



2005-CB02-NMY-Taniguchi

Symposium Establishing Guidelines for
Environmental Education based on
Environmental Ethics

PROCEEDINGS

International Symposium: Establishing The Guidelines For
Environmental Education Focusing on Environmental Ethics

**2007 | Centre for Civilisational Dialogue,
Kuala Lumpur, Malaysia**

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Published by:
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TABLE OF CONTENTS

INTRODUCTION	9
OPENING SPEECH <i>Dato' Hajah Rosnani Ibrahim</i> <i>Director General, Department of Environment Malaysia</i>	
KEYNOTE ADDRESS "Orientation of the Framework for Guidelines of Environmental Education based on Practice of Environmental E ducation" <i>Fumiaki Taniguchi</i>	13
ENVIRONMENTAL EDUCATION EFFORTS MINISTRY OF THE ENVIRONMENT OF JAPAN <i>Yoshiaki Asano</i>	22
ENVIRONMENTAL EDUCATION FOR MALAYSIAN UNDERGRADUATES <i>Rosli Omar</i>	29
THE ETHICS OF ENVIRONMENTAL EDUCATION: THE MALAYSIAN NGO EXPERIENCE <i>Angela Hijjaz</i>	40
CHALLENGES BY JAPANESE HIGH SCHOOL STUDENTS FOR BETTER ENVIRONMENTS <i>Yoshihisa Shimizu</i>	45
ENVIRONMENTAL EDUCATION <i>Siriwat Soondarotok</i>	49
ENVIRONMENTAL EDUCATION IN MALAYSIA: A CASE STUDY OF UNIVERSITY OF MALAYA, MALAYSIA <i>Suzana Ariff Azizan</i>	52
ANALYSES OF CASE STUDIES ON IMPLEMENTATION OF ENVIRONMENTAL EDUCATION IN THE ASIA-PACIFIC REGION – THE CASE OF KUALA SELANGOR NATURE PARK <i>Nagarajan Rengasamy</i>	58

COMMUNITY- BASED EDUCATION -- THE COLQUITZ WATERSHED STEWARDSHIP EDUCATION PROJECT <i>Gloria Snively</i>	64
COMMUNITY-BASED ENVIRONMENTAL EDUCATION: A STUDY OF THREE CANADIAN CASES <i>Gloria Snively</i>	72
THINKING LIKE AN OCEAN: TOWARDS CO-EXISTENCE BETWEEN PEOPLE AND NATURE <i>Gloria Snively</i>	82
PROPOSAL FOR ENVIRONMENTAL EDUCATION BASED ON RELIGIOUS ETHOS: FOCUSING ON COMMON VALUES IN DIVERSE CULTURES AND RELIGIONS <i>Azizan Baharuddin</i>	95
INTRODUCTION TO MARINE STUDIES FOR YOUTH <i>Koh Kian Choon</i>	103
RESPONSIBILITY FOR NATURE – A CHALLENGE FOR THE ENGINEERS <i>Nik Meriam Nik Sulaiman</i>	107
CLIMATE CHANGE: A FRAMEWORK FOR EDUCATION ABOUT THE INTERCONNECTEDNESS OF ENVIRONMENTAL ISSUES <i>H. Damon Matthews</i>	113
KOREAN ELEMENTARY SCHOOL TEACHERS’ PERCEPTIONS OF AQUARIUM FIELD TRIPS AND CASES OF AQUARIUM EDUCATION IN THE USA AND CANADA <i>Jong-Mun Kim, Gloria Snively, Rick Kool</i>	119
THE MONKEYS OF AWAJISHIMA: CREATING EMPATHY AND ENVIRONMENTAL AWARENESS <i>Sarah Turner</i>	130
BIODATA	142

Introduction

Main objectives of the project

The fundamental objectives of the project of Guidelines for Environmental Education Focusing on Environmental Ethics and Human Dimension of Global Change which is a cooperation between Konan University, Japan and the Centre for Civilisational Dialogue, University of Malaya, Malaysia are:

2. To make full use of participating countries' experiences and knowledge of global change research to formulate guidelines for environmental education & sustainable development
3. To fill the existing gaps among teachers & other stakeholders involved, such as global change experts, decision-makers, etc., by developing methods/modules for environmental education that can be used as a basis for countries in Asia.

The project is planned for approximately two years from November 2005 to December 2007, and will include two "sets" of international symposia and workshops the first in Kobe, Japan, and the second in Kuala Lumpur, Malaysia.

Some of outcomes of the project

1. Symposia and workshops that will:
 - a. Elaborate the concept of environmental education that focuses on ethics and the human dimensions of global change
 - b. Elaborate and identify the potential role of networks such as APN in the region
 - c. Establish skeletal guidelines for environmental education that are flexible to suit the needs of countries in the Asian region
2. To hold short courses/workshops and site visits in order to: develop Curriculum and Materials, and develop documentaries on DVD/CD-ROM
3. To introduce curricula and models that can be used in mainstream education systems

4. To publish and disseminate information on environmental education and sustainable development that highlights the latest discoveries, techniques, technologies, and strategies for environmental sustainability
5. To establish a network of resource persons for environmental education and sustainability
6. To establish empowered communities who have increased awareness of their roles and contributions to environmental and sustainable issues.

Report on the 2nd Symposium Establishing Guidelines for Environmental Education based on Environmental Ethics

The 2nd symposium was held on the 3-4 May 2007 at the Wawasan Room Rumah University, University of Malaya, Kuala Lumpur Malaysia. It was attended by about 20 people and was officiated by the Director of the Malaysian Department of the Environment, Datuk Hj Rosnani bt Ibrahim.

The symposium was an effort to work closely with the Asia-Pacific network for Global Change Research (APN). APN is an inter-governmental network whose primary goal is to foster global environmental change research in the Asia-Pacific region, increase developing country participation in that research, and to strengthen links between the research community and policy makers. It promotes, encourages and supports research activities on long-term global changes in climate, ocean and terrestrial systems and on related physical, chemical, biological and cultural (ethical) socio-economic processes. The 21 APN member countries include Australia, Bangladesh, Cambodia, China, Fiji, India, Indonesia, Japan, Lao people's Democratic Republic, Malaysia, Mongolia, Nepal, New Zealand, Pakistan, Philippines, Republic of Korea, Russian Federation, Sri Lanka, Thailand, United States of America and Vietnam.

