivor Goodson (1987) in *School Subjects and Curriculum Change*, p. 77.

8.1 Introduction

Chapter Seven answered the first three research questions by synthesising the data on the introduction of environmental education in three junior high schools in Taiwan. It provided a platform from which to understand the problems and obstacles when implementing environmental education as prescribed in the new Taiwanese national curriculum. This chapter will therefore respond to the fourth research question: What are the crucial themes in curriculum change for the introduction of the new subject of environmental education? It will discuss the themes in the context of what the literature to date has described for the introduction of other curriculum subjects.

Section 8.2 will present themes for curriculum change from the literature. They are mainly those themes previously documented, in Section 3.5, that the present study found were also strongly influential when introducing this particular new subject at the junior high level. Section 8.3 will discuss particular themes for the case of environmental education. They are not documented clearly in the literature but need to be taken into account when introducing this unique subject - environmental education. Finally, the chapter concludes, in Section 8.4, with the expanded themes to be considered when the new subject of environmental education is introduced.

8.2 Themes for Curriculum Change

The eleven themes discussed in this section are those which emerged as important for environmental education in the case study schools and which also resonated with those themes described in the existing literature (see Section 3.5 and Section

4.4) on the introduction of successful environmental education and other curriculum subjects such as biology and geography.

8.2.1 External examinations and university departments

Evidence shows that external examinations and universities have an inordinate influence on the school curriculum (Hofstein & Eisenberg, 1978). Successful contestation between subjects is strongly influenced by the issue of external examinations (Goodson, 1987), the existence of which contributes to the high or low status of any subject in the school curriculum. The reason curriculum developers often try to inject their new curriculum into the existing external examination framework is because having a recognised external examination for their subject would be one sure way to guarantee large-scale adoption and implementation (Marsh, 1988). For example, biology was first introduced into Oxford and Cambridge examinations in 1885 and so its long process of subject emergence in schools was initiated (Goodson, 1987). When school subjects are taught in the universities, this leads to changes in their school relevance, or utility, which can more easily be controlled and directed from universities (Goodson, 1995). Both biology and geography were exemplar school subjects in this regard (see Section 3.5.4.1). The examinable subjects in Taiwanese junior high schools are Chinese, English, mathematics, biology, chemistry/physics, earth science, history, geography, and civics. All are tested in external examination and taught in universities.

In Marsh's (1988) view, having an external examination could lead to unintended directions and emphases for a curriculum. For example, both teachers and students would check the previous examination papers to get ideas for areas of emphasis and topics to be ignored when teaching and learning. This exam-driven instruction is confirmed from the Taiwanese case studies. For example, in the second round of interviews, the Redbrick environment officer said examinations still led the instruction in Taiwanese schools after the curriculum change.

> Grade 1-9 Curriculum tries to let children learn happily, but the problem is that the examination (BCT) still leads the instruction in schools. Both students and parents care about it a lot. Under the circumstances of attending higher education, examination needs to have discrimination. But, with limited resources in schools, choice needs to be made. The curriculum must be similar to the past time, if students just want to get good marks in examinations. (Environment Officer, Redbrick, 2002)

At different times during this research, eighty percent of the interviewees (28/35) in the Taiwanese case studies (9/12 in Redbrick, 8/10 in Parkway and 11/13 in Riverside) said or agreed that the Basic Competence Test (BCT) to attend higher education would impact on the implementation of environmental education in schools because it was not clearly examined in the BCT (see Sections 6.2.5, 6.3.5 and 6.4.5). Reviewing the literature, the case of geography in Western Australia from 1964 to 1984 showed that the power of external examination has not diminished to any significant degree, even after two decades of curriculum development and implementation (Marsh, 1988). Section 4.4 also described the power of external examination to affect the implementation of environmental education. In the West, the intended cross-curricular status of environmental education in the British national curriculum contributes to its low priority for most schools and teachers because only the core and foundation subjects are formally tested (Huckle, 1993). In Australia, few schools really teach environmental education across all the subjects because traditional school subjects have much greater value in accessing higher education (Lamb & Araos, 1998). In the East, Stimpson (1997) pointed out that environmental education not being publicly examined resulted in low status in Hong Kong. The major constraint hindering environmental education in China was also the examination (Wu, 2002; Zhu, 1995b). These examples show the powerful influence exerted by external examinations.

In Taiwan, a special circumstance makes all this especially severe at the junior high level. There are only nine years of compulsory education in Taiwan, rather than the twelve years in the western world. Thus, the pressure to gain university entrance starts from junior high education in Taiwan. One of the goals of the new Taiwanese national curriculum is to reduce the frequency of examinations in schools in order to decrease the burden on students and promote enjoyment in learning. The new curriculum requires schools island-wide to have only two term examinations instead of three per semester, but this was not implemented during the first and second year of curriculum implementation. After data collection was completed, however, in the third year of curriculum implementation in 2004, some schools had still retained three term examinations, although other schools, including those in the city studied, were following the new requirement. These

latter schools might have strategies to undermine this requirement. For example, in the researcher's own school the instructional director added another two examinations, with a different name from the term examinations required by the Ministry of Education. This resulted in four examinations per semester, which was even more than the old curriculum. The thinking was that with two examinations per semester it would be hard for students to prepare for because of the quantity of examined content. In addition, students would not work hard enough due to decreased awareness of the need for examination preparation. Thus, in October 2005 the chairman of the *Commission on Educational Reform* Dr. Lee, Yuan-Jer (see Section 2.3.3) admitted in the Legislative Yuan (the Taiwanese Congress) that the effort made to decrease academic competition and pressure in Taiwan had failed (Chang, 2005).

It has been a source of debate since the 1960s as to whether or not an external examination could evaluate the essence of environmental education. Failure to introduce external examinations for environmental education happened in the late 1960s in Britain. The barrier was its very broad and extensive content. In the Taiwanese case studies, all the 32 school staff (in the third round of the interviews) believed that the teaching of environmental education would increase to some extent if the BCT examined its content. However, 91% of the school staff (29/32) across the three rounds of interviews stressed that the learning outcome of environmental education should be *behavioural change* rather than knowledge gain. Behavioural change is not included in the BCT senior high assessment. Further, many school staff believed that the contemporary external examinations in Taiwan could not properly evaluate and might undermine environmental education. For example, the Riverside principal in 2003 said that testing it in BCT would lead to teachers and students emphasising knowledge more than action in environmental education.

> Of course it will be valued more if BCT examined the content of environmental education. However, it will probably be valued by studying more about the environmental knowledge. As to students would do it or not, it is not for sure yet. (Principal, Riverside, 2003)

Marsh (1988) also expressed concerns that examiners might avoid important aspects such as values and attitude clarification questions (Higginbottom, 1980), which are exactly the unique characteristics of environmental education. In

Section 4.4.4, it was pointed out that Stimpson (1997) considered the reason why cognitive environmental objectives were often stressed, while values and behaviour were neglected in Hong Kong, was because the strong public examination pressure led to a lack of teaching time/resources in schools and encouragement/assistance from the educational authorities.

Another reason that environmental education failed to be claimed as a school subject in the early 1970s was because of the absence of a pathway towards academic university study. The situation, even in the early twenty first century, has not changed much. There are no departments of environmental education in universities worldwide, though some universities have graduate programs and/or schools of environmental education or departmental courses in environmental education. Therefore, the survival and existence of environmental education in primary or secondary schools relies mostly on school staff enthusiasm and commitment (Eichler, 1977; Fien & Ferreira, 1997). In contrast, early in 1903, one of the founding fathers of geography, MacKinder, asserted that geography first should gain a place in school exams and then have university geography established (cited in Goodson, 1995). The convergence of these two themes eventually proved the best strategy to support the emergence of geography in schools.

In sum, whether subject content is evaluated in examinations, especially external examinations, and whether or not a subject has an extension to a university department has been found to influence its emergence in the school curriculum. This was also the case for environmental education at the Taiwanese junior high level.

8.2.2 School timetabling and programming

The status of school subjects varies, with those areas of knowledge perceived to be more powerful able to increase their power through greater access to curriculum time and institutional space (Paechter, 2000). In Layton's (1972) model, the first stage towards a new subject's emergence is to gain a place in the school timetable (see Section 3.5.2). Geography and French are the exemplary subjects demonstrating this theme during their emergence in schools (see Section

3.5.4.1). A successful country-wide example of the implementation of environmental education is Norway. The amount of school time devoted to thematic and project work for environmental education is greatest in primary schools (80% in Grade 1) and then gradually reduces to 20% in lower secondary schools (see Section 4.4.2.1).

In the Taiwanese new national curriculum, 80% or more of the time is distributed to seven learning areas (Area Learning Periods) and the rest of the time (20% or less) is allocated to the Flexible Curriculum (Alternative Learning Periods). Table 8.1 shows the content of Flexible Curriculum during the first and second years of curriculum implementation in the three case study schools (see Sections 6.2.6, 6.3.6 and 6.4.6).

Table 8.1 Timetable of Flexible Curriculum in the Schools Studied

School year	**2002/03**	**2003/04**	
	7th Grade (6 periods)	**7th Grade (5 periods)**	**8th Grade (5 periods)**
Redbrick	Class/weekly meeting 1 Compensation teaching (English) 1 Knowing Taiwan (Social studies) 1 Life art (Art & Humanities) 1 Computer practice 1 ***Extracurricular activities** 1	Class/weekly meeting 1 Compensation teaching (Mathematics) 1 Compensation teaching (English) 1 Knowing Taiwan (Social studies) 1 Computer practice 1	Class/weekly meeting 1 Compensation teaching (Mathematics) 1 Compensation teaching (English) 1 Knowing Taiwan (Social studies) 1 Computer practice 1
Parkway	Class/weekly meeting 1 Extracurricular activities 1 Life conversation (English) 1 Life art (Arts & Humanities) 1 Computer practice 1 ***Environmental protection education** 1	Class/weekly meeting 1 Extracurricular activities 1 Reading guidance (Chinese) 1 Life art (Arts & Humanities) 1 Computer practice 1	Class/weekly meeting 1 Extracurricular activities 1 Reading guidance (Chinese) 1 Speaking skill (English) 1 Knowing Taiwan (Social studies) 1
Riverside	Class/weekly meeting 1 Extracurricular activities 1 Chinese 1 World passport (English) 1 Local teaching (Social studies/science) 1 ***Library guidance** 1	Class/weekly meeting 1 Extracurricular activities 2 World passport (English) 1 Local teaching via computer (Social studies) 1	Class/weekly meeting 1 Extracurricular activities 2 World passport (English) 1 Computer practice 1

* is the period removed in the second year of curriculum implementation.

From this table, it should be noted that most of the time in the Alternative Learning Periods was allocated to compensation learning for examinable subjects such as English, Chinese, mathematics and social studies. Moreover, the citywide one-period reduction (extracurricular activities in Redbrick, environmental protection education in Parkway, and library guidance in Riverside) did not belong to any examinable subject compensation teaching periods. The original design of the Flexible Curriculum was for schools to develop their school-based

curricula and schools could make their own choices to do whatever they wanted to do. Apparently, only Parkway junior high school designed one period for its school-based curriculum from the Flexible Curriculum. However, Parkway still did not put all the effort into its school-based curriculum, as this period was only one of the six periods allocated to its Flexible Curriculum. Moreover, both Redbrick and Riverside junior high schools designed several topics rather than a school-based curriculum. There were no regular, or even weekly, periods for these topics. The reason schools chose to do compensation learning is because of the strong academic competition pressure to attend senior high schools leading to the perception students need to spend more time on the learning of examinable subjects.

Therefore, the design of this weekly period environmental protection education in Parkway from the Taiwanese case studies, during the first year of curriculum implementation, can be seen as an initial step towards the emergence of environmental education in the school. However in the second year of curriculum implementation, this period was removed from the school timetable due to a requirement from the City Educational Bureau. The Bureau required that each school reduced the total number of timetabled periods per week by one. There were several reasons for taking away environmental protection education, rather than other school subjects in Parkway. First, a homeroom teacher was in charge of the teaching and so there was no subject teacher to oppose to its removal. The removal did not create the so-called problem of subject teachers' material interest (see Section 3.5.4.2). Secondly, there was no syllabus available and this did cause difficulty when homeroom teachers conducted the teaching. Thirdly, its removal would not influence the existing school curriculum because it belonged to the Alternative Learning Periods (Flexible Curriculum) rather than Area Learning Periods. In Parkway administrator's words, the removal of environmental protection education led to the least impact in Parkway school curriculum. For example, the Parkway ex-instructional director in 2004 said doing so would not make much impact to his school.

> The period of 'environmental protection education' is a trial in our school, but it is not valued so much now … It was given to the homeroom teacher last year because it couldn't be distributed to science teachers … However, we don't have money to pay the homeroom teacher this year … Besides, there is no teaching materials for homeroom

> teacher to teach it … It wouldn't cause much impact by removing this period. (Ex-Instructional Director, Parkway, 2004)

As to the implementation of six *Important Issues* (information technology education, environmental education, gender education, career development education, human rights education, and home economy education), it was information technology education (ITE) rather than environmental education (EE) that ranked first for implementation in these three schools (see Sections 6.2.4, 6.3.4 and 6.4.4). ITE could have immediate learning outcomes and therefore schools prefer to spend time on that. The learning outcomes of EE would be hard to achieve within a short time and schools tend not to show any urgency in its introduction. The Riverside English teacher pointed out this view by the following statement in the first year of curriculum implementation.

> The first priority to implement those six Important Issues will be 'information technology education' because it could have immediate accomplishment … You could observe its learning outcomes from school Website…The content and form of the Web pages certainly could show students' computer literacy … As to environmental education, it's hard to see its immediate learning outcomes … We must find something with fast endings if wanting to show credit in a brief time and information technology education could make it. (English Teacher, Riverside, 2003)

During the second year of curriculum implementation, he even said that EE would be the last priority to have time allocation in schools due to its not being a school subject but a living style or way of thinking.

> Environmental education is not a school subject but just a kind of living habit, style, or thinking ... It's hard to be valued a lot … Yes, we might do it (environmental education) if there is still have time after school subjects and other Important Issues' usage. (English Teacher, Riverside, 2004)

This is exactly what Young (1971) points out: school subjects vary in status in the eyes of teachers, students and the outside world. Although all 46 school staff (from different stages over three years studied) expressed at least once, and up to three times, that environmental education was important and should be taught in schools, apparently, it was still not their first priority when considering the time given to environmental education in their school timetables.

The inclusion of environmental education in the school calendar or long term plan might provide more opportunities for the teaching of environmental education in schools. Environmental education could be a Topic run in a special week or in the winter and/or summer vacation. Yet, only three out of 31 school staff, in the second year of curriculum implementation, supposed the winter and/or summer

vacation would be a possible time to have an environmental education workshop. They were still not optimistic about this possibility because of the extra cost to parents and additional administration for schools. For example, the Parkway principal said the possibility to conduct outdoor education for EE during these vacations was not high.

> Biology teachers want to have one week outdoor education of environmental education during summer vacation for Grade 7 students ... I don't see much feasibility to run it, because parents' views are not very up-to-date paying money for extra curriculum … It may have the possibility of being run in the future but will be restricted inside school grounds rather than out-of-school … Students need to stay overnight in their home to save money and administrative trouble if it is more than one day. (Principal, Parkway, 2004)

As to one special week of environmental education during semester, the outlook was not optimistic either because of the crowded curriculum, or less effectiveness within a short term. The key administrators, instructional directors, responsible for the school development from both Parkway and Riverside raised these two reasons for the impossibility to do so.

> It is impossible to have topic teaching of environmental education during semester time due to the crowded curriculum. (Ex-instructional Director, Parkway, 2004)

> The effectiveness won't be good enough if planning a program of environmental education just for one week … It's better to extend the time conducting a long-term weekly topic teaching program such as a horticulture society in extracurricular activities … At present, it is very competitive to seek time to run certain school activities. (Instructional Director, Riverside, 2004)

In conclusion, knowledge perceived to be more important is able to increase its importance through occupying more curriculum time and institutional space in schools. Thus, languages (Chinese and English), mathematics, and science occupy most of the time, while science and information technology education occupy most of the room in Taiwanese junior high schools. The need for adequate time to allow the emergence of environmental education is demonstrated by both the literature and the Taiwanese case studies.