The Asia-Pacific is an important region for the understanding of global environmental problems. Important atmospheric and oceanic phenomena occur here, such as the Asian monsoon and the El Niño phenomenon, which affect the world climate, and the region also has tropical forests, deserts, and mountains. At the same time, the Asia-Pacific region has a population of nearly 3 billion – more than half of the world's human population. In addition, its economic growth rate is the highest of any other region in the world. Because of its population growth rate and its economic activities, this region contributes to global climate change in a major way. Degradation of the environment, such as deforestation and desertification, is becoming a matter of great concern, as are natural disasters which occur as a result of this degradation, such as floods and droughts.

Background of the Symposium

Studies on "Environmental Education" have not yet been sufficiently integrated to solve environmental issues. In order to have a common understanding of

environmental issues based on environmental ethics, internationally recognized guidelines for environmental education need to be established. The symposium aims to establish preliminary guidelines and discuss the role of networks in environmental education in the Asia-Pacific region, in order to assist in the development and promotion of knowledge related to global change research.

The fundamental objectives of the symposium were:

1. To make full use of participating countries' experiences and knowledge of global change research to formulate guidelines for environmental education & sustainable development
2. To fill the existing gaps among teachers & other stakeholders involved, such as global change experts, decision-makers, etc., by developing methods/modules for environmental education that can be used as a basis for countries in Asia.
3. Share view points, experiences, knowledge and expertise from invited guests in the fields of the natural, social and human sciences, regarding issues of global change and environmental ethics.

On Day One of the Symposium

Prof Fumiaki outlined the orientation of the fundamental approach for the Guidelines of Environmental Education Based on the Practice of Environmental Education. This was followed by the opening remark by the Honorable Datuk Hj. Rosnani bt Ibrahim who is the Director of the Department of Environment and Natural Resources, Malaysia.

The papers presented covered issues and examples of important elements that are critical in the curricula for environmental education in general and for environmental ethics education in particular.

Dr. Rosli Omar, Suzana Ariff, Angela Hijaz and Rengasamy gave the Malaysian perspectives on the role and contribution of the Malaysia Higher Education system and NGOs respectively. From Japan, Yoshiaki Asano explained the environmental education efforts of the ministry of the Environmental whilst Yoshihiza Shimizu shared the efforts and challenges of Japanese High School students in their efforts to help the cause of the environment.

On Day Two of the Symposium

Case study of the Implementation of Environmental Education in the Asia –Pacific were presented by Gloria Snively who shared the Canadian Case Study with the participants in promoting "coexistence between man and nature". Siriwat Soondarotek of Thailand discussed at great length the concept and meaning of "environmental education" and how it has evolved globally. Azizan Baharuddin spoke on the proposal

for Environmental Education based on religious ethos focusing on common values in diverse cultures and religions. Koh Kian Choon shared his experiences educating youths on the marine life while Nik Meriam spoke on the engineers' challenge to be responsible towards nature. The latter three are from Malaysia.

On Day Three of the Symposium

The Paper presenters with some of the participants were taken on a study tour of one of the most successful NGO environmental education effort in Malaysia which is the Taman Alam Nature Park in Kuala Selangor, Selangor. The study tour included a very interesting talk about the activities and challenges faced by the Taman Alam which is a wetland nature park reserve which whilst housing many important plant and animal species, is an important bird migratory spot. Besides touring the reserve, the participants also planted an important mangrove plant species *Collophylum inophyllum*.

With the guidance of Mr. Nagarajan the manager and head park ranger at the Taman Alam. In the afternoon the the participants also saw a special private park belonging to Mrs Angela Hijaz an active member of the WWF & MNS of Malaysia at Rimbun Dahan, an hour's drive from Kuala Selangor.

The climax of the field visit was the visitors boat ride at Kg. Kuantan to see the fire fly species or local *kelip-kelip*. This firefly community is one of only 2 communities which inhabit the *berembang* tree. The specie throws out their light synchronously, which lights up the trees they inhabit along the Kuala Selangor river.

The trip served to impress upon the participants how critical is the "experiential" approach in environmental education is.

On Day Four of the Symposium

A special meeting between the paper presenters discussed further, the scope and framework of the guideline for the Asia Pacific region.

Opening Speech

Dato' Hajah Rosnani Ibrahim
Director General, Department of Environment Malaysia

It is my great pleasure to be here this morning to officiate the opening of the Symposium on "Establishing Guidelines For Environmental Education Based On Environmental Ethics" (III). Firstly, I would like to thank the organizing committee for inviting me to be with you here this morning. To our overseas friends, welcome to Kuala Lumpur.

Since the Earth Day in 1970, the world has lost nearly 200 million hectares of tree cover. Desserts have expanded by over 120 million hectares. Thousands of plant and animal species become extinct each day. Freshwater fish are declining in many areas. Approximately 480 billion tons of top soil have been lost. It is no wonder that such facts have led to the perception of many that the planet is experiencing a serious environmental crisis. The 1990s are a crucial decade. The East – West ideological conflict, which dominated world concerns for over a generation, has ended. No one can know what new political alignment will emerge in the future. But there is one certainty: unprecedented world – wide environment damage has continued despite the efforts of legislators, agencies, environmental organization, and individuals.

The most important struggle today and for the near future therefore is prevention of further environmental degradation as well as to reverse the trend we have spoken of. Such changes require international corporation, which must effect changes in the world economy and political priorities. The key principle which must be the basis of these changes is environmental sustainability which involves not just efficient agriculture but also minimization of energy use and pollution. However before we elaborate more on the idea of sustainability there is a need to appreciate a few other basic fundamental principles, the first of which is ecology. Ecology is the branch of biology which investigates living relationships. The science of organization and interaction between different organisms, the living system they inhabit and their physical environments. In this context, it is interesting to note that there is much less research into the large - scale system of ecology compared to the small scale system of molecular biology, being done today. Therefore I think we need to be reminded

that as we see the fragility of our world, the future of life depends on a greater human understanding of this subject to begin with. In reality the type of research that is required for a transition to a lasting earth is of 3 broad categories. One is the use of science or ecology to discover the workings of nature, such as elemental cycles. Then we need engineering for developing technology for energy and resource conservation. Another is economic systems that are consistent with sustainable living. Above all we need a fresh approach to add to the battle of protecting the environment. This is because in the long term, the most important approach is lasting change of human attitude to those that are compatible with sustainable life. We need lifestyle change. We cannot isolate any environmental problem from the whole crisis of modern life. The environment is influenced mostly by human behavior, national and international development, economics and politics, as we have already mentioned.

What is environmental ethics ?