8.2.3 Syllabi

The importance of teaching materials is hardly in question as it is one of the themes for new subject emergence in schools (see Section 3.5.4.1). For example, Layton (1973) stated that textbooks and/or syllabi were crucial to support the subject of science which ultimately became an important subject in schools. Another example is the biology syllabus, published in 1937, to promote the

teaching of this subject. This led to its successful emergence in schools in the 1960s (Goodson, 1987). At present, from primary to junior high to senior high schools in Taiwan, every school subject inside the school timetable has its own textbook. This confirms the importance of syllabus when consolidating a subject's status in schooling. As to environmental education, in its early days Cerovsky (1977) stated that the effective process of environmental education could not be accomplished successfully without materials including publications and aids such as textbooks and teacher guides. Several decades later, Benedict (2000) still stressed the importance of teaching materials as one of the enabling factors for schools when supplementing and developing teachers' competence for environmental education. Successful whole school initiatives implementing environmental education in a sustainable way in schools in South Africa, UK, Scotland, China, Sweden, New Zealand, and ENSI offer either resource kits or research materials to participating schools (Henderson & Tilbury, 2004). For example, in the case of Enviroschools in New Zealand, an *'Enviroschools Kit'* is offered to teachers in participating schools to provide ideas on how to initiate their school environmental education scheme.

In contrast, in the Taiwanese case studies one of the reasons Parkway could not run its weekly period of environmental protection education was because no syllabus was available (see Sections 6.3.2). When being asked what kind of help teachers needed to teach environmental education in 2003/04, 73% of the school staff (22/30) in the third round of interviews suggested a need for teaching media and materials such as videos, VCD, DVD, statistics diagrams and tables of environmental problems, lesson plans, systemic syllabus and exemplar case studies, etc (see Sections 6.2.3, 6.3.3 and 6.4.3). The Riverside history teacher commented that it was the government's duty to do this job. She said:

> Government should nominate a task team of environmental education to develop teaching materials for school teachers' reference or conduct workshops of environmental education to give teachers professional development**.** Government should not just let schools do it by themselves as school teachers are all overloaded. (History Teacher, Riverside, 2003)

From the interviews in 2002/03, one suggestion to increase the teaching of environmental education in Taiwanese junior high schools was to add a systematic unit of environmental education in the textbooks of the seven learning

areas. One year later, more than one fifth (7/32; 22%) of the school staff in the third round of interviews ranked this as a first priority, possibly because school teachers in Taiwan always try to teach all the content in textbooks. Although the competence indicators of environmental education for Grade 7-9 students in Taiwanese junior high schools are included in the *Guidelines of Environmental Education* (see Appendix 4), they are only required to be infused into school teachers' subject teaching and there are no suggestions as to what extent and in what way this infusion should be done. Only three teachers said that they needed teaching methods specifically for environmental education, as most of the teachers considered that the infusion teaching they did was adequate and sufficient. In contrast to other *Important Issues*, information technology education has its own textbook in Taiwanese junior high schools. This does make a difference to its subject status as it is being valued high among all the *Issues*. This indicates the importance and urgent need of teaching resources especially the syllabus of environmental education in Taiwan to facilitate its emergence in schools. The importance of syllabus towards the subject emergence in schools is confirmed by both the literature and the Taiwanese case studies.

8.2.4 Central government leadership

Attention to the history of curriculum emergence shows the power and influence of central government leadership. Often, the place and status of a subject in the school curriculum has been established finally by government legislation, often under pressure from a variety of interest and subject groups, and from industry. Paechter (2000) stated that government support was required to consolidate the academic respectability of Design and Technology (D&T) in the 1990s. Norway provides a successful example of the emergence of environmental education (see Section 4.4.2.1), and central government leadership especially that of the Ministry of Education, was central to this. The Taiwanese case studies also emphasised the influence of central government leadership in the second year of curriculum implementation (see Sections 6.2.3, 6.3.3 and 6.4.3). Many staff believed that the Ministry of Education held the ultimate influence over the case of environmental education in Taiwanese junior high schools. For example, in 2003 the Redbrick chemistry/physics teacher said the Ministry did the job to establish the *Issue*

information technology education rather than environmental education as a school subject.

> It depends on the attitude of the Ministry of Education … Whether the Ministry wants to keep environmental education as a school subject, or not. During the period of curriculum development, the Ministry of Education could look for experts to edit textbooks, require teaching hours in school timetable, ask professional teachers to teach it. It has happened to information technology education already. (Chemistry/Physics teacher, Redbrick, 2003)

The Riverside instructional director said in 2004 the survival of environmental education in schools relied on whether government policy mandating schools to teach it in school timetable or not.

> It depends on whether the goal of national development emphasise it or not … Only if government strongly directed the implementation of environmental education and even requested schools teaching environmental education for several periods in school timetable. Then schools would be cooperative to the policy execution. Without policy requirement, it would be definitely hard to get environmental education to survive when facing learning areas' competition. (Instructional Director, Riverside, 2004)

Paechter (2000) has noted that in recent times there has been increased interest in effecting curriculum change by shifting the emphasis from individual or group endeavour to government. Projects in some countries, particularly in England, operated by introducing mandatory curricula and attempting to change the relative status of a number of school subjects via making some compulsory and others not. Paechter also noted that the only new subject in the recent years to have successfully achieved the predominance of mathematics, English, and science was the information technology (IT). It has benefited from its association in wider society with technical rationality among the young generation and the belief by successive governments that technical literacy is essential for life in the twenty first century. This is confirmed in Taiwanese case studies in 2002: the Ministry of Education (MOE) required junior high schools to teach information technology education (ITE), but not the other *Important Issues*, for 40 hours per school year at Grade 7. Thus, ITE has emerged as an independent school subject although it, like environmental education, belongs to one of the six *Issues* in the new Taiwanese national curriculum.

Apart from ITE, the MOE has strongly encouraged Taiwanese citizens to upgrade their abilities in English since 2000 by passing the General English Proficiency Test (GEPT). From primary to junior high and to senior high education, many

schools, therefore, encourage their students to take GEPT and advertise their pass rate to enhance their reputations. From 2004, some universities have requested their graduate students pass the third level of GEPT (five levels in total). The MOE also demanded that all junior high schools achieved an English language environment. Every office and classroom in a school had to be labelled with both Chinese and English from the 2003 school year. Thus, the Taiwanese government directed an overwhelming social trend and pushed junior high schools towards English language curriculum implementation. This is confirmed in the Taiwanese case studies in 2004 that all three schools studied, designed, and worked for English as one of their school characteristics (see Sections 6.2.6, 6.3.6 and 6.4.6). This corroborates the influential power of central government leadership on the junior high school curriculum.

By contrast, in the third round of interviews half (15/30) of the school staff across the three schools assumed that the Taiwanese government did not value environmental education much. Additionally, the Taiwanese case studies show that teachers considered the MOE had not funded environmental education like other *Important Issues* such as career development education and gender education. The MOE had not taken a leading, but rather a cooperative, role when implementing environmental education in the new Taiwanese national curriculum. The Riverside leading administrators clearly expressed this view at different research phases. For example, the instructional director said, in the first year of curriculum implementation, that the budget was only distributed to the *Issues* which the MOE functioned as the leading governmental office.

> Ministry of Education is not the leading governmental office to expand environmental education but it is the leading office to do career development education. Therefore lots of money from the Ministry was distributed to schools on implementing career development education rather than environmental education. (Instructional Director, Riverside, 2003)

In the second year of curriculum implementation, the principal said the small budget from the MOE was because it was not the major governmental office in charge of environmental education in Taiwan.

> The Ministry of Education is not the major governmental office to offering budget for environmental education to schools … Except that not the Ministry of Education, but another governmental office, Environmental Protection Administration, is in charge of the implementation of environmental education. Thus, there is little budget coming from

> the Ministry of Education to do environmental education in schools. (Principal, Riverside, 2004)

This suggests that whether or not the MOE plays the major leading role definitely influences the emergence of environmental education in Taiwanese junior high schools. Environmental Protection Administration (EPA) is another governmental office in charge of the expansion of environmental education in Taiwan. However, it is not the chief governmental office to schools over the issue of the implementation of environmental education. The attention Taiwanese junior high schools paid to the EPA is mainly focused on garbage classification and recycling, rather than teaching and learning in education. This shows the problem of an unclear leadership role among governmental offices in Taiwan. Therefore, it is necessary to identify whether or not the Taiwanese Ministry of Education actually has an authentic leading role when implementing environmental education.

In conclusion, the Taiwanese case studies confirm that the central government leadership of the emergence of environmental education in schools cannot be ignored. It is exactly the fact Benedict (2000) pointed out, that the mainstreaming of environmental education at the school management level and in all schools and teacher training is difficult without support from the top.

8.2.5 Teacher professional development

The literature on the emergence of a school subject reveals the need for teacher development; this comprises the second stage of Layton's (1972) model of new subject emergence. Successful examples of traditional school subjects with this theme are elementary science in England in the late nineteenth century, biology in England in the junior and middle school curriculum in the 1930s, and new physics in secondary schools in Canada in the 1960s (see Section 3.5.4.1). For instance, the School Board in London offered evening classes and summer school for elementary science. The British governmental agencies offered biology programs of 2-3 days conference, lecture series, workshops, courses and summer schools, and the British Columbian Science Teachers' Association funded more than 20 weekend sessions for new physics. Similarly, many conferences and workshops

are conducted in Taiwan for existing school subjects promoting new ideas in education.

One of the crucial factors influencing the successful implementation of environmental education worldwide is also teacher development, for both pre-service and in-service teachers (see Section 4.4.5). For example, in the early 1990s, Norway conducted a compulsory pre-service introduction and a mandatory in-service development program of environmental education to all the teachers. This provided a genuine national infrastructure and was a prerequisite of the successful implementation of environmental education in Norway. Therefore, after offering 14 years of an optional course for environmental education, University of Waikato in New Zealand initiated its first compulsory environmental education pre-service course for primary school teachers in 2004 (Barker, Keown, Saunders, & Schon, 2005). In New Zealand-based case studies of environmental education practice in eight schools, at least one staff member per school had a personal interest in environmental education and had participated in the Ministry of Education's environmental education *Guidelines* professional development training (Bolstad, Eames, Cowie, Edwards, & Rogers, 2003). In a review of whole-school approaches to sustainability, Henderson and Tilbury (2004) stated that professional development was a critical component to the success of those whole-school initiatives worldwide. This indicates the importance of teacher professional development in the successful implementation of environmental education.

In contrast, the three Taiwanese case studies show a lack of professional development of environmental education on a large scale (see Sections 6.2.3, 6.3.3 and 6.4.3). Except for one citywide workshop for environmental education in this city, each of the 46 interviewees since the first round of interviews commented that there had been no specific external workshops for environmental education. The Redbrick art teacher even said there was little specific introduction to environmental education when attending workshops of the Grade 1-9 Curriculum in the year prior to the curriculum change.

> Before implementing *Grade 1-9 Curriculum*, there was no workshop specifically for environmental education ... Those workshops mainly introduced *Grade 1-9 Curriculum* in general such as curriculum integration, core rationale, curriculum goals, core competence,

> and competence indicators … With only a little introduction of six Important Issues, however, they were mentioned only by terms without detailed introduction. (Art Teacher, Redbrick, 2001)

As to internal workshops run in the three schools, the last round of interviews showed that no specific environmental education workshop was conducted over the three years studied. Nevertheless, there were internal workshops for some *Important Issues* such as information technology education, gender education, human rights education, and career development education, but not environmental education. The Redbrick principal said the reason schools conducted workshops for these *Issues* rather than environmental education was because of a requirement and funding from the Ministry of Education.

> Internal workshops of 'information technology education' and 'Three in One instruction-students-counselling' were conducted the most frequently. Other workshops such as fire control, gender education, and law education were run more often as they were required by government and distributed with funding. However, a workshop of environmental education was not required by the government to be run. (Principal, Redbrick, 2004)

Thus, the interlaced relationship between central government leadership and school-based material interests (will be discussed in the following sections) guided the direction of schools' internal professional development in Taiwan.

In 2002, an environmental education workshop was held in the city studied but only one teacher per school could attend. In contrast, the whole school staff participation in a professional development program in Otari school, New Zealand, and found this was very helpful for a successful stream project in environmental education (Bolstad, 2004). Not surprisingly, the citywide 2002 environmental education workshop did not influence the teaching of environmental education at the classroom level, at least in these three case study schools. Even when Redbrick was required by the City Educational Bureau to conduct an action research on environmental education late in the second year of curriculum implementation, only five staff, rather than the whole school staff, attended the environmental education workshop. Consequently, only the biology teacher (one of those five staff) conducted the so-called action research in Redbrick, and this without cooperating with other school staff or outside agencies. Therefore, the Redbrick principal expressed a pessimistic view about the emergence of environmental education in her school, as there was no whole school teacher

professional development to lead to a whole-school involvement in environmental education.

From the discussion above, the Taiwanese case studies confirm the importance of teacher professional development in contributing to the subject's emergence in schools. The case studies also verify the requirement of professional development for environmental education, and especially to get as many staff as possible receiving professional development, and working together on its emergence in schools.

8.2.6 Informal curriculum

Teaching and learning can happen at any time and any place in schools via any teacher and so the informal curriculum is recognised as important, although for schools the public pays more attention to the formal curriculum. In Taiwan, the informal curriculum is everything done outside of the timetabled periods and non-school subjects inside the school timetable such as class and weekly meetings, self-learning time, and extracurricular activities. Normally, timetabled periods of academic (examinable) and non-academic (non-examinable) subjects constitute the formal curriculum.

Reviewing the literature, the importance of the informal curriculum in reaching and enriching, especially the affective domain of existing school subjects, cannot be ignored (see Section 3.5.4.1). For example, Australian students learn about civics and citizenship through participating in school activities and external clubs or organisations (Department of Education and the Arts, 2006). A study of values in the *Northern Ireland Curriculum* also shows the rich opportunities within the informal curriculum for the transmission and discussion of values in schools (Smith & Montgomery, 1997). In the Taiwanese case studies, 84% of the interviewees (27/32) believed that environmental education in their schools existed more in the informal curriculum than the formal curriculum (see Sections 6.2.3, 6.3.3 and 6.4.3). This can clearly be seen in the daily garbage classification and recycling done in lunchtime, cleaning time, nap time, homeroom teacher time, the intervals between periods, and sometimes after school. Most of the staff interviewed viewed these activities mainly and particularly as being for

environmental education and always referred to them as school activities specifically for environmental education. In addition, it is at the weekly meeting rather than other timetabled periods that students could receive speeches specifically for environmental education. This indicates that although environmental education was infused into subject teaching in the formal curriculum, it was done in an adjunct way and was not as apparent as it was in these activities done in the informal curriculum. This is confirmed in the NZ Enviroschools program, as teachers were encouraged to discuss influential aspects from the informal curriculum when developing a living curriculum for their schools (Bosch, Craig, Jones, Mardon, Mataira, & Ritchie, 2003).

The situation of environmental education activities in the informal curriculum contributed to the crucial role the homeroom teacher played in the Taiwanese case studies (see Sections 6.2.3, 6.3.3 and 6.4.3). Taiwanese homeroom teachers are responsible for students in both the formal and informal curriculum. Every interviewee (37/37) since the second round of the interviews, believed that homeroom teachers could directly guide students' skills and behaviour, at least orally, when doing garbage classification and recycling as part of the informal curriculum. However, they did not think that homeroom teachers would have the time to teach environmental knowledge and cultivate environmental awareness properly via inspiring pedagogical approaches. For example, the Redbrick chemistry/physics teacher in the first year of curriculum implementation said homeroom teachers could only verbally request students keep their environment clean, rather than conduct activities for environmental education.

> It is actually hard for the homeroom teacher to have autonomy conducting a certain activity except if it is written when planning and developing school curriculum in advance … It is not possible for homeroom teacher using certain pedagogical approaches to teach environmental education except orally requiring students keep classroom clean and tidy and maintaining order when doing out-of-school visiting … The homeroom teacher, in fact, is not ideal to teach environmental education if viewing curriculum in the scale of one grade, but they will have an ideal role to teach environmental education from the point of view of one class. (Chemistry/Physics Teachers, Redbrick, 2002)

In the second year of curriculum implementation, just over a third, 34% of the school staff (11/32), believed that environmental education should be taught more via the informal curriculum in schools because no time was available in the formal curriculum. They believed that learning by doing (garbage classification and recycling) could better achieve the goal of cultivating students' good

environmental behaviour. Given the constraints on the school timetable and the nature of environmental education, it is hardly surprising to find that environmental education was taught and practised so much via the informal curriculum in Taiwanese junior high schools. Thus, the Taiwanese case studies confirm the importance of the informal curriculum when discussing subject emergence in schools, especially the case for environmental education.

8.2.7 Non-formal education

Education is a broad area and is not confined to schools. Everything relevant to education, but not taught by school teachers in and/or out of schools, belongs to non-formal education in Taiwan. It mainly includes family and social educational organisations such as the museum, zoo, botanic gardens, educational centres, etc. Along with the technological development in modern societies, non-formal education could be seen as it has influenced more and more every field of education at large, especially since the 1970s. The 1990 World Conference on Education for All not only highlighted the importance of non-formal education but also provided global strategies for strengthening it (Siaciwena, 2000). Since the early 1990s, this trend of non-formal education has happened to and been recognised in science education (Feher & Rennie, 2003), even though this theme was not mentioned in the emergence of science in schools in the late nineteenth century. Breton (1998) pointed out that a nation's science education infrastructure consisted of the media, science centres and museums, industry-education programs, out-of-school student programs and competitions, community education programs and other non-formal science learning outlets. Breton argues that these are valuable contributors to scientific and technological literacy.

The power of non-formal education to foster the emergence of environmental education in schools has long been recognised. As early as 1977, the UNESCO publication *Trends in Environmental Education* pointed out the importance of non-formal environmental education because environmental education is orientated towards community action. Non-formal environmental education could provide the opportunities to link lively experiences and hands-on investigations of the real world with the formal environmental education in the schools. Since the 1990s, voices have called for collaboration between formal and non-formal

environmental sites. For example, Waddock (1995) asserted that this collaboration was essential to reach the full potential and impact of environmental programs that promoted environmental literacy and understanding. One major problem Clover (2002) identified for the growing environmental problems worldwide was the dismissal of the importance of non-formal education and its limited framing in terms of public awareness. Many studies provide evidence of the contribution of non-formal education towards the emergence of environmental education. Filho (1996) stated that nongovernmental organisations (NGOs) had been particularly active in promoting environmental education in Europe. Findings of the case study of Wildlife Trusts UK confirms the essential role of non-formal education's responsibility for education for sustainability (Palmer & Birch, 2003). Evidence in environmental education student learning outcomes shows that environmental education programs can effect changes in students' environmental attitudes, knowledge and behaviours (though in a few cases) via both school-based and outdoor educational initiatives (Rickinson, 2001). Examples of these programs are outdoor residential field courses lasting for a week, out-of-school visiting to local zoos/museums and public gardens that encompass preparatory and follow-up work, school-based programs that include elements of parental and community involvement, and an environmental curriculum focusing on actual local environmental issues rather than envisaged ones. This evidence indicates the importance of non-formal education, or at least the combination of formal and non-formal education, when teaching environmental education. By combining environmental education goals with non-formal sites, many objectives such as offering meaningful experiences in school subjects, working towards a citizenry stronger in math and science, helping retention for tests, and providing professional development can be successfully achieved (Kilkenny *et al*., 2000).

In the third round of interviews, more than a quarter (9/32; 28%) of the interviewees in the three schools believed that non-formal education, especially social education, should take more responsibility than formal education in teaching environmental education (see Sections 6.2.3, 6.3.3 and 6.4.3). The Redbrick principal's reply was representative. In 2004, she said social education

would do a better job than school education to the implementation of environmental education.

> Let social education do it and it will be better as schooling is tightened with the crowed curriculum. It is a world full of information. Out-of-school information is very good and beyond the country borders. Students can join out-of-school activities, read newspaper and magazines, and watch TV programs. It will be better if students could develop their attitude and/or behaviour by themselves via these influences rather than being guided rigidly from school teaching. (Principal, Redbrick, 2004)

Taiwanese school teachers normally teach abstract concepts including definitions and explanations of phenomena that students rarely have the opportunity to explore through first-hand experience of the natural world. Non-formal educational organisations could reverse this learning process and motivate students to change their attitudes and maybe take action as well. In addition, out-of-school activities of environmental education providing enjoyable and constructive experiences are certainly relevant to the cultivation of citizenship in students' adult life. Family education is another focus in environmental education when Taiwanese school staff mentioned non-formal education. This view was expressed throughout this research by both teachers and administrators. For example, in 2001 the Riverside instructional director said in the pre-reform time that family education should precede school education to cultivate students valuing the environment.

> We should teach students from their childhood to value the environment. Basically, it should be initiated from family education to cultivate in children good sanitary habits and then gradually add in environmental education during kindergarten and primary education. If family education could be achieved well and then extended to school education, it should have every citizen value the environment. (Instructional Director, Riverside, 2001)

In the second year of curriculum implementation in 2003/04, the Redbrick mathematics teacher said non-formal education, especially family education, should teach more about environmental education.

> I request students do recycling well everyday but it was still not good enough. Many students did not have a good living habits which should be cultivated from their families … Non-formal education should teach more about the environmental education especially the family education. (Mathematics Teacher, Redbrick, 2003)

At present, formal education is restricted to schools and colleges. It is the core of the education system. The boundaries defining and separating it from the larger societal environment are clearly drawn. Any evolution towards an open system in education must include the development of an increasing variety and diversification of institutional structures at the core and the development of new types of institutions outside of the core serving a wider range of educational

purposes (Singh, 1991). In the 1970s, Withrington (1977) suggested that non-formal environmental education could be offered to out-of-school youth by self-governing environmental youth organisations, conservation work-camp organisations, university and college student environmental societies, school clubs, environmental action groups, ecology and recycling centres, museums, young naturalists' clubs and environmental study centres, and non-specialist organisations. In the 1990s, Singh (1991) suggested choices for both adults and out-of-school youth: the pervasive TV and/or electronic media especially the Internet, community development activities, agricultural extension centres, small-scale industries development, community health centres, and an increasing range of programs.

In sum, teaching via non-formal educational programs and/or sectors has the potential to make a significant contribution towards the emergence of environmental education in schools. It also becomes a trend in every field of education at large.

8.2.8 Subject characteristics and definition

Bernstein (1971) analysed the differences between strongly classified *collection* curricula that were well insulated from each other, and those of a weakly classified *integrated* type. In Bernstein's view, in order for a school subject to retain its identity, strong boundaries have to be maintained between it and other subject areas. Maintenance of a clear boundary is particularly important to teachers of high status subjects. As early as 1973, Walford argued that unity within the subject sub-groups was a basic requirement for the continued existence of geography in schools (cited in Goodson, 1985a, 1995), because 'new geography' changed the boundaries and led to subject fragmentation. In the early 1990s, a common view among British secondary school teachers, especially science teachers, was that the cross-curricular themes polluted their subject or interfered with their students' learning of that subject (Whitty, Rowe, & Aggleton, 1994). Strong classification not only provides a distinct identity, but also a focus for resource allocation, in schools and education system. For example, strong boundary subjects (i.e. Chinese, English and mathematics) in Taiwanese junior high schools would always win when encountering subject competition in the

school timetable. Historically, many subjects with an integrative nature have encountered sustainability problems and failed to become established as a school subject in the British school curriculum. Examples of this are the failure of European studies and environmental studies to gain a place in the school curriculum in the 1960s (Goodson, 1995).

It is generally agreed that one of the reasons why environmental studies failed to become an academic subject in the late 1960s is because that its content was too broad and integrated to be evaluated. That is, it did not have a strong boundary in Bernstein's terms. Within the formal school system, environmental education could be incorporated into existing subject areas or it could be taught as a subject in its own right. When the former approach is adopted, it is easy to stimulate student interest at the primary level but hard at secondary level because the subject areas are arbitrarily prescribed (Goodson, 1987). The present case studies confirmed this (see Sections 6.2.3, 6.3.3 and 6.4.3). Instruction in Taiwanese junior high schools is done by different subject teachers and when talking about the possibility of teaching environmental education via topic teaching, the school staff were concerned about who would do the teaching. The Riverside health education teacher pointed out this worry in 2004 and said:

> We should not have the topic teaching of environmental education in our school. Who is going to teach it? Which learning area should environmental education belong to? Everyone is overloaded and it is hard to get someone interested in doing it. (Health Education Teacher, Riverside, 2004)

The broad and holistic nature of environmental education (see Section 4.2) is also confirmed in the Taiwanese case studies (see Sections 6.2.3, 6.3.3 and 6.4.3). During the first round of the interviews, more than one third (13/38; 35%) of the school staff expressed concern about the breadth of environmental education. For example, in the beginning of this research, the Riverside ex-principal said it would be too rigid if education at large were divided into specific ones such as environmental education and leisure education.

> Environmental education is too broad … to students, it covers school's material environment and non-material environment which is the harmony of human relationship. This would influence students' learning and is relevant to the hidden curriculum … Education is hard to be divided into one and another as they are closely connected. If you divide education into leisure education, environmental education and so on, it would become rigid. Education should be dealt with an macro view and conducted in a micro way. (Ex-principal, Riverside, 2001)

Due to its broad content, everything done in Taiwanese junior high schools, consequently, could be seen as relevant to environmental education. The Riverside history teacher also said in 2001 that everything relevant to the environment belonged to environmental education.

> Environmental education should be broad with many dimensions. Everything relevant to the environment could be covered. From my subject's view, it should be the caring about our community environment, including its history and geography, and locality. (History Teacher, Riverside, 2001)

Additionally, Taiwanese school staff preferred not to use the term 'environmental education' when teaching topics relevant to the environment. According to the interviews in 2003/04, none of the school staff had ever used the term over the three years studied, because environmental education was involved in students' daily activities. The Parkway instructional director said, in the last round of interviews, using this term would let environmental education become a slogan in education.

> Environmental education is relevant to many things and hard to be done specifically and clearly … Why should we use the term 'environmental education' when doing everything relevant to it? It then would become rigid and a slogan education. Most of the time when we using a slogan means that it was done the worst. Environmental education is involved in our daily life and no need to name it to become a slogan. (Instructional Director, Parkway, 2004)

This suggests that environmental education has not been identified as a distinct subject in these three schools, even though all those interviewed considered they did it already.

The emergence of a new subject can be accompanied by *radical* changes in the nature of teaching and learning in schools such as Design and Technology (D&T) (Paechter, 2000). In the first round of interviews, pre-reform, 62% of the school staff (23/37) in the Taiwanese case studies considered environmental education was simply to do with environmental protection. This view actually existed across the three schools over the three-year study. It would be a barrier to upgrading the status of environmental education in Taiwanese junior high school curriculum if its focus was restricted just to the theme of environmental protection. This indicates that environmental education has not been seen as an emerging subject with radical educational emphasises in Taiwanese junior high schools. It would be seen that there was no need to do anything further with environmental education since every school staff member believed that it was being done daily

already. If school staff did not recognise the radical potential of environmental education, it would be hard to achieve true and distinct subject emergence for environmental education in Taiwanese junior high schools.

However, a subject's radical features could also undermine its final establishment in schools. For instance, by 1994, opposition from teachers and others led to a revision that removed some of the most radical and innovative features of D&T (Paechter, 2000). Without a power base in universities, it was necessary for D&T to become far more academic to consolidate its subject status in the school curriculum. This case again followed the traditional pattern (academic evolution) of subject emergence in schools such as biology and geography (see Sections 3.5.4.1). The characteristics of environmental education mean it has the potential to change present schooling in a much more radical way than that of D&T. These characteristics have brought obstacles to establishing a clear subject status for environmental education in the contemporary school curriculum. Historically, integrated subjects such as European studies and environmental studies have failed to achieve subject emergence within the school curriculum while more strongly bounded subjects such as geography have succeeded in their bid to become established. Here again, in Taiwan, it would seem that the holistic nature of environmental education has encountered problems due to its integrated nature even after its official introduction into the national curriculum.

8.2.9 Material interests (school-based)

From the literature, subject teachers' material interest is one of the themes of new subject emergence (see Section 3.5.4.2) and a kind of resources allocation and professional rewards to teachers. This theme mainly means the subject teachers' pay, promotion and conditions, and is broadly interlinked with the fate of their subject communities. The low status subjects with poor career patterns and survival problems may lead their subject teachers to readily embrace and promote new inventions (Goodson, 1988). For example, rural studies in Britain in the late 1960s was a low status subject emphasising highly utilitarian or pedagogic values and faced survival problems in an education system stressing academic examinations. Moreover, there was no tertiary base and hence no specific university scholars involved to promote its status in schools. Therefore, it was in

the rural studies teachers' material interests to upgrade it into an academic subject by developing an A-level environmental studies syllabus. Another example of subject teachers pursuing higher status and respectability, is the change of Design and Technology from Handicraft in the 1970s (Goodson, 1987). The reason is exactly what Ball (1987) notes, that the status of a particular subject within a school can have an enormous impact on the resources available to teachers and students working in that area.

No evidence of subject teachers' material interests, however, is shown in the literature of successful implementation of environmental education worldwide currently. It seems that the desire of school staff involved in environmental education is *value-driven* rather than *material-driven*, as discussed above. For example, the driving force in Canada to implement environmental education successfully was personal belief and commitment (Hart, 1998). One of the factors contributing to the initiation of environmental education in the New Zealand case study exemplar schools was personal passion (Bolstad, Eames, Cowie, Edwards, & Rogers, 2003). Environmental education, especially the recent paradigm, education for sustainability, has a highly value-laden content (Fien & Tilbury, 2002; Hopkins & McKeown, 2002; Palmer & Birch, 2003; Tilbury, 1995). Historically, environmental education relies on enthusiastic teachers in schools (Eichler, 1977; Fien & Ferreira, 1997). This indicates that environmental education has not fitted into the theme of subject teachers' material interest in the literature contributing to the emergence of a new subject.

Since the second round of interviews, the Taiwanese case studies show that the preference of school staff doing projects and/or research is based on accessing grants for their schools (see Sections 6.2.6 and 6.4.6). It is also the fact of material interest but in the scale of school-based rather than subject teachers. However, *school-based material interests* is not mentioned often in the literature of curriculum history, such as in the emergence of biology or geography. Taiwanese junior high schools always prefer to apply for projects, or the Seed School, for information technology education, because the funds will go hand in hand with the project. This is the reason for both Redbrick and Riverside

applying for the Seed School of ITE. This was evidenced when the Redbrick principal said:

> The seed school of information technology education has a budget and that's why we apply for it. (Principal, Redbrick, 2003)

School-based material interests also influence the implementation priority of those six *Important Issues* in Taiwanese schools, as some *Issues* but not others are distributed with funding. For example, the Riverside instructional director in the first year of curriculum implementation pointed out that career development education, gender education and information technology education were the budget-based *Issues*.

> Most important is the budget from the Ministry of Education. The government will ask for accountability and have evaluation if some Important Issues are allocated with money … Schools will work more on those Important Issues if they following this process … At present, the new coming and most valued Important Issue in junior high schools is career development education … Gender education is a yearly project with regular funds before and after the *Grade 1-9 Curriculum* … Information technology education was done a lot in the past, though the funding is less now. (Instructional Director, Riverside, 2003)

Nevertheless, the budget from the Taiwan's Green School Partnership Network Project (TGSPNP) which Redbrick gained in 2004, was quite small in the scale of school-based development. The amount of the budget could not motivate schools to do environmental education as the Redbrick principal said such a small budget actually meant 'zero' to her school development.

> At present, the funding of environmental education from the Ministry of Education is zero. The Ministry of Education only expected schools to develop software such as instructional designs, teaching strategies, teaching models, and so on. Therefore, the budget of 'Green School' we gained only covers the fees of printing, photocopying, stationery, and a small amount of overtime pay for action research. It is really nothing helpful to school development. (Principal, Redbrick, 2004)

It is clear that Taiwanese junior high schools prefer to apply for funding for material items when conducting school development; such as buying computers, facilities and equipment, constructing new buildings, establishing e-classrooms and multimedia classrooms, and doing greenification and beautification of the school grounds. When identifying what kind of help was needed to teach environmental education in the third round of interviews, two Riverside administrators (the instructional director and director of student affair) stressed finance rather than teaching media/materials. Apparently, school administrators will and can do more work on those *Important Issues* allocated with money from the central government such as information technology education, gender

education, career development education, and human rights education. This theme is confirmed in the literature of successful environmental education worldwide. The 'school-based material interests' is actually the enabling factor that Benedict (2000) described for schools: adequate financial resource for planning and implementing the instruction of environmental education is necessary. In addition, the review of *Whole-school approaches to sustainability*, good practices of environmental education globally, highlights the role of significant and continuous financial support to assist whole-school programs' strategic planning and to focus on improving schools for more effective outcomes (Henderson & Tilbury, 2004). The Taiwanese case studies resonate with the literature on the importance of material interests but in a school-based scale, for the emergence of environmental education in schools.