It is a field of study which deals with the moral and ethical responsibilities of human beings towards the environment. It touches on values and asks questions such as, does nature have value that extends beyond its obvious role of meeting human needs? Are some parts of nature more valuable than others? What is man's responsibility towards nature? Just as the environment is a complex entity, environmental ethics too, is not just concerned with ethical enquiry but has to take on board aesthetical, religious, scientific, economic and political considerations. Environmental ethics encompasses a very diverse and rich responses which are prompted by the environmental crisis. It is a relatively new discipline, developing rapidly beginning in the 70's. Today it plays a crucial role in a world that is only beginning to develop the ability to engage in global cooperation. The field is still in a stage of active growth and a variety of exciting ideas can be seen emerging. Today environmental ethics is very much informed by the dominant anthropocentric (human – centred) concerns or world view. An alternative view, which is called ecocentrism is to view a problem from the perspective of a whole ecosystem which comes from an awareness that we are actually only part of a larger system. Environmental ethics education can be made even more effective with the understanding of action played out at the systems level and group level. Concepts of collective wisdom and human maturity as a species are important here. *Homo sapiens* is a young and new species, having been around for less than 200,000 years Ethical choices and consequences ought to be assumed on the scale of large groups, at the systems level over the long term, extending to non-human as well on to human life and well-being. The above view goes well with James Lovelock's hypothesis which sees the earth as a living super-organism also known as **gaia**. This hypothesis also proposes that the homeostatic or balanced and self- organising planet, which is the sum of all its living interactions, in turn acts to optimize surface conditions for the maintenance of life.

Indeed culture and the religious view is very important for an environmental ethics. One element in religious teaching is the notion of *stewardship* of man towards nature. The stewardship principle tells us that humans are not the only animal to feel emotion and pains (a damaged ecosystem in fact exhibits widespread sufferings) but our species has exhibited conscience and intelligence. We invented tools and civilizations and derived management and ethical systems beyond what we know are the capabilities of other human forms of life. With such power also comes responsibility. In this case our responsibility is stewardship, and the protective guardianship of earth

and its living systems. Should we be **technocratic**, placing trust in future technology to save us from the mess we make of the earth, or should we be **ecocentric** and remain within human limits and principles of ecology with adequate precaution, prevention and preservation of critical life-support processes ? We have to choose soon, and utilize the scientific and ecological, management tools of the subject of environmental science to the best of our abilities.

In any case, I feel certain that the gathering of social and natural scientists, philosophers, engineers, policy makers as well as NGO's here this morning will bear much fruits of wisdom in terms of the environmental education guidelines that the **Asia – Pacific Network** is promoting for all of us. To the organizers, congratulations and good luck on your efforts. To our special guests / colleagues from abroad, please enjoy your stay in Malaysia. I wish you the best for your endeavours. The outcome of this seminar would be of interest to us at the ministry, and I look forward to a further working together and strengthening of networking between us. You can rest assured that on the part of the ministry, we will be most happy to assist similar efforts in the future. And now with the phrase of *Bismillahirrahmanirrahim* it gives me great pleasure to declare this symposium open.

Keynote Address

Orientation of the Framework for Guidelines of Environmental Education based on Practice of Environmental Education

Fumiaki Taniguchi

1. Introduction

- Background of this symposium
- Objectives of this symposium
- Related workshop

2. Personality Building and Environmental-Awareness Heightening

- Aims of education
- Awareness heightening of spirit or mind in personality in three environmental dimensions
- Integration of natural, social and human sciences, or environments

3. Asia-Pacific Networking: Framework of Guideline

- Using internet
- International conferences: APN

4. Declaration, charter, etc. for the references to the framework

- Japanese Law: Enhancing Motivation on Environmental Conservation and Promoting of Environmental Education (2003)
- Earth Charter
- Education for sustainability
- Environmental education (NAAEE: North American Association for Environmental Education)
- Canada Environmental Sustainable Development Strategy 2004-2006 (Canada)

5. Conclusion

- (1) Possibility of the guideline for environmental education: networking
 - i. Malaysia, Thailand, Japan, Canada from which countries participants came.

- ii. China, Nepal, India, from which participants could not come, but they are the members who have rights to cooperate in APN projects.
- iii. Australia, New Zealand, U.S. were supposed to come, but they are also not able.

[Including these Asia and Pacific countries we could focus on the Guideline for Asian programs referring to the Canadian First Nations which are common to Asian environmental circumstances.]

- (2) Next September, we are going to summarize the final meeting with Malaysia, China, India and Canada in Kobe, Japan.
- (3) Environmental Ethics Based Regional Religion Personality Building: Integration of knowledge, passion, will and belief. Ethics and Religion: should be stable, in one way, as theoretical ethics and in other way, as religious belief.
- (4) Cultivation of moral sentiment and religious belief is the most important task.
 - i. criterion of human behavior
 - depends upon sentiment and belief
 - ii. awareness of belief emerges from sentiment and belief
 - iii. action (practice): motives by sentiment and emotion consideration (theory): thought, reflection, meditation

[Final end of self-realization in education is to get out of narrow ecoconsciousness and to move from such ego-conscious self to broad ecoconscious self].

6. Supplement: Keywords to Discuss

Introduction

1. Background of this symposium

- (1) The symposium aims to establish preliminary guidelines and discuss the role of networks in environmental education in the Asia-Pacific region.
 - i. to assist in the development and promotion of knowledge related to global Change research,
 - ii. to share viewpoints of knowledge and expertise from invited guests in the fields of natural sciences, social sciences, and human sciences.
 - iii. in order to have a common understanding of environmental issues based on environmental ethics, internationally recognized guidelines for environmental education need to be established.
 - iv. comprehensive studies on "Environmental Education" have not yet been sufficiently integrated.

2. Objectives of this symposium

- (1) The fundamental objectives of the symposium “Establishing Guidelines for Environmental Education Focusing on Environmental Ethics and Human Dimension of Global Change organized with the Cooperation between Konan University, Japan and University of Malaya, Malaysia” are:
 - i. to make full use of participating countries’ experience & knowledge of global change research to formulate guidelines for environmental education & sustainable development.
 - ii. to fill the existing gaps among teachers & other stakeholders involved, such as global change experts, decision-makers, etc. by developing methods/modules for environmental education that can be used as a basis for environmental ethics education for countries in Asia.

3. Related workshop

- (1) to share the experiences of participating countries in environmental education & sustainable development.
..... Malaysia, Canada, China, India, Nepal, Australia, New Zealand
- (2) to discuss how to mobilize these experiences in the Asian context
..... method and policy-making
- (3) to discuss the potential roles of networks in the Asia-Pacific region with respect to environmental education and sustainable development principles or philosophy of environmental education, concept of sustainability and development.

[The outcomes of both the symposia and workshop will be used to formulate guidelines that can be used by countries in Asia to develop environmental education guidelines to suit the needs of their own countries].

7. Personality Building and Environmental Education

1. Awareness Heightening

- (1) Aims of education: Personality Building = Integration of Knowledge to understand, sentiment to sympathize, Will to live and Belief to judge
 - i. Sentiment cultivating
..... sense of wonder, aesthetic sentiment sympathy, etc.
 - ii. Knowledge Training
..... reason, logic, memory, ability of problem-solving, etc.
 - iii. Spirit Awakening
..... belief, religious mind, communion, etc.
 - iv. Will Forming
..... attitude, participation, action, decision-making, etc.

[Such components of integrated personality are naturally linked to Environmental Awareness Heightening which is essential to Environmental Education].

(2) Awareness heightening of spirit or mind in personality in three environmental dimensions: original experiences in each environment.

- i. Environment of Nature; Original Experience in Nature = awakening sense of wonder (Rachel Carson), aesthetic sensation, moral sense etc, including wisdom and sense of moral and religion.
(Wisdom required though natural experiences)

When we have walked in these woods I have made no conscious effort to name plants or animals nor to explain, but have just expressed my own pleasure in what we see, calling his attention to this or that but only as I would share discoveries with an older person. Later I have been amazed at the way names stick in his mind, for when I show color slides of my woods plants it is Roger who can identify them. Oh, that's what Rachel like—"that's bunchberry!" or, That's Jumer (juniper) but you can't eat those green berries—they are for the squirrels." I am sure no amount of drill would have implanted the names so firmly as just going through the woods in the spirit of two friends on an expedition of exciting discovery.

- ii. Environment of Society; Original Experience in Society = awakening friendship, human relations, love etc. In social environment younger generation in Japan seems to toss vivid spirit and be declined to be withdrawn in the house without any contact with others.

- iii Environment of Mind; Original Experience in Spirit = awakening moral sentiment, religion, belief etc. Japanese young generation seem to have lost vitality in life! so loss of power to live or ego-ism causes serious problems.

[Original experiences in nature, society and mind environment awaken the spirit of young people which enables spontaneous growth to realize potential of Self and helps the formation of integrated personality].

(3) Integration of Natural, social and human sciences, or environments

- i. Logical methods: feedback and feed forward to make theoretical framework
 - Induction; gathering materials, collecting data and analyzing evaluation (feedback)
 - field experiences! observation, practice converting "experiences into "knowledge": probable truth
- ii. Deduction; making theoretical frame work (framework-making)
— human relations! policy, sustainable society: logical truth always true but no expansion of knowledge

- iii. Abduction; forming new hypothesis for problem-solving theory, framework by feed forward (feedback)
 - environmental ethics
 - experimental probability grounded on hypothetical theory (then, feedforward according to new hypothesis)
 - [These logical methods correspond to integration of personality: knowledge to understand, sentiment to sympathize, will to live, belief to judge!]

2. Practice: Networking and Eco-tour VTR

- (1) Japan
 - Teacher-training
 - Networking with Hyogo Institution of Education Board
- (2) Thailand
 - Vihara (NW)
 - Kui Bud National Park
- (3) Canada
 - First Nations: traditional heritage (arrowhead, knife)

[Networking and eco-tour is very effective methods for environmental education.]

3. Building integrative theory: Environmental Education based on Ethics

- (1) Personality Building; Integration of knowledge, sentiment, will and belief
.....Knowledge —Wisdom
- (2) Comprehensive Subjectsneeded to afford will the frame work to focus on their ends
- (3) Leading to same direction of resolution of environmental issues
.....we will have the common value to judge about and act together to the same target

[In such framework of logical method, practical integrative theory we will be able to know which way to go and what to act for sustainable future].

4. Asia-Pacific Networking: Framework of Guideline

- (1) Using internet
 - i. Thailand: Phranakhon Rajabhat University “International Network for environmental education” (common material as a subject)
 - ii. China: Peking University. Preparation for devices at Peking University (Preparing the instruments from Japan)

- iii Malaysia: University of Malaya. Workshop (Polycom, Fresh Voice)
(making networking in Asia-Pacific region)

[Concrete method to network]

(2) International conferences: APN

- i "Global Change Research and Environmental Education -the APNS Expected Roles-" inviting Japanese Minister (April 2005, Hyogo Prefectural Art Museum in Kobe, Japan)
- ii. "Establishing Guidelines for Environmental Education Based on Environmental Ethics (January 2006, Konan University, Kobe, Japan)
- iii. Using internet between Thailand and Japan, 28-30 January 2006

(3) "Establishing Guidelines for Environmental Education, Based on Environmental Ethics (II)". The 5th International Conference of Health Behavioral Science °Education on Health and Environment: Integrated Medicine & Environmental Education" (17-21 August 2006) sectional meeting at Thailand: Phranakhon Rajabhat University

[need to hold international conference not only by internet but also by real conferences as the proverb, "Think globally, act locally."

5. Declaration, Charter, etc. for the references to the framework

- (1) Japanese law: Enhancing Motivation on Environmental Conservation and Promoting of Environmental Education (2003) Purpose:
 - i. encouraging willingness for environmental conservation and environmental education by cooperations, citizens, and private bodies organized by these entities environmental conservation and environmental education
 - ii establishing a sustainable society that realizes sound economic development with reduced environmental loads while maintaining a healthy and productive environment Sustainable society and sound economic development
 - iii. providing a basic principle on environmental conservation activities, encouragement of willingness for environmental conservation and environmental education,
 - iv. clarifying the responsibilities of citizens and private bodies etc., the State, local governments, establish a basic policy and other necessary matters to encourage willingness for environmental conservation and promote environmental education,

- v. contributing to ensure healthy and cultured living for both the present and future generations of the nation. intergenerational ethics

[This law is embodied in the ground plan (2004) of which teachers and instructors can easily make use].

(2) Earth Charter: Principles

- i. Respect and Care for the Community of Life
- ii. Ecological Integrity
- iii. Social and Economic Justice
- iv. Democracy, Non-violence, and Peace

[The themes of environmental education are expanded].

(3) Education for Sustainability

Key characteristics of education for sustainable development Education for sustainable Development will aim to demonstrate the following features:

- i. Interdisciplinarity and holisticness
- ii. Values-driven
- iii. Critical thinking and problem solving
(Locally relevant addressing local as well as global issues, and using the language(s) which learners most commonly use).

[UNDES: United Nations Decade of Education for Sustainable Development 2005-2014]

(4) Environmental educations (NAAEE: North American Association for Environmental Education)

- i. Fairness and accuracy
- ii. Depth
- iii. Emphasis on skills building
- iv. Action orientation
- v. Instructional soundness
- vi. Usability

(5) Canada's Sustainable Development Education Strategy.