8.2.10 External constituency (parents)

The external constituency for the development of a new subject, from literature, are the public, including parents, employers, trade unions, universities, scholars, politicians, administrators and others (see Section 3.5.4.2). Examples of school subject emergence influenced by the external constituency are high school biology in USA driven by legislators, educational committees and college professors, high school mathematics in USA supported by curriculum interest groups, US learning disabilities initiated by concerned parents and educators, and 'new' physics in secondary school in Canada developed by physics teachers, university physicists, B.C. Science Teachers' Association, Royal Commission on Education, and central government. The recent technology education curricula in schools was influenced by wider economic, and social as well as educational factors (Gilbert, 1992). The recent emergence of environmental education in schools is also due to these broader factors. Therefore, some interviewees in the case study schools suggested environmental pressure groups, especially educators, strongly advocate environmental education to the Taiwanese central government. For example, in the last round of interviews, the Parkway principal highly recommended that educators request the government to examine environmental education.

> Government policy would be influenced a lot by pressure groups … Educators of environmental education should advocate it loudly to push government into valuing it. They should request the government examine environmental education, as it is so important. Consequently, environmental education may be valued a lot by the public. (Principal, Parkway, 2004)

The present case studies show that the direct external constituency for Taiwanese junior high schools is mainly parents and societal views, which focus on the need for examination preparation so that students can gain high scores in external examinations (see Sections 6.2.5, 6.3.5 and 6.4.5). This is exactly what Sheu (2000) commented, that parents and public in Taiwan assessed the accountability of junior high schools by the number of their graduates attending star senior high schools. This parental pressure can be seen from both teachers and administrators in each of the case study schools. For example, in the second year of curriculum implementation, the Parkway home economics teacher said it was an abnormal phenomenon in Taiwanese junior high schools to pursue only the exam preparation.

> It's better to have less academic pressure to attend star senior high schools so that every school need not work so hard in order to achieve only this purpose … However, the reality is that parents care about it a lot and will check this outcome so that everyone is panicking and working towards it … No choice, no matter city or country every school works very hard currently. It is really an abnormal phenomenon in Taiwan. (Home Economics Teacher, Parkway, 2004)

In the same year, the Parkway principal said school instruction was guided by society, especially parents, in Taiwan. School staff had to emphasise exam-driven instruction for this reason. In addition, the most influential pressure for principals was accessing senior high education.

> Government value something while the whole society and parents do not value it. Schools are usually to be guided by the whole society. Theoretically, we all know education should not be guided by examination. But what can we do if not follow the examination? … The reality in society is hard for schools to get it changed … The principal would receive pressure from teachers, parents and attending higher education and the last one is the most influential … The societal value would evaluate a principal by the number of students attending star senior high schools … The principal had to take the ultimate responsibility of the school development. (Principal, Parkway, 2004)

The phenomenon of 'streaming' in the three case study schools is a product of parental pressure, because streaming is illegal in the Taiwanese education system. Parents with academically high performing children always request schools to stream students in order to upgrade their children's examination marks. Otherwise, they transfer their children to junior high schools with a streaming system. The link in parents' view between the star senior high schools and state universities establishes a ladder leading to professional occupations for their children in the future. Parents place high value on whether or not the school will help their children gain high marks in BCT to attend senior high schools. Thus, school staff realise the ultimate means to raise a school's reputation is student

performance in external examinations. In order not to lose students, schools normally manipulate the school timetable to increase the time for examinable subject teaching. This fact was evident in the Flexible Curriculum (20% or less of the school timetable) in the Taiwanese case studies (see Table 8.1). Even for a school that had successfully piloted the government's 1998-2000 *Trial School Scheme* of the Grade 1-9 Curriculum and continued those excellent trials till the 2001 school year, it was still not helpful for them to gain more Grade 7 students after the new curriculum was implemented in the 2002 school year. In the third round of interviews, the Riverside environment officer said parents in her previous school community still sent their children to study in a nearby school with a 'streaming' system.

> Another school with high ratio attending star senior high school was close to my previous school … That school was warned by the Bureau frequently for their illegal streaming system … Although the result was good in my previous school after joining the trial scheme of the Grade 1-9 Curriculum, parents still did not want to sent their children to study in my school as they supposed that happily learning did not really help their children's future especially when attending star senior high schools. They still sent their children to study in that school. (Environment Officer, Riverside, 2004)

Moreover, all the 32 staff interviewed in this round of interviews hopelessly believed that parents in their schools would value most the number of their graduate students attending star senior high schools. Therefore, school administrators and teachers had to give up, under parental pressure, their ideal educational philosophies in order to have their school survive in the competitive exam-driven society in Taiwan. In short, the power of the entangled relationship between external examination and external constituency is clearly proved in Taiwanese case studies.

The subject associations could be seen as part of the external constituency. Their members include teachers, scholars, university professionals, and interest groups. The literature of curriculum history and successful environmental education shows that subject associations strongly influence and support the emergence of a new subject such as biology, geography, and/or environmental education in schools (see Section 3.5.4.1 and Section 4.4.2). However, this theme was not seen in the data or findings in the Taiwanese case studies. Over the three years studied, no interviewee in the case study schools ever mentioned the Chinese Society for Environmental Education (CSEE), a subject association in Taiwan. No evidence

shows that CSEE was involved in the school development in these schools. This theme (subject association), therefore, has not contributed to the emergence of a new subject in Taiwan, at least in these three schools.

8.2.11 Emergence process: internal value evolution and external compulsion

The model which Layton (1972) developed, and Goodson (1985a) expanded, is that new subjects emerge via internal 'academic' evolution rather than external compulsion such as geography and biology (see Section 3.5.4.2). Layton and Goodson did not mention the pattern of external compulsion by governmental legislation for subjects such as technology education and environmental education. The process of environmental education inclusion in national curriculum globally, however, is not exactly that of technology education when comparing the status of both in the contemporary school curriculum. Environmental education has been externally introduced by various central governments via *infusion* into existing school subjects as a theme or issue, rather than an independent school subject (i.e. technology education). Therefore, the situation of implementing environmental education is actually different from technology education. In fact, environmental education is a unique case experiencing its subject emergence via both internal evolution and external compulsion in the last several decades. It emerged upwards via the internal 'academic' evolution in the school curriculum in the late 1960s, although it failed to sustain this position in the early 1970s, in Britain. As environmental degradation has become more severe decade by decade, many countries have introduced environmental education into schools by external authority. Despite this, the problems and obstacles environmental education is encountering now are still the same as those at the time when it was evolving internally in the late 1960s.

There are many exemplars of schools implementing environmental education in a 'grass roots' way such as Enviroschools in New Zealand, the Green School Award in Sweden, the Green School Project in China, Learning through Landscapes (LtL) in UK, Evergreen in Canada, FEE Eco-schools in Europe, Asia, Africa and South America, and ENSI's Learnscapes in Europe and Australia (Henderson & Tilbury, 2004). In fact, Enviroschools in Hamilton, New Zealand

began in 1993, much earlier than the governmental release of the *Guidelines of Environmental Education in New Zealand Schools* in 1999 (Eames & Cowie, 2004). These national guidelines suggest and encourage schools to develop environmental education programs through a process of school-based curriculum development. However, it is not a mandatory requirement from the Ministry of Education even now. It could be seen as the emergence of environmental education in these exemplar schools following the process of internal evolution. However, it is internal 'value' evolution for environmental education rather than the internal 'academic' evolution for traditional subjects such as biology and geography.

Talking about the topic teaching of environmental education in a grass roots way, the Taiwanese case studies suggest that an uncertain, even contrary, mode existed in Taiwan (see Sections 6.2.3, 6.3.3 and 6.4.3). In the third round of interviews, school staff indicated they would definitely teach environmental education only if the Ministry of Education mandated it. At different times during this research, Parkway's two instructional directors mentioned the powerful influence from the Ministry of Education. The former director said in the first year of curriculum implementation that some schools would not allocate time to the teaching of environmental education without government request.

> If the Ministry of Education does not require teaching environmental education in the school timetable, the focus of each school will be different and some schools may not allocate time to it. (Instructional Director, Parkway, 2003)

In the second year of curriculum implementation, the new director said school staff would definitely cooperate with the mandates to teach environmental education even though they were reluctant to do it.

> Schools must implement environmental education cooperatively if the government does require it. This momentum is much stronger than anything else because we have to do it. The chance will be low if just waiting for schools do it voluntarily … Even reluctantly, school staff will do it if it were required by the government. (Instructional Director, Parkway, 2004)

Some school staff still doubted the effectiveness even under governmental compulsion due to the crowded curriculum. For example, in the same year the Redbrick instructional director said there was no time to conduct activities for environmental education.

> We will definitely do environmental education under government's requirement but it could be a document presented to government … We may follow the document to do something but should not last for a long time … It is so crowded, the curriculum at present and very hard to do something new. (Instructional Director, Redbrick, 2004)

Except for the crowded curriculum, the social value of opportunity to attend star senior high schools was again the crucial reason why junior high school staff would not implement authentic environmental education, even under pressure from the Ministry of Education. In the first year of curriculum implementation, the Parkway former instructional director predictably and sharply said that schools would only produce documents and nothing would be implemented well if the problem of academic competition was not solved.

> The real problem is the pressure to attend senior high education. Everything will be tricky and even fake if this problem is not solved … Everyone will just follow to do governmental requirement and produce documents but may not really do it or say something but act differently. That's all. (Instructional Director, Parkway, 2003)

It can be clearly seen here the most influential theme to the implementation and/or emergence of environmental education in Taiwan is examination rather than governmental requirement.

Another issue to be considered is the learning style of environmental education. A unique characteristic of environmental education is its behaviour orientated emphasis, which the Taiwanese case studies confirmed (see Section 7.4.1). While 69% of the school staff (22/32) in 2003/04 considered that it would be more effective if learning environmental education were made compulsory via school regulations and governmental laws, 84% (27/32) believed that only the voluntary teaching and learning of environmental education would lead to life-long behavioural change. The consensus was that regulations and laws could only achieve behavioural change in the short, not long, term. These contradictory views indicate that a gap exists between the ideal and the reality in the teaching and learning of environmental education in Taiwanese junior high schools. Although, Taiwanese school staff consider environment education programs and student learning would be better if it could be built up via personal belief (voluntary), or emerging in a grass roots way (internal value evolution), they do not see how this will work in Taiwan at the present time. This finding from the Taiwanese case studies confirms that the internal value evolution of environmental education as it has happened in exemplar schools worldwide could

be the most appropriate approach to the implementation of sustainable environmental programs in schools but this has not yet been achieved in Taiwan. Thus, most of the Taiwanese school staff would be prepared to address environmental education within their subject area without identifying it as such. The suggestion was that to do so could undermine their own subject programs. For example, in the third round of interviews the Parkway mathematics teacher worried that he could be questioned that he did not teach mathematics properly for teaching more about environmental education.

> At present, I don't feel that I need to stress environmental education a lot, because the real goal of my teaching is to achieve the understanding of mathematics. It will become a burden as students and parents might think we teachers are talking something not relevant to mathematics, if we do teach environmental education a lot. (Mathematics Teacher, Parkway, 2003)

He said in 2003 that he would be happy to explicitly teach environmental education once it had been accepted as mainstream by society.

> We'd better teach more about environmental education and name this term after the whole society and parents come to value it very much, and environmental education becomes the mainstream of our society. (Mathematics Teacher, Parkway, 2003)

This indicates that educational changes in Taiwanese junior high schools would follow the changes in society. In conclusion, the situation in Taiwanese junior high schools is that the implementation of environmental education should be via a grass roots approach or internal value evolution, but this has not been achieved. The perception was that it might be achieved after a *social change* especially on the area of *value* in society. At present, the implementation of environmental education in Taiwan, at least in these three schools, will be more effective by external compulsion via governmental request.

8.3 Particular Themes for the Case of Environmental Education

In this thesis, the three themes discussed in this section are indispensable to environmental education but not so necessary to other school subjects in relation to the literature on the emergence of new subjects. They are, however, mentioned in the literature on successful environmental education worldwide, and their importance is confirmed in the Taiwanese case studies when introducing the new subject of environmental education into schools.

8.3.1 Local environment involvement

Undoubtedly, the local community and environment is much more important to environmental education than to other school subjects. The typical learning environment for traditional disciplines consists of classrooms and/or laboratories in schools and universities where selected content is introduced and discussed (Goudswaard, 1977). Learners are expected to develop abilities in order to function more effectively in the human-made world. There is actually a psychological separation, in Goudswaard's view, between learners and traditional school subjects except art, music and others pursuing self-expression. In contrast, environmental education programs seek to encourage students to look at their surroundings and their own place within them with a more practised eye, a more involved heart, and a more responsible mind (Wolsk, 1977). Others have made the same point in 1977: Johannes Goudswaard asserted that environmental education was orientated towards community action and Jan Cerovsky pointed out that the local environment played an important teaching role to environmental education. It is exactly environmental education building the problem-solving skills that clarifies the relationships between natural and human-made systems and encourages values and behaviours sensitive to these relationships. The successful ENSI project in European countries lightens the role of the school generating concrete knowledge about the local environment for community use rather than merely transmitting abstract knowledge in dissociation from its local applications and uses (Elliott, 1998). The successful New Zealand example, Otari School, shows that the local stream and bush became a teaching inspiration and a resource for doing environmental education (Bolstad, 2004). Another outstanding example is Raglan school creating an 'Envirocommunity' rather than just an 'Enviroschool' in New Zealand (Rogers & Barker, 2004). This special characteristic of environmental education, working closely with the local community, is not absolutely necessary for any existing school subjects.

From the Taiwanese case studies, all 32 interviewees in 2003/04 said that the sound relationship between their schools and communities should be mutually interactive (see Sections 6.2.3, 6.3.3 and 6.4.3). However, the interactions they enumerated across the three schools were similar to each other, as shown in Table 8.2.

Table 8.2 The interaction between schools studied and their communities

	Redbrick	Parkway	Riverside
Parents' board	* meeting with principal weekly or frequently in addition to regular meetings.	* meeting with school administrators regularly.	* meeting with school administrators regularly.
School activities attended by community people	*parents day (meeting with teachers); *policy advocacy seminars (parents-students); *school festival; *educational seminars (parents - students); *seminars (community primary teachers).	*parents day (meeting with teachers); *policy advocacy seminars (parents-students); *school festival; *educational seminars (parents-students); *parental growth workshops.	*parents day (meeting with teachers); *policy advocacy seminars (parents-students); *school festival; *educational seminars (parents-students); *community concert; *parents-homeroom teachers meetings per class.
School grounds access	*community people come to have a walk in the early morning & late afternoon; *community people borrow auditorium for activities; *community people attend night class to learn computer and English.	*community people come to exercise and play tennis after school hours; *community people borrow auditorium and classrooms for activities; *community people attend night class to learn computer and English.	*community people borrow auditorium and classrooms for activities; *community people attend night class to learn computer and English.
Community mothers' involvement	*road duty; *library management.	*road duty; *library and guidance office management; *recycling (Tzu-Fu-Sr).	*road duty; *library and guidance office management; *school activities; *ringing up when students with bad behaviour outside of the school.
School use of community facilities for instruction	*teaching swimming in community swimming pool during summer & winter vacations; *community historical club helped to do outdoor education once (in community river in the 2002 school year); *visiting community archaeological site (in the 2003 school year).	*teaching swimming in community swimming pool during summer & winter vacations (NOT NOW); *students' assignments of summer/winter vacations (visiting community); *introductory books of park plants.	*regular outdoor education via social studies to visit community temple; *biology workshop via community river (NOT NOW); *books of community temple and river.
Relationship with community organisations	*offering classrooms to community university's evening teaching; *social groups in Taichung City give lecture to teachers & students once a while; *students co-operate with emotional researches.	*community park officers ask students' to help cleaning parks.	*community temple offers scholarship to students; *students visiting their mother primary schools on teacher's day to express thanks to their primary teachers (NOT NOW); *community clean-ups (NOT NOW).