Strategy 2004-2006 (www.ecgc.ca) Environment Canada

- i. Chapter 1: Sustainable Development
- ii. Chapter 2: Environment Canada's SDS 2004-2006 Framework and Commitments
- iii. Chapter 3: Working Across Government to Advance Sustainable Development
- iv. Chapter 4: Environment Canada's Commitment to Global Stewardship

v. Chapter 5: Performance Reporting

8. Conclusion

- (1) Possibility of the guideline for environmental education: networking
 - i. Malaysia, Thailand, Japan, Canada from which countries participants came.
 - ii. China, Nepal, India, from which participants couldn't come, but they are the members who have rights to cooperate in APN projects.
 - iii. Australia, New Zealand, U.S. were supposed to come, but they are not able to this time.

[Among these Asia and Pacific countries we could focus on the Guideline for Asian programs referring to the Canadian First Nations which share elements in common to Asian environmental circumstances.]

- (2) In September 2007, we are going to summarize the find meeting with Malaysia, China, India and Canada in Kobe, Japan.
- (3) Environmental Ethics Based on Regional Religion Personality Building: Integration of knowledge, passion, will and belief. Ethics and Religion: should be stable, in one way, as theoretical ethics and in other way, as religious belief.
- (4) Cultivation of moral sentiment and religions belief is the most important ask.
 - i. criterion of human behavior
 - dependence upon sentiment and belief
 - ii. awareness of belief emerges from sentiment and belief
 - iii. action (practice): motivated by sentiment and emotion consideration (theory): thought, reflection, meditation[Final end of Self-realization in education is to get out of narrow ecoconsciousness and to move from such ego-conscious Self to broad ecoconscious Self].

9. Supplement: Keywords to discuss

- (1) Concept of terms
 - i. sustainability, sustainable society or future
 - ii. economic development endogenous development
 - iii. environment and life
 - iv. ecosystem, forest, biotope, wilderness, wet land
 - v. dualism, reductionism versus holism
- (2) Framework
 - i. decade of education for environmental education by UN
 - ii. guideline, framework, principle
 - iii. philosophy, ethics, morals

- (3) Method
 - i. networking, partnership, information, exchange
 - ii. case studies
 - iii. theory-making
 - iv. problem-solving
 - v. System of self-organization, circulation

- (4) Purpose
 - i. bridge between practice and theory
 - ii. Asia and Pacific network
 3. Problems of global environment

- (5) System
 - i. formal education and non-formal education or life-long learning
 - ii. society and religion
 - iii. relationship between Declarations, Charter, etc.
 - iv. relationship between south and north countries, developing and developed countries.

- (6) Themes
 - i. environmental education literacy
 - ii. value, sentiment, cultivation, spirit, faith
 - iii. global change, global warming
 - iv. resources such as water, air, energy, fossil, fuel, bio diesel
 - v. contamination such as soil, air water by chemicals
 - vi. extinction of species, biodiversity, alien species, habitat
 - vii. biotechnology
 - viii. population problems

- (7) Environmental ethics
 - i. fairness, Justice, distribution
 - ii. intergenerational ethics
 - iii. rights of nature/plants/animals
 - iv. justice of distribution
 - v. 3 R (recycle, reduce reuse), 4 R (recycle, reduce, reuse, refuse)

Environmental Education Efforts Ministry of The Environment of Japan

Yoshiaki Asano

Agenda

- Expectation on environmental education
- Laws and plans about environmental education
- Policies implemented by MOEJ
- Japan's efforts on UNDES

Expectation on environmental education



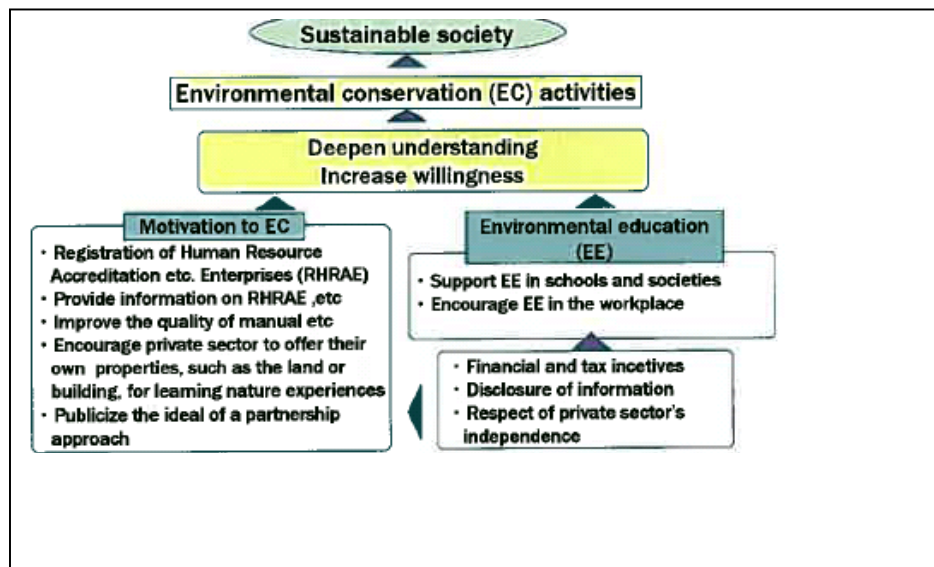
Legislations and decisions relevant to environmental education



Basic environmental law

- Article 25
 - The state shall take necessary measures to increase corporations' and citizens' understanding of environmental conservation and to encourage their willingness to engage in activities related to environmental conservation, by means of promoting environmental education and learning and improving public relations activities with regards to environmental conservation.
- Article 27
 - The state shall make efforts to appropriately provide necessary information on environmental conservation including the state of environment, so as to promote the education and learning provided for in Article 25 and to contribute to the activities voluntarily conducted by the private bodies etc. provided for in the preceding Article, in consideration of the protection of the rights and benefits of individuals and legal entities.

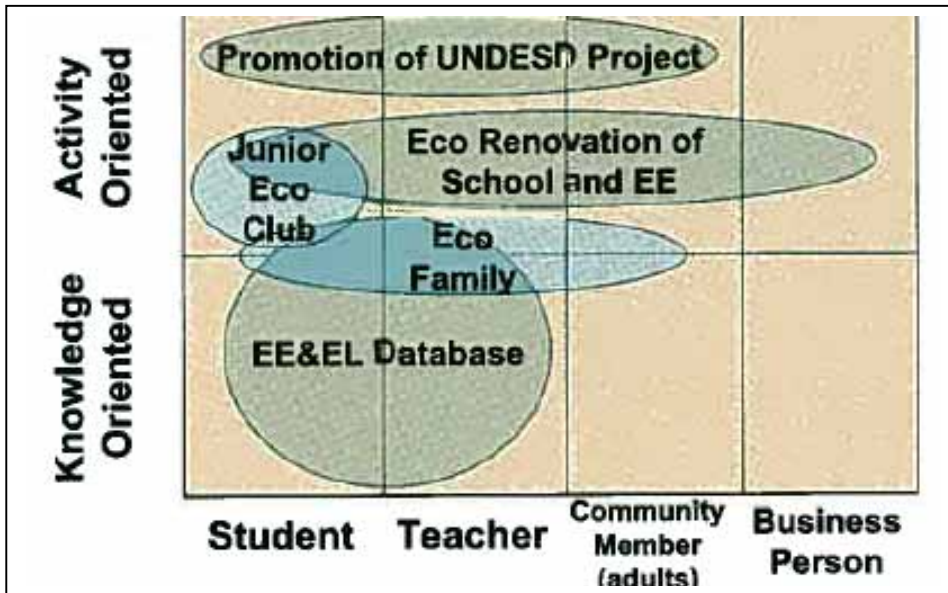
Structure of the environmental education law



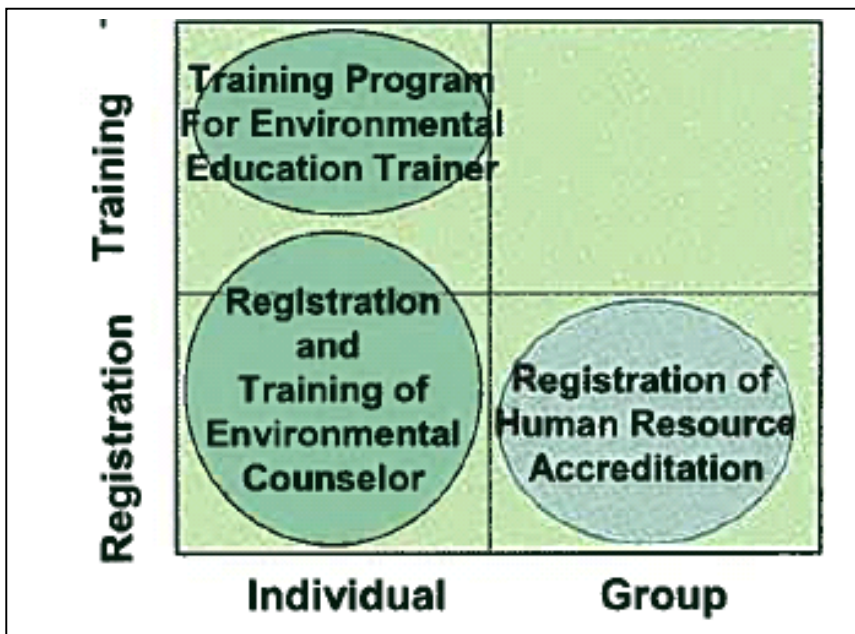
Projects implemented by MOEJ

- Direct assistance to learners
 - Junior eco club
 - Eco family project
 - EE/EL database
 - Eco renovation and EE
 - Promotion of UNDESD project
- Indirect assistance/ human development
 - Training program for EE trainer
 - Registration and training of environmental counsellor
 - Registration of human resource accreditation

Direct assistance to learners



Indirect assistance to learners



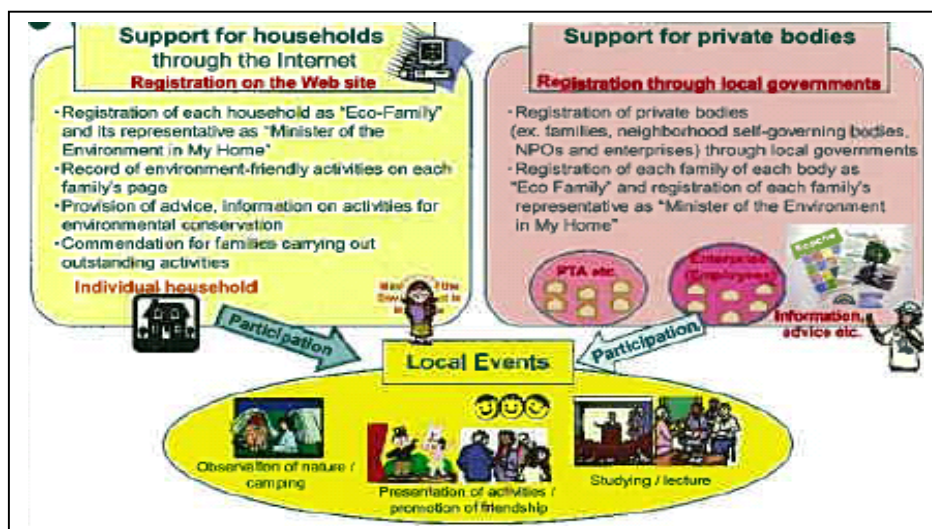
Junior-Eco Club

- MOEJ promoted Junior-Eco Club activities throughout Japan, for elementary and junior high school students and the adults who assist them.
- Through these clubs, MOEJ has been helping children to enjoy environment related activities and studies in their local communities.



Eco Family project

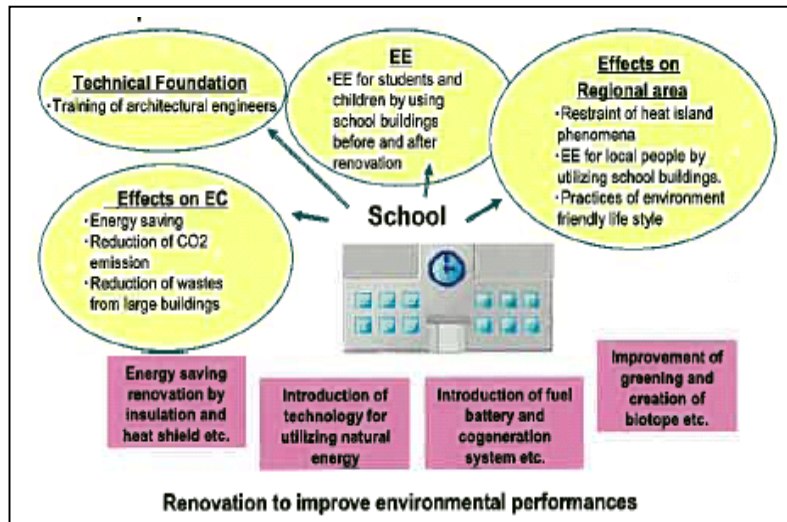
- Support eco-conscious families (“eco-family”) with information provision through web site.
- Useful advices and information are available on the internet as well as from environment specialists in person.
- Good activities of the family are awarded.