Mainly, schools would have regular meetings with their parents' board (see Table 8.2). Community members would attend school activities and use the school grounds to run educational/recreational programs. Community mothers would help to do road duty and library management. Sometimes, schools would use community facilities for instruction and have friendly relationships with community/city organisations. Only Riverside held regular outdoor education - social studies visits - to its community temple.

In the second year of curriculum implementation, although nearly four fifths (25/32; 78%) of the school staff identified with the potential of environmental education to advance the interactive relationship between their schools and its community, their views of its effectiveness varied. A quarter (8/32; 25%) of the school staff were pessimistically of the opinion that it would have little or no effectiveness because the exam-driven society in Taiwan did not encourage school involvement in the local environment as a part of school development. Some school staff even complained about the opening school grounds to the public as it added an extra cleaning job for their students. For example, at the end of this research the new Parkway instructional director said she felt it was a burden having close relationship with their school community.

> Our school grounds are opened to the public to play tennis and other sports after school hours. The problem is that community people did not keep the sports field and toilet clean. Our students have to do a big clean-up every morning. We are becoming furious and thinking to shut our school grounds. However, community people would be angry if we did shut the door. It becomes our headache. Thus, we feel it is too much of a burden having close relationship with our community except for some activities. (Instructional Director, Parkway, 2004)

Among those who considered environmental education could enhance a mutually interactive relationship, more than one third (9/25; 35%) of them suggested community clean-ups, but they believed this would need to be done for a long time before it was effective. Again, cleaning-up indicates that *environmental protection* might be considered the main focus of environmental education in Taiwanese junior high schools. Only one sixth (4/25; 16%) of the school staff supposed there would be a very strong influence, under the successful implementation of environmental education, to enrich this interactive relationship.

From the above, the Taiwanese case studies did confirm the importance and the potential of local environment involvement, though it was not obviously shown in a universal way as yet. The Riverside environment officer's previous school had developed its school-based curriculum for environmental education and did a very successful job. The Riverside environment officer said the school staff strongly relied on their local environment to develop teaching materials for environmental education.

> Because of the geographic location, environmental education was chosen to be our school-based curriculum in my previous school. The local environment there includes a park which was transferred from garbage disposal after greenification and beautification, an industrial area with many factories, a refinery, and a river. Therefore, we brought students to visit these places and designed activities via these resources to let students attend them. These four spots were very rich to expand environmental education and could be visited more than once. Within four years, two years before and two years after the curriculum change, we developed a whole series of learning sheets and teaching materials adequate to Grades 7, 8 and 9 students respectively. (Environment Officer, Riverside, 2004)

This small school, therefore, gained a reputation by following the essence of the new Taiwanese national curriculum and many people came to see their achievements. Thus, the theme of local environment involvement is apparently indispensable to the new subject of environmental education, rather than contemporary school subjects. However, this school did not gain many more Grade 7 students to study there, according to the Riverside environment officer (see Section 8.2.10), because parents ultimately valued student performance in BCT more. This shows the dilemma and awkward situation Taiwanese junior high school staff face. In fact, 'reciprocal community' and 'family involvement' are essential to, and one of the key features of, successful school implementation of environmental education globally (Henderson & Tilbury, 2004). In contrast, none of the contemporary school subjects seem to depend so strongly on school-community interaction.

8.3.2 Transformative nature with whole school involvement

The scope of environmental education has grown much broader over the last half century, encompassing many parallel movements concerned with education for relevance and social change (see Section 4.5). Obviously, the challenges associated with environmental degradation and sustainable development have important implications for, and connection with, education at large and schooling

(Rickinson, 2001). Currently, successful environmental education worldwide seeks to act as a 'transformative' catalyst of change in education at large. Transformative in the sense of a *radical* change brings about changes in both perspectives and initiatives within educational institutions working to deal with the problems now being faced at a global level.

As early as 1977, Wolsk reminded educators that along with wanting students to look outward, which is an important goal of environmental education, teachers and others in the education system also needed to look inward - to the 'system' itself. Therefore, the introduction of environmental education could be viewed as a process of educational change for systemic change to institutional frameworks (Benedict, 1999). The paradigm shift of environmental education is from teaching about, in, and for the environment to it being a catalyst of systemic educational change and being a model for the 'new learning' in the twenty first century (see Section 4.5). This shift shows that the real need in both environmental education and education at large is to change from 'transmissive' towards 'transformative' learning. It requires radical thinking and action with a systemic change at all levels. In the early 1990s, a UNESCO Asia-Pacific program *Educational Innovation for Development*, highlighted the issue that future-oriented educational change would inevitably involve change and redirection of the 'education system' (Singh, 1991). It is reported that much of the crisis in education at large in most countries, has its origin in institutions which are replicating rather than creative, and dominated by the system. Therefore, transforming the system by restructuring and reorientation will be critically important. Nevertheless, this view is not new but just reinsures the importance of the UNESCO's viewpoint several decades ago: the application of 'ecological thinking' to educational methods (Wolsk, 1977). These methods exist as part of an open-ended complex system, which should include selection from alternative methods, the application of the method to different objectives/ages/learning sequences, the relationships with the rest of the school programs, the feedback and evaluation of learning outcomes, the action programs in community development, and the *integration* of the school subjects. From what has been discussed above, the style of new learning for the education at large in the twenty first century is equal to the essence of environmental education.

Without using this terminology, and without being aware of these chronological paradigm shifts, the staff in the three case study schools all suggested they were aware, at least to some extent, of the *transformative* nature of environmental education (see Sections 6.2.3, 6.3.3 and 6.4.3). They commented that environmental education could enhance their school educational goals: health, honour, diligence and gratitude (Redbrick); safety and health, technology and humanities, liveliness and aggressiveness, ability and achievement (Parkway); love and concern, cultivation of talents: local concern with worldwide view, happy learning with adaptive development, self-loving to love others and regulating by others to self-regulating, using technology to do active exploration, reflection and practice (Riverside). The Taiwanese school staff also believed that environmental education could enrich education at large, as whole-person education. This was their ultimate goal for education. All of them said that they should teach more than examinable knowledge. Yet, good practice of environmental education would take a long timeframe, especially in increasing school reputation. For example, the Riverside English teacher said that environmental education could only indirectly increase the school's reputation.

> The improvement of the school grounds does increase school reputation immediately … The educational part of environmental education will need to take time in order to show its effectiveness. It will help to increase school reputation but not a direct factor, as it won't have immediate outcomes. (English Teacher, Riverside, 2004)

Thus, Taiwanese junior high school staff hesitated to promote the teaching of environmental education in their schools as it is a demanding and transformative job. Environmental education contemporarily done in these schools did not seem to engender school staff confidence in the enhancement of school reputation, because the public (especially parents) would still value examination performance at the end when evaluating whether a school is good or not. Here again, the Taiwanese case studies confirm the potential of environmental education to supplement school educational goals and proliferate education at large, but these have not yet been achieved in Taiwan.

As how to achieve a transformative environmental education in schools, owning radical thinking to act liberally seems to be the essential prerequisite among school staff in Taiwanese junior high schools when implementing environmental education. A *whole school approach* would be the most necessary requirement.

The exemplar schools in NZ's Enviroschools, Sweden's Green School Award, China's Green School Project, UK's Learning through Landscapes, Canada's Evergreen, FEE's Eco-schools and ENSI's Learnscapes are all examples of whole school approaches to integrate environmental education across the school curriculum (Henderson & Tilbury, 2004). Most of them are primary schools where it is easier to achieve curriculum integration than in secondary schools. However, a new trend with more and more secondary schools working via a whole school approach to implement environmental education at least has occurred in New Zealand (Bolstad, Eames, Cowie, Edwards, & Rogers, 2003). Although no evidence was shown from the three case study schools to support this strategy, the Riverside environment officer's previous school did implement environmental education successfully via a whole school approach. She said all the staff in her pervious school worked together preparing everything for the new curriculum, including environmental education.

> Whether or not teachers have pressure to learn new stuff is relevant to its whole school atmosphere … All of the school staff in my ex-school worked together executing the Trial Scheme and prepared everything for the new curriculum including environmental education … As to my present school, it still follows the old curriculum. The responses of these two schools are quite different … My ex-school then gained reputation after doing the Trial Scheme … Many visitors came to learn from us. (Environment Officer, Riverside, 2004)

This is exactly the reason why the Redbrick principal and instructional director pessimistically expressed that environmental education could not be one of their school characteristics after the curriculum change. Only if the whole school staff worked together, could it possibly create successful environmental education. In the second year of curriculum implementation, the Redbrick principal said too few teachers in her school working together in the 'Green School' project.

> It's too early to say that 'Green School' will become one of our school characteristics. I can't see its possibility yet. There are only two teachers joining the project of 'Green School'. Further, one of them is a practicing teacher and will leave our school in the next school year … We even don't know whether we can continue it in the future or not. (Principal, Redbrick, 2004)

The Redbrick instructional director said teachers might not be happy with the extra time and workload required to be a green school.

> It will be still difficult to get the project of 'Sustainable Campus' rooted in our school as it needs many teachers involved in this project. Teachers might not be happy with the extra time and workload required. It could be possible only if many enthusiastic teachers or the whole school staff are interested in and would like to do it. (Instructional Director, Redbrick, 2004)

One of the reasons Raglan school in New Zealand could expand from a Enviroschool into an upper level Envirocommunity was *principal support* (Rogers & Barker, 2004). The school principal is the key to his or her school involvement in the whole-school approach, as those enthusiastic school staff who initiated to develop environmental education in New Zealand exemplar schools usually include the principal (Bolstad, Eames, Cowie, Edwards, & Rogers, 2003). In fact, each individual school is a basic unit of the education system. It would be hard to demand a nation's education system be changed in a very brief time, but it could be more possible to have school leaders who changed their thinking in order to act differently in their schools within a short term. The Riverside environment officer in the Taiwanese case studies also stressed the influential role of her previous principal especially when they implemented the successful topic teaching - environmental education. In the second year of curriculum implementation, she said whether or not a school conducted out-of-school visits very much depended on the principal's decision.

> I think the reason why my ex-school could make the topic teaching of environmental education and especially out-of-school visiting is still relying on the principal … whether the principal wants to take responsibility and do it or not … It won't cause parents much money when visiting governmental organizations, park, river … parents only need to pay insurance and car rental … the problems of maintaining order among students when conducting out-of-school visiting could be overcome and it depends on whether the principal and directors would like to run these activities or not. (Environment Officer, Riverside, 2004)

Therefore, in the summary of findings of the international review of whole-school sustainability programs, Henderson and Tilbury (2004) identified 'school leadership' as one of the key features characterising the vision of a sustainable school. Once school leaders could think and work in a transformative way, the future-orientated education and/or environmental education could possibly be achieved. Undoubtedly, other contemporary school subjects would not need as much leadership from school principals as environmental education does.

8.3.3 National cooperation network

Syd Smith (2005) stated that schools were unable to succeed in educating their students and communities for a sustainable future if they were left to develop their programs alone. He argued that schools need the full participation of their communities, government and NGOs. Seen this way, the cooperative network for

the emergence of environmental education could be divided into three levels: school-based, local, and national. The reason leading to success of Otari school in New Zealand is the cooperation and support from local government offices and private sectors including the provision of teaching materials, funding and human resources (Bolstad, Eames, Cowie, Edwards, & Rogers, 2003; Bolstad, 2004). Such a demanding job actually could not be achieved if it relied soley on school teachers' enthusiasm and commitment. Raglan school relied on a cooperative network of community environmental groups and governmental agencies to run its school-wide environmental education and thus lead to an Envirocommunity in that area. However, the case of either Otari or Raglan school in New Zealand belongs to the lighthouse effect, as John Fien in 1997 described exemplar schools of environmental education in Australia (see Section 4.4.3). The support structures should reach schools on the scale of national rather than local or school-based level so that the influences of environmental education could be permanently rooted nationwide.

Although no school staff in the Taiwanese case studies directly suggested the idea of a national cooperation network, many teachers emphasised the need to have support beyond their schools, especially from the government, when implementing environmental education. At the beginning of this research, for example, the Redbrick scout-training teacher in 2001 said the implementation of environmental education should not only rely on schools.

> Our government should be more efficient; otherwise, environmental education couldn't be implemented well only relying on schools. (Scout Training Teacher, Redbrick, 2001)

The Parkway environment officer also said in 2001 that non-formal education and government offices should help schools teach environmental education because this would enhance the execution of the government's environmental legislation.

> Mass media, newspapers, TV, and government agencies should catalogue the reasons leading to disasters and implant these ideas to public … schools should teach environmental education but it is a cooperative role to the establishment and execution of laws. (Environment Officer, Parkway, 2001)

Cooperation among students is also an essential learning task when conducting an environmental education program in schools. In addition to co-operative learning, Henderson and Tilbury (2004) stated that student-centred learning and action learning are the pedagogical approaches required to reflect the content and

process of Education for Sustainability. This characteristic is special to environmental education rather than other contemporary school subjects. A cooperation network thus becomes a key and crucial factor leading to the success of environmental education.

A very successful country example is Norway (see Section 4.4.2). In addition to establishing compulsory pre-service and in-service teacher education and providing a time allocation in primary and secondary schools in the early 1990s, Norway built an innovative system of inter-sectoral cooperation 'country contact groups' and fostered discussion about the local environment and schools by key players from both governmental agencies and NGOs. They also established an environmental education network as a forum for the exchange of environmental information between schools and local and regional management in different sectors, and with research institutions. Norwegian students will soon be involved in a national program. It could be a project such as mapping biological diversity, by accessing taxonomists, ecologists, museum collections and other resources through a network and national database (Benedict, 2000). The results of presentation and communication will be on the Internet to enhance students' further learning.

Henderson and Tilbury (2004) highlighted the importance of partnerships and school networks leading to critical success in global whole school initiatives. For success nationwide, however, the partnerships and school networks should be expanded to a country level to achieve national success of environmental education and/or education at large. This network should include central and local governmental agencies, research institutions, universities, educational organisations, subject associations, private sectors, commercial and industrial sectors, and especially schools. Obviously, no contemporary school subjects need such a huge supporting network during their emergence in schools.

8.4 Summary

This chapter moves between the literature and Taiwanese case studies to respond to the fourth research question: What are the crucial themes in curriculum change

for the introduction of the new subject of environmental education? The particular themes when introducing the new subject of environmental education during a curriculum change have been evaluated and, based on this; this chapter presents the eleven plus three additional themes, from the viewpoint of this thesis, that need to be taken into account when introducing a new subject specifically for environmental education into schools.

The argument arising in Section 8.2, which confirmed the themes described in the curriculum history literature, was about the internal 'academic' evolution of a new subject's emergence. Even with external compulsion, as has been the case for environmental education since the 1990s worldwide, these themes are still decisive. The eleven themes are: the possibility of gaining external examination credit and entry to a university department, the prioritising of the subject in school timetabling and programming, and the development of a systematic syllabus. Next, are the presence of strong central government leadership and the provision of sufficient teacher professional development. Further themes are the inclusion in the informal as well as the formal curriculum in a school and the inclusion of environmental education in non-formal education in society. Still, further themes are the presence of clear subject characteristics and definition, the presence of substantial school-based material interests, and the gaining of support from an external constituency, especially parents in the case of Taiwan. Finally, the last theme is the internal value evolution plus external compulsion, i.e. recognition of the value of environmental education within a school coupled with governmental mandate. In the Taiwanese case studies, internal value evolution was less important than external compulsion.

Section 8.3 described themes not so indispensable to other school subjects in the curriculum literature but which were apparently indispensable for successful introduction of environmental education: establishing local environment involvement by setting up long-term partnerships with local groups, a whole-school approach via curriculum integration to the transformative nature of environmental education, and a sound national cooperative network built up with central governmental agencies, research institutions, universities, subject associations, private sectors, and schools. When checking these three particular

themes, environmental education is found to be special or substantially different from any other contemporary school subjects.