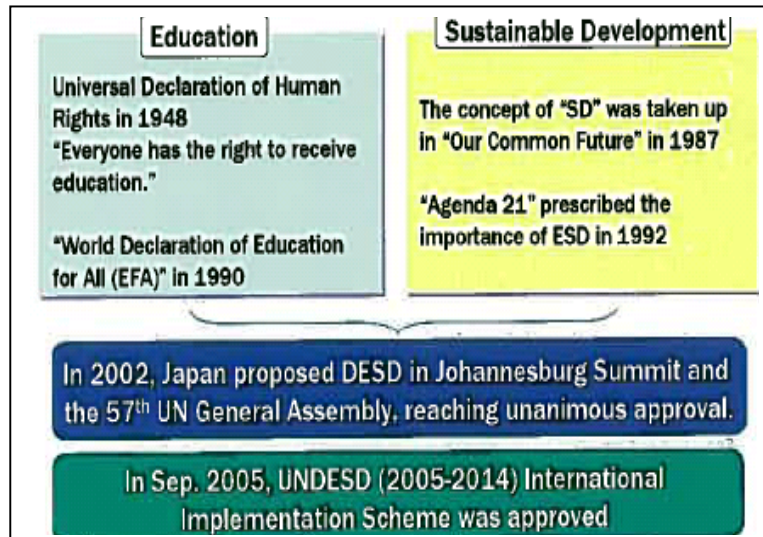
EE/EL database

- Provision of information on EE/EL to teachers and students
- <http://www.eeel.jp/index.html>

Eco renovation of school and EE



Movement towards UNDESSED (United Nations Decade of Education for Sustainable development)



Developing Japans' plan for implementation for UNDESSED

2005	
Dec.	Establishment of “the Liaison Conference of Ministries and Agencies Concerned with UNDES D”
2006	
Jan.	Establishment of Round Table involving various stakeholders (government, NPO, academia, mass media, etc)
Feb.	Public Comment on Provisional Japan’s Plan
Mar.	Decision of the Japan’s Plan of Implementation for UNDES D by the Liaison Conference

Contents of Japan’s plan of implementation for UNDES D

- Priority issues
- Guidelines for implementation
- Promotional methods
 - Key programs in the early stage
 - Concrete promotion methods in Japan
 - Programs expected of stakeholders
 - International cooperation
- Evaluation and review

Environmental Education For Malaysian Undergraduates

Rosli Omar

Abstract

*The Earth faces unprecedented challenges for survival in the coming decades. The state of its environment is so serious that scientists are now mentioning the possibility of another mass extinction of species - the Sixth Extinction. Habitat destruction and overkill of species from unsustainable consumption, the traditional culprits, are now added global warming as causes towards this Sixth Extinction if **business-as-usual** human practices continue. To change this an environmental education based on sound understanding of the causes, as well as how to overcome them rooted in environmental ethics is needed. The course will have to look at the problem holistically - combining the scientific understanding of the causes as well as the economic and social drive for development, which is quite often anathema to a healthy environment. Some specific Malaysian situations will be discussed. The new generation of graduates with a sound environmental education is our hope of this change - the older and present generations are too steeped in bad practices to change their "business-as-usual" ways.*

Introduction

The Earth is in dire straits and will get worse if the "business as usual" attitude is in our behavior and practices. It is bad enough that scientists are now talking about another mass extinctions of species - the Sixth Extinction (Wilson 1994, Leakey and Lewin 1995, Eldredge 2001). As Wilson says, "The SIXTH GREAT extinction spasm of geological time is upon us, grace of mankind". There have been five major mass extinctions before: the fifth includes the terrestrial dinosaurs among those that perished 65 million years ago. The cause then is suspected to be the impact of an asteroid on Earth that threw up so much soot that the Earth experienced a climate change. In fact all five mass extinctions were the result of climate change from a variety of causes. Among the main causes for this coming extinction are habitat destruction (cutting down forests, pollution, etc), over kill and over consumption of species, and climate change. If present trend continues, all wildlife fisheries will collapse by 2050 (Worm et al 2007). The orangutan in Sumatra will face extinction in the wild within 5 years because so much of their habitat is destroyed, most recently for oil palm plantation (Nellemann et al. 2007).

Jared Diamond (2005), a professor of Geography at the University of California, Los Angeles, studies how previous societies have collapsed. Among them were communities of the Maya, Ancestral Pueblo (or the Anasazi), and Easter Island. He found that among the most important factors for collapse were habitat destruction due to population expansion and a higher civilisation that has a greater impact on the environment. He predicts that by 2050 major environmental problems will start to manifest themselves. As he puts it, "Our world society is presently on a non-sustainable course", and that "even the world's present population is living at an unsustainable level". And still more will be added. The best lowest forecast scenario is another 2.5 billion, stabilizing at 9 billion people.

Another cause of the next mass extinction is, once again, climate change. This time it is from global warming, due to greenhouse gases, mainly carbon dioxide, that are released to the air by our motor vehicles and factories, as well as from cement production for our buildings. The other greenhouse gas is methane released from padi fields and stomachs of ruminants such as cattle, goats and sheep, among others (Flannery 2005). As we can see these gases are released from our activities. Ironically, the new impetus to cut down forests for oil palm is for biodiesel. This is to replace fossil fuel because biodiesel is deemed to be a "green" fuel that does not contribute to global warming. Global warming is a very serious threat. It is expected to destroy the Amazon rainforest by the end of the century, reducing it to a desert, or at best, grassland (Jenkins et al. 2005). In the ocean, warming of the ocean is expected to destroy the coral ecosystem, the ocean's equivalent to the tropical rainforests in terms of its biodiversity richness (Diamond 2005). The Australian Great Barrier Reef will be gone; and so too will our own Malaysian corals. Climate change was the other main factor in the collapse of previous societies discovered by Diamond. He thinks that the present global warming will be a major factor in the worsening environment at the future. **Environmental studies must be drawn up that educate a new generation of graduates that are aware of the direness of the Earth environment and thus their own and of their children's and their children's children's environment.** They are our hope to bring about a change in human behavior. The previous and even present generations were brought up with the idea that mass consumption was good for economic growth. We are too steeped in our bad habits to change a lifetime of environmentally bad lifestyle. The new generation can be taught the environmental values required for the survival of the Earth and thus their own survival. We are going to look at the ingredients required to bring about this awareness.