Discussion in this chapter has highlighted the need and importance of considering these themes when introducing or developing any new subject in schools. If these themes are not taken into account, as was the case for environmental education in Taiwan, it is unlikely that the emergence of a new subject will be achieved in schools, especially environmental education during a time of wider curriculum change. Although the pattern of school subjects has been established over the last 2000 years, subjects in the school curriculum often became isolated from one another and from students' life experiences. To students, life is not compartmentalised in the way that subjects have been compartmentalised in the school curriculum. It is certainly possible that environmental education, in contrast to most existing school subjects, will be able to integrate students' daily life experiences and contribute to the dissolution of the boundaries of school subjects, regions, and nations to achieve a new era of sustainability. Undoubtedly, environmental education cannot follow the traditional process of new subject emergence. If no consideration is given to the three particular themes (local environment involvement, transformative nature, and national cooperation network), it appears that environmental education could be marginalised and not be fully implemented in schools, at least in Taiwan.

CHAPTER NINE:

CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

"If ESD is seen as yet another isolated societal issue to be squeezed into the curriculum, or yet another topic to be given as an elective, then little progress will be made."
Charles Hopkins and Rosalyn McKeown (2002) in *Education for sustainable development: An international perspective*, p. 23.

9.1 Introduction

Environmental education has increasingly gained emphasis since the late 1960s in school curricula worldwide. However, it is seen as difficult in many countries, including Taiwan, to get environmental education into the mainstream of education. Despite the continued efforts of enthusiastic school staff and governments worldwide, environmental education still has a marginal status in most school curricula, especially at junior high or secondary school level.

This thesis investigated how Taiwanese junior high school staff thought about, and worked towards, the introduction of environmental education in their school development plans, in the context of a large-scale curriculum change. Data generated through interviews, school and government document analysis, observation, and a questionnaire showed that both the Taiwanese government and junior high school staff valued environmental education but, paradoxically, did not work for its inclusion to the extent that their professed commitment would suggest.

The findings of this thesis indicate the importance of, and need for, supporting measures to successfully underpin governmental intended change during curriculum implementation. Many issues need to be considered when introducing a unique subject such as environmental education. This chapter presents the conclusions, implications and recommendations of this thesis in relation to the introduction of environmental education as a new subject in the Taiwanese junior high school curriculum.

9.2 Conclusions

There are two main conclusions from this thesis with regard to the introduction of environmental education in the context of the 2002 curriculum change in Taiwanese junior high schools.

1. **The infusion strategy was inadequate to promote the implementation of environmental education (see Section 7.4.1).**

   In the 2001 Taiwanese curriculum reform, it was the government's intention to introduce the new subject of environmental education into a revised national curriculum via an *infusion* strategy. This represented a *laissez-faire* attitude from the government as the suggestion was that teachers teach and implement environmental education, *whenever possible*, in their subject/area teaching and through school development. However, at least in the three Taiwanese junior high schools studied in this research, the implementation of environmental education via infusion through the seven learning areas has met with only limited success.

   The four reasons why the infusion strategy designed for environmental education via this national curriculum change did not work are discussed in the following sections.

   1.1 School staff did not recognise the significance of curriculum integration and school-based curriculum development within the curriculum reform (see Section 7.6).

   The lack of success of environmental education was largely because Taiwanese junior high school staff did not really agree with, or comprehend, two general features of the reform: *curriculum integration* and *school-based curriculum.* Overseas experience suggests that these factors are essential in implementing environmental education. The teachers in this study basically had a compartmentalised view of the seven learning areas. Hence, the attempt to introduce a cohesive environmental philosophy across a disjunctive curriculum was bound to be inadequate.

1.2 School staff did not recognise the potential of environmental education to enhance their school reputation (see Section 7.4.1 and Section 8.3.2).

A major reason for the lack of real change to the position of environmental education in Taiwanese junior high schools was that school staff did not see it as having the potential to increase their schools' reputation, especially in the short term and in comparison with a focus on enhancing student exam performance. They believed that environmental education could expand their schools' educational goals in the long term rather than their schools' reputation in the short term. Despite international experience showing that success in environmental education can lead to wider success in education, this study provides evidence it can be difficult for school staff in an exam-driven society to prioritise implementing environmental education via a whole school approach, something that has been shown to lead to successful education in schools.

1.3 The emergence of environmental education depends on a set of themes, some of which are relevant to other school subjects and some of which are particularly salient to environmental education. Many of the themes were not recognised or valued by teachers in the study (see Sections 8.2 and 8.3).

The successful emergence of an innovative and holistic subject such as environmental education in Taiwanese junior high schools, involves eleven *themes* common to the introduction of new subjects into the school curriculum. These themes comprise the possibility of gaining external examination credit and entry to a university department; the prioritising of the subject in school timetabling and programming; the development of a systematic syllabus; the presence of proactive support from central government leadership; the provision of teacher professional development; the inclusion in the informal as well as the formal curriculum in a school; the inclusion of environmental education in non-formal education in society; the presence of clear subject characteristics and definition; the presence of substantial

school-based material interests; the gaining of support from an external constituency, especially parents; and the presence of an emergence process that couples internal value evolution with external compulsion. The case of environmental education in Taiwanese junior high schools illustrates the implications that arise when environmental education is not part of an external examination and a university department, teacher professional development, a syllabus, a priority in school timetabling and programming, and does not have support from parents. It highlights how the integrative nature of environmental education and ineffective central government leadership can cause difficulties. The dominance of exam-driven instruction underlines how important both informal curriculum and non-formal education are. In this situation, environmental education needs to rely on the gradual evolution of a perception of respect and value within the school community. This internal value evolution had not been achieved yet for environmental education at the time of study. Overseas studies have shown external compulsion is ineffective. In the schools studied in Taiwan, the emergence of environmental education in junior high schools under the present curriculum reform would seem to be reliant on external compulsion.

This thesis draws attention to the importance of taking into account three additional themes as particularly salient to environmental education: the need to set up long-term partnerships with local groups that have an interest in or responsibility for the local environment (e.g. societies, agencies and non-governmental organisations) to achieve *local environment involvement*; the need for a whole school approach through curriculum integration to achieve the *transformative nature* of environmental education; and the need to build up a sound cooperative network that includes people at all levels of the education system and society to achieve a *national cooperation network.* As an outcome of the Taiwanese case studies, these three additional themes (local environment involvement, transformative nature, and a national cooperation network) are recognised by the researcher as being both

essential and indispensable in Taiwanese junior high schooling, but this have not been achieved in the three case study schools. If this extended menu of themes is not considered, the successful implementation of environmental education will be difficult to achieve, at least in these three Taiwanese junior high schools.

1.4 The low subject status of environmental education severely retards its implementation in the Taiwanese junior high school curriculum and in society (see Section 7.5.3).

Subject status, especially in relation to legitimisation as an examination subject, was significant in the implementation of environmental education in the 2002 curriculum change in three Taiwanese junior high schools in this study. The reform has left largely unchanged the hierarchy of school subjects. The highest subject status belongs to the examined learning areas of Chinese, English and Mathematics, followed by Science and Technology, and then Social Studies. Arts and Humanities, Health and Physical Education, and Integrative Activities, which are not examined as part of the system of access to senior high schools, have low status in schools. Environmental education does not belong to either an examinable or a traditional non-examinable learning area. Its status in the schools continued to be low over the time of the study. In Taiwan, the exam-driven nature of society has continued to support and contribute to exam-driven instruction in junior high schools. Raising the status of environmental education is imperative. However, this implies changes in the deep structure in society with regard to values about education.

2. Environmental education co-evolves with education at large (see Section 8.3.2).

Considering the extended list of themes outlined above, environmental education needs to operate at the whole school level and in conjunction with outside agencies, if it is to be successful. These parameters for

environmental education are, in fact, the parameters of an emerging vision of education at large. This vision attests to the value of critical, creative and innovative education in the twenty first century. It seems likely that only when school education is reconceptualised as a transformative device will environmental education be able to be introduced successfully. Put another way, it seems likely that only when environmental education's objectives are seen to fit with the objectives of education school and society wide that the successful implementation of environmental education will be achieved. This then will be exactly what Taiwanese educators intended before the curriculum change: the era of environmental education would come with successful implementation of the curriculum reform (see Section 1.2). The co-extensive relationship between environmental education and education at large is clearly shown from the tenth core competence "independent thinking and problem-solving" in the *Grade 1-9 Curriculum*, and the 5-3-4 competence indicator for environmental education in Taiwan "organise a team with peers in order to learn and to plan how to solve environmental issues through democratic and autonomic process". Trying to squeeze environmental education into discrete periods in a school's timetable is unlikely to allow for the realisation of its holistic and transformative nature as exemplified in the above competence indicator.

Education is one of the main ways a society has of social reproduction so as to achieve social construction. Hence, education is deeply socially embedded and can be seen to reflect the dominant social values and power structure. In Taiwan, this is reflected in the exam-driven instruction in junior high schools. Thus, the successful introduction of a unique subject such as environmental education not only needs a *radical* change in the thinking of school teachers and administrators about education but also in parents and society at large.

9.3 Implications

There are three phases in the curriculum change process: initiation, implementation, and continuation or institutionalisation (see Section 3.4.1). The

final phase is the most crucial as it determines whether the change becomes built in as an ongoing part of the system, or disappears through attrition or by way of individual decisions. The lessons that can be learned from the introduction of the new subject of environmental education in the new Taiwanese national curriculum are discussed in this section.

9.3.1 Implications for curriculum change generally

All curricula are value-laden. The new Taiwanese national curriculum could be seen as a social-historical product that embeds aspects of Tyler's objective model and Stenhouse's process model of curriculum. It was derived from an historical imperative of economic, cultural, and democratic development and the social problem of the need to change education. The design of the core rationale (see Section 2.3.4.1), curriculum goals and core competencies (see Appendix 2) of the new Taiwanese national curriculum reflects the predetermined goal setting of Tyler's objective model (see Section 3.2.3). These goals are set to bring certain behaviour changes in education. The inclusion of curriculum integration and school-based curriculum (see Section 2.3.4.1) in the new Taiwanese national curriculum could be related to Stenhouse's process model (see Section 3.2.3). The establishment of the school-based curriculum is a developmental process accompanied by curriculum integration across all the seven learning areas. These two aspects - curriculum integration and school-based curriculum - allow a process of growth and social development that requires participation from all groups within a school.

From the Taiwanese experience, it would seem that curriculum change struggles to achieve its stated goals if it is large in scale with many changes required in a short timeframe (see Section 7.5). The Taiwanese experience suggests it can be difficult to produce any real change when the curriculum change model adopted is a centre-periphery model with power-coercive and empirical-rational strategies (see Section 3.3.3). In this case, the centre-peripheral model could be seen in the Taiwanese government's setting up of innovation project teams to lead the reform process. By implication, schools were regulated to the role of receiving the reform. The implementation of the new Taiwanese national curriculum via central government administrative order can be seen as a power-coercive strategy.

The empirical-rational strategy could be seen in the workshops run to persuade teachers to adopt the new curriculum. From another perspective, the findings confirm that curriculum change is not necessarily successful if it belongs to a top-down technological perspective of change. The technological perspective in the 2001 Taiwanese curriculum reform could be seen to be underpinned by the assumption that teachers are technicians and teacher training will bring about improvement in education. Real change, particularly for the teaching and learning of environmental education, is more likely to happen if teachers and school administrators are willing to make the intended government changes in a grass roots way, especially given whole school change is recommended for its successful implementation. This involves school-based change where teachers themselves are the change agents. This change process is consistent with a bottom-up or periphery-centre model with a normative-re-educative strategy (see Section 3.3.3). In school-based change models, teachers work collaboratively to shift their school culture to more productive norms.

The findings of this study lend support to the work of Jang (1999) who proposed a comprehensive set of factors as influences on curriculum implementation (see Section 3.4.4). Jang's factors were: the characteristics of the innovation suit the needs of users with clear goals/strategies and workable supporting measures; local factors such as strong leadership from local government and the school principal, along with support from the school community and good communication among teachers; strategic planning factors such as teacher development, good communication among organisations and discussion of problems that happen in the implementation process; and finally, external environment factors such as the adjustment of government policies, expert advice, financial resources, and technical support. In the case of the 2001 curriculum reform in Taiwan, the findings of this study show that without workable supporting measures including strong principal leadership with support from school community, sufficient teacher professional development, good communication among organisations, proper expert advice, practical government policies and adequate financial resources, curriculum change struggled to achieve the intended goals.

The Taiwanese experience also clearly shows a *social control* (examinations as a first priority) influence on the junior high school curricula. Basically, the educational philosophy of Taiwanese junior high teachers is a whole-person education. However, the strong pressure from society, especially parents, pushes them to modify, or even give up, their educational views about teaching content and/or method. School administrators also have to cope with this social control. This fact supports Anderson's (1992) assertion in the book, *Global Education*: the source of *educational change* within schools actually relies on the *social change* in society preceding it rather than the reverse (i.e. with schools leading changes in society). It would be hard to expect any significant change to occur in schools, if there is no significant change in Taiwanese society especially its social values.

Moreover, the emerging characteristics of education at large in the twenty first century, as discussed in Section 4.5 and Section 8.3.2, are those of integrated projects and theme-based learning rather than subject-based learning. The idea is that every topic, theme, or issue should be integrated across subject areas and learning communities, and far less restricted to a discrete timetabled period. Obviously, the key features of environmental education equate with these characteristics of education at large. Education and environmental education can be seen to be two sides of the one coin, evolving and influencing each other to a great extent. The successful implementation of environmental education worldwide could lead to successful education at large, and vice versa.

9.3.2 Implications for environmental education in Taiwan

A key issue raised by the findings of this thesis is the lack of effectiveness of the *infusion* strategy. This study shows that the status of environmental education did not markedly increase from its initial lowly position after curriculum implementation in any of the three Taiwanese junior high schools studied. This resembles what happened in England and Wales with the introduction of the National Curriculum in the 1990s when environmental education was introduced as one of five cross-curricular themes within the subject-based culture of the British secondary school curricula. It is hardly surprising that many Taiwanese junior high schools still spend the majority of the school day teaching examinable subjects rather than introducing the new cross-curricular *Important Issues*,

especially environmental education. When a new subject like environmental education is introduced in a rather nominal, under-resourced and generally half-hearted way, the reality of teaching at the classroom level could hardly be expected to change.

It is clear that infusion is an inadequate curriculum change strategy for the implementation of environmental education. Further, it is not realistic to expect environmental education to be prioritised, and taught, in a situation where it competes as one of the six options that have been allocated less than 20% of the curriculum time per week. The international literature about the transformational nature of environmental education suggests that it really has to be implemented through a *whole school approach* via *curriculum integration*. Due to its nature - holistic, interdisciplinary, problem-centred, value-oriented and community-oriented and the centrality of issue-based, problem-solving, student-initiated activities, and local to global dimensions, successful environmental education requires support via a bottom up whole school philosophy and cooperation from communities in the local area along with the integration of school subjects towards learning about local environmental issues. In addition, an adequately financed and effective educational system, especially at junior high level, is the key to encourage and/or require the development of a whole school consciousness towards the teaching and learning of environmental education. Moreover, a national cooperative network combining a variety of sources from all sectors of Taiwanese society is necessary to provide sufficient finance, technic, expertise, and evaluation support.

The effective introduction of environmental education in Taiwan requires a radical rethinking of the value of examinations and the nature of desired student abilities at every level of the education system, including policy makers, teacher educators, school leaders, teachers, and, most importantly, parents. **What is at stake a fundamental issue: How sincere are people in their desire to change the exam-driven education system in Taiwan into a system driven by the values of environmental sustainability?**

9.4 Recommendations

Based on the findings from this thesis, the researcher would like to raise five crucial suggestions for the introduction of the new subject of environmental education in Taiwan:

1. Educating teachers about the nature and implications of curriculum integration, what it is and how to achieve it in their teaching area. And, educating principals about how to achieve curriculum integration in their schools.

2. Devising systems of legitimated, valid assessment for environmental education that provide prestigious evidence of student learning through to tertiary level. This also needs to include evaluation at the level of school policy, classroom teaching, student assignments and/or behaviour for environmental education.

3. Educating teachers and school administrators into a new vision for education at large (transformative and holistic), which resonates with the purposes of environmental education to help them appreciate that the successful implementation of environmental education, could contribute to successful education at large in schools. This would inevitably enhance their schools' reputation.

4. Helping schools and teachers to establish robust, enduring linkages with both local/national organisations and other schools regionally/nationally leading to the development of an active national cooperative network for environmental education. This would offer opportunities for students to access data and advice relevant to their assignments in environmental education and for teachers to gain information and experience to guide students.

5. Elevating environmental education from an optional one sixth of 20% subject in the school curriculum to the status of a mandatory and school-

wide program. This requires the Ministry of Education to re-evaluate the overall junior high school curriculum and budget distribution.

The following seven additional suggestions for the introduction of environmental education into Taiwanese junior high schools are at a more specific level. The suggestions aim at providing feasible and workable strategies, now and in the future.

1. It is absolutely necessary to develop a *national cooperation network* for environmental education to its effective implementation in schools. This could be built up and expanded from Taiwan's Green School Partnership Network Project (TGSPNP). In addition, the Taiwan Sustainable Campus Program (TSCP) needs to be included in this national cooperative network so as to reconcile both aims. It is necessary to encourage not only school grounds' improvement (TSCP) but also the teaching and learning of environmental education (TGSPNP) as part of the formal curricula, especially at the classroom level. Most importantly, the Ministry of Education should take the leading role to expand this national cooperation network rather than simply acting as a supporter of the policies of the Environmental Protection Administration.

2. It is essential that schools have a *budget allocation* for environmental education from the Ministry of Education. This would motivate schools to prioritise and implement environmental education, especially in relation to the development of teaching modules and student participation experiences. Financial support should not be restricted to information technology education, gender education, career development education, and human rights education. Funding should be distributed to environmental education to the same extent to avoid the issue of low priority in Taiwanese junior high schools. There is also a need to offer sufficient funding, initially, to the member schools of Taiwan's Green School Partnership Network Project (TGSPNP) to strongly stimulate instruction specifically for environmental education. Budgetary planning and distribution should be equally allocated to both TGSPNP and TSCP

(Taiwan Sustainable Campus Program). Without proper funding the member schools of TGSPNP will not be able to implement environmental education well, especially at the junior high level. Moreover, this would provide no school-based material interests to the rest of non-member schools to implement environmental education.

3. There is a need to provide for the development of teacher *expertise* through support from TGSPNP and/or the Ministry of Education. This could be achieved through the production of a handbook (lesson plans), teaching materials and aids, and professional development from outside experts to help junior high school staff develop a feasible curriculum specific for environmental education. This curriculum must be able to compete for resources within the exam-driven school culture in Taiwan.

4. There is a need to carry out a full-scale *evaluation* of environmental education in Taiwanese junior high schools. This should not just focus on garbage classification and recycling. The evaluation of environmental education should be expanded to investigate classroom teaching and learning. Similarly, other *Important Issues* also need to be evaluated at the classroom teaching level to check whether the *infusion* strategy designed in the new Taiwanese national curriculum is working, or not.

5. It is necessary to have compulsory *pre-* and *in-service* courses in ecological-environmental studies for all school teachers, especially those at the junior high level. Without well-equipped teachers with adequate knowledge and strategies there can be no successful environmental education in schools.

6. Textbook publishers should be required, compulsorily, by the Ministry of Education to edit a *systematic* unit for environmental education in the more relevant learning areas such as Science and Social Studies, or, preferably in all seven learning areas. Without proper teaching materials i.e. textbooks, lesson plans, and teaching modules, school teachers will not be able to teach environmental education effectively.

7. There is a need to conduct further research to document students' actual learning in environmental education after the introduction of environmental education into the junior high school curriculum via the infusion strategy. Government, especially the Ministry of Education, should compare the learning outcomes of environmental education before, and after the 2001 curriculum reform (ended in July 2005) to understand the influence of its official introduction into schools.

In short, the successful implementation of environmental education in Taiwan requires proper supporting measures, especially a budget allocation and the development of teaching materials, assessment and a national cooperation network.

9.5 Concluding Comments

The purpose of this study was to investigate whether or not the infusion strategy for environmental education in the new Taiwanese national curriculum achieved a substantial emergence of environmental education within the school curriculum. The findings show that the hierarchy of the school subjects remains the same after the 2002 curriculum change in the Taiwanese junior high schools. In other words, the implementation of environmental education through an infusion strategy during this curriculum change did not achieve the planned and intended change in Taiwanese junior high schooling. The findings also suggest that the successful implementation of the innovative and holistic subject of environmental education requires attention to three particular themes which are not strongly addressed in the emergence and development of existing school subjects. The themes, indispensable to the successful evolution of environmental education, are: setting up systems for local environment involvement, taking due account of the transformative nature of environmental education, and inaugurating a national cooperation network. The emergence of environmental education requires a *systemic change* in the values of Taiwanese society, especially in relation to the education system, which needs to move away from its current exam-driven ethos and towards a more critical, creative and innovative foundation. The successful implementation of environmental education requires *a whole school approach* via

curriculum integration concurrent with consideration of the three particular themes detailed above.

The major insight arising from this study of curriculum issues is the need to earnestly take into account teachers' challenges and motivation during a school-based change when designing or planning a national curriculum change. Crucial factors contributing to a successful curriculum implementation are strong principal leadership with support from the school community, sufficient teacher professional development with adequate financial resources, good communication among organisations with proper expert advice, and practical government policies. Also evident was the role of social control exerted by a society as an influence on planned curriculum change and anticipated curriculum implementation. The most important finding in the study, in the researcher's view, is that a grass roots, school-based change requires an enthusiastic teacher community which communicates effectively with and is supported by the school administrators, especially the principal. Only if all these factors are considered and addressed will the educational changes occurring in schools become transformative and lead to social change in Taiwan, and in other countries.

Appendix 1: The Characteristics of the Grade 1-9 Curriculum

1. **Deregulation**
   It replaces the detailed 'curriculum frameworks' by objective-orientated 'curriculum guidelines' and fully opens the market of textbook edition.
2. **Consistency**
   It combines two curriculum development committees, elementary and junior high level, into one committee so as to design the Grade 1-9 Curriculum with an consistent view.
3. **Integration**
   It integrates 11 and 21 school subjects (elementary and junior high level) into seven learning areas and combines subject knowledge with students' daily experience to cultivate their core competence.
4. **Important issues**
   It infuses six important societal issues (information technology education, environmental education, gender education, career development education, human rights education and home economics education) into seven learning areas so that students will be able to get a grasp of the changes and the reality of the society.
5. **School-based curriculum**
   Schools need to establish the committee of curriculum development to develop their own school-based curricula. The design of alternative learning periods could lead to the development of school characteristics.
6. **Team teaching**
   It values and encourages team teaching with a group of teachers planning and/or developing curriculum together in order to teach cooperatively by the nature of topics, their individual expertise and lecture timetable.
7. **Core competence**
   It aims to foster students' core competence, starting from their daily life and experiences, combining textbook knowledge and arranging learning activities around it.
8. **Local to global views**
   It aims at enhancing local to global views on language and culture learning. Students need to select one of the three dialects and start to learn English from grade five in elementary schools (in old curriculum, it was no need to learn dialect and English learning started from grade seven). It also adds more choices of learning other foreign languages for the sake of the internationalism.
9. **Activity curriculum**
   It values activity curriculum and therefore integrative activities is no longer an attached curriculum but a formal, essential and integrated one.
10. **Accountability**
    It establishes the mechanism of accountability to control the quality of school education. At the government level, it sets up competence indicators and runs basic competence test at different learning stages. At the school level, the committee of curriculum development checks curricula of every grade and learning area. It replaces the central-authority administration control by giving freedom to both local educational governments and schools so as to achieve the cooperation of different administration levels.
11. **Fewer learning hours**
    It reduces the weekly learning hours to decrease students' burden from 33-38 to 28-35 periods per week.

Appendix 2: Curriculum Goals and Core Competence of the Grade 1-9 Curriculum

Curriculum goals	Core competences
1. To enhance self-understanding and explore individual potential;	1. Self-understanding and exploration of potentials, which involves thorough understanding of one's physical conditions, capabilities, emotions, needs, and personalities, loving and caring for oneself, self-reflection on a regular basis, self-discipline, an optimistic attitude, and morality, showing one's individuality, exploring one's potentials, and establishing suitable values.
2. To develop creativity and the ability to appreciate beauty and present one's own talents;	2. Appreciation, representation, and creativity, which involve the capability of perceiving and appreciating the beauty of things as well as exerting imagination and creativity, developing an active and innovative attitude, and expressing oneself in order to promote the quality of living.
3. To promote abilities related to career planning and life long learning;	3. Career planning and lifelong learning, which involves the utilisation of social resources and individual abilities in order to bring one's talents into full play, plot one's course for the future, and develop the ability of lifelong learning in accordance with the transition of the social environment.
4. To cultivate knowledge and skills related to expression, communication, and sharing;	4. Expression, communication, and sharing, which involves making effective use of all kinds of symbols (such as languages in both spoken and written forms, sounds, motions, pictures, and arts) and tools (such as media and technology) in order to make clear one's thinking, concepts, and emotions as well as listening attentively to and communicating effectively with others, and sharing various perspectives and information with others.
5. To learn to respect others, care for the community, and facilitate team work;	5. Respect, care and team work, which involves being democratically literate, tolerant of different opinions, and equitably to individuals and groups of different identities, having respect for life and caring for the community, the environment, and nature, obeying the rules of the law and the norms of the community, and holding an attitude which is beneficial to team work and cooperation.
6. To further cultural learning and international understanding;	6. Cultural learning and international understanding, which involves appreciating and respecting different groups and cultures, understanding the history and culture of one's own country as well as others', recognising the trend of the globalisation in which countries all over the world are integrated into a global village, and developing a global perspective with mutual interdependence, trust and cooperation.
7. To strengthen knowledge and skills related to planning, organising, and their implementation;	7. Planning, organising and putting plans into practice, which involves being able to make plans and put ideas into practice in daily life, adopting approaches by which thoughts and practice are incorporated and by which each member can contribute to the community as well as serve the public and one's country with enthusiasm.
8. To acquire the ability to utilise technology and information;	8. Utilisation of technology and information, which involves the utilisation of the technology in a correct, safe and useful information, and make use of such information for the purpose of enhancing learning efficiency and living quality.
9. To encourage the attitude of active learning and studying;	9. Active exploration and study, which involves encouraging curiosity and observation, actively exploring and discovering questions, and applying one's learned knowledge and skills in daily life.
10. To develop abilities related to independent thinking and problem solving.	10. Independent thinking and problem solving, which involves cultivating the ability and habit of thinking independently and reflectively, making thoughtful analyses and judgements about questions, and effectively solving problems and resolving conflicts.

Appendix 3: The Comparison of Old/New Curriculum in Taiwanese Junior High Education

	***Curriculum Guidelines* for new curriculum (From 2001)**	***Curriculum Frameworks* for old curriculum (From 1994)**
Curriculum design	Curriculum Guidelines for elementary to junior high education	Curriculum frameworks for junior high education only
Aim	To cultivate citizens with humanitarian attitudes, integration ability, democratic literacy, both indigenous awareness and global perspective, and the capacity for lifelong learning.	To focus on life education, moral education and democracy education in order to cultivate optimistic and aggressive teenagers and good citizens with the balance of virtue, wisdom, health, cooperation and aesthetics.
Goals	* To enhance self-understanding and explore individual potential; * To develop creativity and the ability to appreciate beauty and present one's own talents; * To promote abilities related to career planning and life long learning; * To cultivate knowledge and skills related to expression, communication, and sharing; * To learn to respect others, care for the community, and facilitate team work; * To further cultural learning and international understanding; * To strengthen knowledge and skills related to planning, organising, and their implementation; * To acquire the ability to utilise technology and information; * To encourage the attitude of active learning and studying; and * To develop abilities related to independent thinking and problem solving.	* Cultivating students with the attitude esteeming themselves/others and being diligent/responsible; shaping students' national awareness and the sentiment of loving home/region/country in order to gain the virtue of understanding courtesy and respecting justice. * Enlightening students' abilities of creativity, logical thinking and value judgement; promoting students' abilities of problem-solving and adaptation to social change in order to gain the attitude of lifelong learning. * Training students healthy with strong will; cultivating students' knowledge/ability to have proper leisure in order to promote their spiritual/physical maturity and health. * Cultivating students' attitude of cooperation and democracy; promoting the harmony between an individual and a group; broadening individual mind to be kind to people and/or animals. * Promoting students' aesthetic and creative ability; cultivating students' attitude to love life and protect the nature; building up a meaningful and delightful livelihood to students.
Core Competence	* Self-understanding and exploration of potentials; * Appreciation, representation, and creativity; * Career planning and lifelong learning; * Expression, communication, and sharing; * Respect, care and team work; * Cultural learning and international understanding; * Planning, organising and putting plans into practice; * Utilisation of technology and information; * Active exploration and study; and * Independent thinking and problem solving	None
Teaching time	40-45 min/period	45 min/period
Learning hours	Grade 7: 30 hrs/week Grade 8: 30 hrs/week Grade 9: 30 hrs/week	Grade 1: 33-34 hrs/week Grade 2: 35-36 hrs/week Grade 3: 30(+5)-33 (+5) hrs/week
Items for Total Learning Hours	Learning area hrs: 80% per week/school year Alternative learning hrs: 20% per week/school year	None
Learning areas (subjects)	Seven learning areas * Language Arts: Mandarin, English * Health and physical education * Social studies * Arts and humanities * Mathematics * Science and technology * Integrated activities	Twenty-one subjects * Chinese * English * Mathematics * Understanding Taiwan * Civics * History * Geography * Biology * Physics/chemistry * Earth science * Healthy education * Home economics and daily technique * Computing * Physical education * Music * Arts * Scouts training * Local art activities * Counselling activities * Team activities * Optional subjects

School curriculum and planning organisation	Each school should establish the 'committee of curriculum development' and 'curriculum team' for seven learning areas.	None
Teaching materials	1. Textbook is not the unique source of teaching materials. 2. Multi-sources of teaching material: * textbooks edited by private sectors; * teaching materials developed by local government, schools, and teachers; * multimedia materials. * one-unit teaching materials.	* Academic textbooks edited by National Institute of Compilation and Translation. * Non-academic textbooks edited by private sectors.
Curriculum Checking system	Each school should give one-year school curriculum to local educational government for checking.	None
Teaching implementation	It is allowed to break different learning areas and rearrange subjects/learning hrs in order to have a big unit or a theme teaching.	None
Curriculum regulation field	Curriculum Guidelines roughly regulate the conceptual framework of objectives, learning areas and their competence indicators.	Curriculum frameworks regulate in detail the outline/items, objectives/content/methods/evaluation, and time for arriving/leaving schools.
English teaching	From grade 5 in elementary schools	From grade 7 in junior high schools
Competence Indicators	Competence indicators	None
Infusion of Important issues	Information technology/environmental/gender/human rights/career development/home economics education	None

APPENDIX 4: Environmental Education Competence Indicators for Three Learning Stages

Curriculum objectives	1st Learning Stage (Grade 1 - Grade 3)	2nd Learning Stage (Grade 4 - Grade 5)	3rd Learning Stage (Grade 6 - Grade 9)
1. Environmental awareness and sensitivity	1-1-1 Be able to use ears, eyes, mouth, nose and heart observing and exploring the environment. 1-1-2 Be able to appreciate natural beauty through ears, eyes, mouth, nose and heart contacting animals/plants/landscape in the natural environment; be able to express individual's feeling and sensitivity to animals/plants/landscape through painting, making crafts and telling stories.	1-2-1 Be aware of the relationship between the environment and individual's physical/mental health. 1-2-2 Be aware of the impact of personal life style to the environment.	1-3-1 Through observing and exploring nature, be able to express concerns for the beauty of natural environment by creative work s such as writing articles, making crafts, playing music and drama.
2. Environmental conceps and knowledge	2-1-1 Be able to recognise natural environment and basic ecology principles in his surroundings.	2-2-1 Be able to understand the environmental problems in his surroundings and their influences to individual, school and community. 2-2-2 Be able to continuously observe and record the environmental problems in community and explore their reasons. 2-2-3 Be able to compare the characteristics of environmental issues in different local areas domestically.	2-3-1 Be able to understand local and global environmental issues and their influences to human. 2-3-2 Be able to recognise the interaction between economy system, media and political organizations, and environmental management. 2-3-3 Be able to recognise global environmental issues and their cultural differences.
3. Environmental ethics and values	3-1-1 Be able to love organisms by observing and exploring them; be able not to hurt organisms and the environmental requirements for their habitats. 3-1-2 Be able to be curious and think of the meaning/value of everything in the environment.	3-2-1 Be able to understand the interactions between individuals and environment in daily life, and cultivate personal interests, hobbies and responsibilities related to natural environment. 3-2-2 Actively be familiar with and concern the environment of school and community in order to understand the importance of environmental right. 3-2-3 Be able to understand and respect different attitudes/behaviours towards the environment from different cultures.	3-3-1 Be able to understand the relationship of interdependence between human and the environment in order to develop aggressive environmental attitudes and ethics. 3-3-2 Be able to learn concerning the minorities and their living environment. 3-3-3 Be able to cultivate the attitude of actively thinking about domestic and global environmental issues and of participating in their activities aggressively. 3-3-4 Be able to concern future generations' living and development.
4. Environmental action skills	4-1-1 Be able to properly describe personal natural experiences and feelings by clearly spoken and written language. 4-1-2 Be able to understand and recognize the environmental problems in the school grounds and homeland through collecting and recording information, and be able to suggest the workable solutions.	4-2-1 Be able to induce and think the reasons for different local environmental problems and judge their possible solutions. 4-2-2 Be able to make a draft of community environmental protection action plan. 4-2-3 Be able to analyse and evaluate the reasons of local environmental problems domestically and think how to solve them. 4-2-4 Be able to use simple technology, collect and use information to explore and understand the environment and its related issues.	4-3-1 Be able to listen (or read) others' reports and reasonably question when facing environmental issues. 4-3-2 Be able to objectively and neutrally afford various proofs/debates and humbly accept others' correction. 4-3-3 Be able to actively and aggressively collect domestic and global environmental issues/strategies through different media. 4-3-4 Be able to use scientific methods to study the practical solutions for environmental problems. 4-3-5 Be able to use scientific instruments to evaluate, analyse, and understand the environmental conditions and changes.
5. Environmental Action experiences	5-1-1 Be able to follow parents and/or teachers to participate activities of community environmental protection or of concerning minorities' livelihood. 5-1-2 Be able to plan and implement personal/collective activities of school grounds environmental protection.	5-2-1 Be able to gain the experiences of participation in activities of doing survey and solving environmental problems in daily life. 5-2-2 Be able to plan and implement simple environmental surveys through the activity of Environmental Protection Director in school grounds. 5-2-3 Be able to implement the action of green consumption, environmental protection and concern.	5-3-1 Be able to participate school clubs and activities of community environmental protection. 5-3-2 Be able to gain the experiences of participating in activities of survey, study and problem-solving for local and global environmental issues. 5-3-3 Be able to organise activities of environmental protection and concerning minorities in schools and community. 5-3-4 Be able to organise a team with peers in order to learn and plan how to solve environmental issues through democratic and autonomic process.

Appendix 5: Interview Schedule (English and Chinese)

1st interview

1. Could you please tell me what is "EE" in your opinions?
2. Do you think "EE" should be taught in schools? Why?
3. Could you please tell me what kind of things should be taught in "EE" in your opinions?
4. Could you please tell me how should "EE" be taught in your opinions?
5. Could you please tell me what should be the students' learning outcomes in "EE" in your opinions?
6. Did any teacher development workshop mention EE infusion? (if yes, what is the content?)
7. Do you think learning about the environment is important? Why?
8. Could you please tell me your current school curriculum, are there any special features?
9. Could you please tell me anything related to EE in your school at the present time?
10. Could you please tell me the present learning outcomes of "EE" for students in your school?
11. Which subject/learning area do you suppose would involve most of the teaching and learning for EE?

1. 請問您認為什麼是環境教育？ 您的看法？
2. 請問您認為學校應該教環境教育嗎？ 為什麼？
3. 請問您認為環境教育應該教些什麼內容？
4. 請問您認為應該要怎樣教環境教育？
5. 請問您認為環境教育的學生學習成果應該是什麼？
6. 這一兩年教育部辦了很多有關九年一貫的活動和研習，請問有沒有研習提到環境教育融入式教學？ (若有, 請問內容是什麼？)
7. 請問您認為有關環境的學習是不是很重要？
8. 請問 X 校目前的課程或學校活動, 有哪些您覺得是比較特別的？
9. 這麼多活動中，請問您覺得哪些是和環境教育有關的？
10. 請問您認為目前 X 校學生的環境教育學習成果，有哪些？
11. 請問您認為在 X 校, 哪些科目或領域的老師可能會教到環境教育？

2nd interview

1. Could you please tell me your opinions/beliefs about the new curriculum? (Characteristics? advantage? disadvantage? acceptance?)
2-1. Did you lead the school-based curriculum development or someone else? Are you a member of the committee of school curriculum development? If not, do you know what is going on in the school curriculum committee? (Meeting regular or not? Minutes announced to every teacher or not?)

2-2. How often do you have learning area meetings? (Regular or not? Since when? What's the discussion? Everyone attend or not?)

3. Please describe how your school curriculum development committee has been planning your new school-based curriculum? (topic? how (method)? which grade? which learning area? When?)

4. What is the most urgent issue you need to face for the new curriculum?

5. Has anyone gone through the curriculum documents and identified EE in your school? How about you? Do you know the existence of the Guidelines of EE? Did you read it?

6. Do you think homeroom teacher should take some responsibility for EE or not? Why? (If yes, How and what?)

1st-2. Do you think "EE" should be taught in schools? Why?

. 1st-1. Could you please tell me what is "EE" in your opinions?

7. Do you think you were teaching EE already before the new curriculum implementation? (What's the content? teaching method? student learning outcome?)

1st-3. Could you please tell me what kind of things should be taught in "EE" in your opinions?

1st-4. Could you please tell me how "EE" should be taught in your opinions?

1st-5. Could you please tell me what the students' learning outcomes should be in "EE" in your opinions?

8. What do you expect the teaching content after the implementation of EE by infusion in the new curriculum might be? (Any difference will be compared with the old curriculum?)

9. What do you expect the learning outcomes for students after the implementation of EE infusion in the new curriculum might be? (Any difference will be compared with the old curriculum?)

10. Which textbook did your learning area choose? Did you take EE into your consideration when choosing the textbook? Why?

1st-11. Which learning area/subject do you suppose would involve most of the teaching and learning for EE?

11. What is the priority for EE implementation in your school? Why?

1st-6. Did any teacher development workshop mention EE infusion? (If yes, what is the content?)

1. 請您談一談您對九年一貫新課程的感覺跟看法？ (特色？優點？缺點？接受度？)

2-1. 請問在 X 校是誰在領導課程發展？您是不是課程發展委員會的成員？ 若不是, 您知道課發會的運作情形嗎? (多久開一次? 會議內容有無通知未參與的老師?)

2-2. 請問您的領域研究會如何運作? (多久開一次? 何時開始? 會議內容? 參與人數?)

3. 請您談一談 X 校的課發會在上學期是如何來發展 X 校的學校本位課程？

(主題? 方法? 年級? 領域? 時間?)

4. 請問九年一貫實施後, 你最迫切需要面對的事情是什麼？

5. 請問您知不知道有誰看過新課程綱要中有關環境教育的部份, 然後確認出 X 校的環境教育？ 您自己有這樣做嗎? 您知道環境教育有課程綱要嗎? 您看過嗎?

6. 請問您認為導師是不是應該分擔一些教環境教育的責任？為什麼? (若是, 教什麼? 如何教?)

1st-2. 您認為學校應該教環境教育嗎？為什麼?

1st-1. 您認為什麼是環境教育？

7. 九年一貫實施之前，請問您的教學是不是已經包含環境教育？ (內容？方法？ 學習成果？)

1st-3. 請問您認為環境教育應該教些什麼內容？

1st-4. 請問您認為應該怎麼教環境教育？

1st-5. 請問您認為環境教育的學生學習成果應該是什麼？

8. 請問新課程實施後環境教育融入式教學的教學內容, 您的預期/期望是什麼？和舊課程一樣嗎?

9. 請問新課程實施後環境教育融入式教學的學生學習成果, 您的預期/期望是什麼？和舊課程一樣嗎?

10. 請問您的領域選用的教科書是哪一家的？選教科書時, 有沒有考慮環境教育？為什麼?

1st-11. 在X校, 哪些科目或領域的老師可能會教到環境教育？

11. 請問您覺得在 X 校實施環境教育 , 它的優先順序是怎樣？為什麼?

1st-6. 去年您所參加的研習當中, 有關環境教育的您是說….今年有沒有改變？

3rd interview

1. Are you optimistic to the new curriculum implementation or not? What sorts of things need to be overcome in your school? (Any change happened to the frequency of the meetings? model of the curriculum development? Leadership?)

1st-2. Do you think "EE" should be taught in schools? Why?

1st-1. Could you please tell me what is "EE" in your opinions?

2. What is your view of a good school? How about parents? Do you think EE can make contribution to promote the reputation of being a good school? How about parents?

3. Do you agree your school educational goals? do you think EE can make contribution to promote and intensify your school educational goals?

4. Do you think we should only be teaching the knowledge for exam? Will you teach more the content tested by exam? What will parents prefer school to teach? Do you think EE will be examined?

5. Do you think you need to say the term 'EE' to students or not, when you teaching it? Why?

2nd-5. Has anyone gone through the curriculum documents and identified EE in your school? How about you? Do you know EE guidelines? Do you read it? What's your opinions if you have read it?

2nd-10. Did you take EE into your consideration when choosing the textbook? Why? Did your learning area meeting discuss EE?

1st-3. Could you please tell me what kind of things should be taught in "EE" in your opinions?

1st-4. Could you please tell me how "EE" should be taught in your opinions?

1st-5. Could you please tell me what the students' learning outcomes should be in "EE" in your opinions?

6. Do you think we should be focusing more on the link between each of the learning area and Important Issues or do you think our present practice and structure in this regard are okay? How do you think EE?

1st-11. Which subject/learning area do you suppose would involve most of the teaching and learning for EE?

2nd-7. Do you think you were teaching EE during the 1st year of new curriculum implementation? (anything new about content? teaching method? student learning outcome?)

7-1. Do you think EE exist more in the formal or informal curriculum in schools? Do you think EE exist more in formal or non-formal education in society?

7-2. Do you think EE should be taught more in the formal or informal curriculum in schools? Do you think EE should be taught more in formal or non-formal education in society?

7-3. Is there anything new for EE done in your school after the curriculum change? Is it easy to have an EE topic teaching in your school?

2nd-11. What is the priority for six Issues implementation in your school? Why? Does the requirement from MOE influence the Issue priority done in your school?

8. What do you think the relationship between your school and its local environment should be? How do you think EE can influence it?

2nd-3. Please describe if any change your school curriculum development committee has planned for 2nd year of new curriculum implementation?

9. What is your suggestion about EE initiatives taken more in schools? Do you think the requirement from MOE would enhance it or not? How about principal leadership? How about an EE program included inside textbooks? How about the BCT has EE content? (If yes, please rank the order according to their influential extent)

1st-6. Did any teacher development workshop mention EE by infusion? What kind of internal workshops run in your school? Do you think you need help or not when teaching EE? If you need, what kind of help do you need?

10. Do you think EE belongs to voluntary or compulsory learning and behaving? Which way will be more effective? Which way will be more substantial? Which way is more important?

2nd-8/9. What do you expect the teaching content/learning outcomes of EE after its implementation by infusion in the new curriculum might be? (any learning for EE? What the difference will be compared with the old curriculum?)

11. Do you think EE was taught in schools before the curriculum change? At that time, was it same the status of EE when compared to academic subjects (Chinese, English, math) and non-academic subjects (art and music)? Was it same the status of EE when compared to law/gender/vocational education? What are the requirements to be a school subject in your opinions? In our teaching, is there anything not belonged to learning area? not being assessed? no curriculum guidelines? no clear educational philosophy? no clear support from the Ministry of Education? After the curriculum change, has any changed (increased) on the status of EE?

12. Does any teacher who paid more attention on expanding EE in your school these two years?

1. 請問您對九年一貫新課程的實施樂觀嗎？在您的學校，您認為有那些事情是實施九年一貫需要克服的？(領域對話次數？課程發展的模式 (教務處/課發會)？ 領導的人選？)

1st-2. 請問您認為學校應該教環境教育嗎？為什麼?

1st-1. 請問您認為什麼是環境教育？

2. 請問您認為那些條件可以構成一個好學校？您覺得家長認為怎樣才是一個好學校？您認為環境教育能提升一個學校成為好學校的美名嗎？您覺得家長會認為環境教育能提升一個學校成為好學校的美名嗎？

3. 請問您同意 X 校的願景嗎？您認為環境教育能強化或促進 X 校的願景嗎？

4. 請問您認為我們應該只教考試要考的知識或內容嗎？您會多教一些考試要考的內容嗎？
您覺得家長喜歡學校教哪些東西？您覺得環境教育是不是考試會考到的內容？

5. 請問在您的教學和環境教育有關的時候，您認為您需要告訴學生環境教育這**名詞**嗎？為什麼?

2nd-5. 請問您知道有誰看過新課程綱要中有關環境教育的部份，然後把X校的環境教育確認出來的？ 您有沒有嘗試自己做過？ 環境教育的課程綱要，您看過了嗎？如果您看過了，您對環境教育的課程綱要有什麼意見？

2nd-10. 請問您用的教科書，有沒有換版本？如果有，在重新選教科書時，您有沒有把環境教育列入您選教科書的考慮範圍？為什麼? 其他的重大議題呢？您的領域對話時間有沒有討論過環境教育？為什麼?其他的重大議題呢？主要討論內容為何？

1st-3. 請問您認為環境教育應該教些什麼內容？

1st-4. 請問您認為應該怎麼教環境教育？

1st-5. 請問您認為環境教育的學生學習成果應該是什麼？

6. 請問在學習領域和重大議題的教學上，您認為我們應該多做一些連結嗎？還是您認為目前的狀況就夠了？您覺得環境教育呢？

1st-11. 請問您覺得哪些學習領域，環境教育教得比較多？

2nd-7. 請問您覺得上學年 (新課程第一年) 您的教學有包含環境教育嗎？(有沒有新內容？方法？ 學習成果？)

7-1. 請問學校中正式和非正式的課程, 您認為環境教育存在何者比較多? 學校教育和非學校教育, 環境教育存在何者比較多?

7-2. 請問學校中正式和非正式的課程, 您認為環境教育應在何者教授比較多? 學校教育和非學校教育, 環境教育應在何者教授比較多?

7-3. 請問九年一貫實施後, X 校對環境教育有新嘗試嗎？您認為 X 校會有環境教育的主題課程嗎？容易嗎？

2nd-11. 請問您覺得重大議題在X校被實施或推廣的優先順序為何？為什麼? 您覺得教育部的要求會不會影響重大議題在 X 校被實施或推廣的優先順序？

8. 請問您認為 X 校和它周圍環境或社區應該是怎樣的關係？您覺得環境教育能怎樣影響這種關係？

2nd-3. 請問X校的學校本位課程是什麼？新課程實施的第一年，有哪些活動是配合學校本位課程的？在第二年，X 校的課發會有沒有做任何修正？跟上學年不同的地方？(您是課發會成員嗎？)

9. 對增加學校內環境教育的教學活動，請問您有什麼建議？您認為教育部的要求會不會加強它？校長的喜好？教科書明確的編寫一個有系統的環境教育課程？ 基本學測的考試題目含有環境教育？讓老師接受適當的研習？ 家長的支持？如果都會，您覺得它們的影響順序為何？

1st-6. 請問這一年來您所參加的研習，有沒有提到環境教育融入式教學？請問這兩年來，您的校內研習主題有哪些？有沒有環境教育的研習？在環境教育的教學上，您覺得您需要幫助嗎？怎樣的幫助？

10. 請問您覺得環境教育是主動自願的學習和行為表現，或外加強迫式的？您認為哪一種比較有效果？您認為哪一種比較能在學生的人生中持久保持？哪一種比較重要？

2nd-8/9. 九年一貫後的環境教育融入式教學的教學內容和方法，以及學生的學習成果，您去年的預期/期望是……..，請問今年有沒有改變？

11. 請問您覺得在九年一貫實施前，學校是否就已經有 EE 的教學？那時，EE 的學科地位和國英數學科及美術音樂術科相比，一樣嗎？和兩性教育、法治教育、技藝教育相比，一樣嗎？您認為怎樣才算是一個學科？ 我們的教學中，哪些不屬於學習領域?沒有被評量？沒有課程綱要？沒有清楚的學科哲學?教育部沒有明確支持？九年一貫實施後，EE 的學科地位有沒有改變 (提升)?

12. 這兩年來，您覺得 X 校有沒有老師在推廣環境教育的教學？

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