Ingredients in an Effective Environmental Studies

A course in environmental studies would need to include the 11 environmental problems articulated by Diamond, which to him, must all be solved to avoid collapse: even if one of them is not solved we would still be in trouble. Students need to understand why each is an environmental problem and how it is contributing to collapse. The first four are issues of natural resources that we are losing:

1. **Natural habitats**, which includes forests, wetlands, coral reefs and ocean bottoms. More than half of the world's original forests have gone and at present rate of

conversion one-quarter of the remaining forests will also be gone in the next 50 years. In Peninsular Malaysia, lowland forests have virtually all been destroyed outside those in national parks. Students need to understand that forests provide, not just timber, but ecosystem services for free: protecting our watersheds, and protecting soil from erosion, constitute an essential step in the water cycle that results in rainfall, and of course provides the habitat for flora and fauna from which we derive the rich biodiversity essential for a healthy "web of life". Deforestation was a, or the, major factor in all the collapses of past societies studied by Diamond.

A greater proportion than forests that is being lost is wetlands, which were regarded before as wastelands. But wetlands too provides free ecosystem services such as cleaning our water supplies by filtering out sediments and other floating matter, absorbing excess rain water thus preventing or reducing the extent of flooding, and providing freshwater fisheries as well as being a breeding place for many ocean fishes. Also, draining and drying up wetlands cause the enormous amounts of carbon dioxide stored within to be released thus worsening global warming.

About a third of the world's coral reefs have been lost. Much has been destroyed by bottom trawling nets (Lotze et al. 2006). Other causes are the use of dynamite for fishing, reef overgrowth by algae because the fish that feeds on them have been fished out, sediments from runoffs as a result of land clearing for agriculture and pollution from nearby lands swamping the reefs as well as coral bleaching from warming seas. Here students can see the interconnectedness of issues. If current practices continue half of the remaining will be gone by 2030.

2. **Wild foods.** Fish and to a lesser extent shellfish contributes a large source of protein for us. About two billion people, especially the poor, depend on them for protein. But over consumption has caused many of the traditionally rich fishing grounds to collapse or soon will be. As mentioned before, all wildlife fish and shellfish fishing will be over by 2050 if no major conservation efforts are started. Students will learn that this is the usual "tragedy of the commons": nobody wants to take the effort to preserve a resource when it is shared by everybody. Each wants to exploit as fast as possible in competition against "the others". Past collapsed societies studied by Diamond have overfished include Easter Island, Mangareva and Henderson Islands.

To overcome the shortage of wild fish aquaculture is introduced where commercial species are reared. But this seemingly promising venture as commonly practiced could be even worse for wild species. This is because wild species are caught to feed the reared ones; it takes some 20 kilograms feed to produce a kilogram of fish. Thus this will hasten the collapse. Aquaculture too produces polluting runoffs which cause eutrophication, the exhaustion of oxygen in the water. Their fishes too contain higher levels of toxins than wild ones. Escapees interbreed with wild species causing genetic diversity to suffer thus making wild species more vulnerable to disease.

- 3. Loss of genetic or biodiversity.** A large fraction of genetic diversity among wild species have been lost and at present rate a large fraction of what remains will be lost in the next 50 years. Students will learn that maintaining this diversity by maintaining the survival of all creatures, fauna and flora, big and small is important for our own survival. Wilson (1994) says, as biodiversity is reduced, so is the quality of the services provided by ecosystems. They will learn how seemingly insignificant creatures provide important ecosystems services. For example, soil bacteria that enable plants to absorb nitrogen, which they can't do on their own; similarly, mycorrhizal fungi living in symbiosis in plant roots help the roots to absorb soil nutrients. This function is so vital that Wilson worries that their loss, already 40 – 50% in the last 60 years in Europe (as of circa 1990) mainly due to air pollution, can be catastrophic; and earthworms in regenerating soils and maintaining its texture. Diamond describes the failure of the Biosphere 2 experiment as due to a lack of appropriate earthworms that result in the fall of oxygen levels, harming human experimenters involved.

Another group of important ecosystem service providers are bees. They pollinate flowers that enable fruits to form and thus a new generation of plants. At the moment a worrying new disease is causing the disappearance of honeybees in the United States especially, where a quarter of the honeybee colonies are gone³, and to a lesser extent, Europe. It is called Colony Collapse Disorder (CCD) and its cause or causes unknown. Students can learn the interconnectedness of life. Following Einstein, who famously said, if bees are gone humans have only four years to live. No bees no fruits, no fruits no plants, no plants no animals.

- 4. Loss of topsoil.** Soils from farmlands necessary for growing crops are being eroded away by water and wind at the rate of 10 to 40 times the rates of soil formation, and between 500 to 10,000 times erosion rates in forests. That is, one of the main reasons for erosion is deforestation (as the case is in Malaysia). Loss of topsoil, the most fertile soil, results in loss in plant productivity thus affecting our food supply. Some 20 to 80% of the world's farmlands are now severely degraded due topsoil loss. It was one of the reasons contributing to the collapses of all past societies as noted by Diamond. Another aspect of soil loss is the loss of fertility due to the fact that farming takes out nutrients faster than can be generated by weathering of the underlying rocks.

The next three issues involve ceilings on energy, freshwater and photosynthetic capacity.

- 5. Energy sources.** Most experts believe that although coal reserves are large present reserves of oil and gas will run out in a few decades. Run out here refers to the readily and cheaply available supply. There would remain those that are progressively more expensive to draw out making it uneconomical to do so. Thus, the push for other sources including sustainable ones such as wind and solar energy. Here the consequence, pros and cons, can be discussed for students to realize its implications. Getting away from burning fossil fuel would stop more emissions of CO₂ that fuel global warming. Biodiesel, even though it reduces the emissions, on the other hand competes with agriculture for land causing food prices to increase or virgin forests to be destroyed as we have seen above. Nuclear

energy does not emit carbon but the storage of its spent fuels is still an unsolved issue because of its radioactive nature.

- 6. Water sources.** Most of the available water sources in the world are already being utilized. In many places the available reserve is at a critical point. Already a billion people lack access to reliable safe drinking water. Many underground water aquifers are being pumped out at a greater rate than they are replenished, such as the Ogallala in the US, the fossil aquifers in Saudi Arabia and Libya, mainly for agriculture. They are expected to run out in a few decades (Postel 1999). In the mean time population is increasing with the rich bounty. What happens when the water runs out? Sea water desalination is still a very expensive affair if that is what some people are thinking of as a solution.

Dams are built to store and regulate water flow and also for hydropower but again they have negative consequences that the students need to be aware of (McCully 1996, Postel 1999). Forest for the reservoir has to be cleared thus worsening our biodiversity problem. Or we could just drown the plants but this would release a lot of methane, which is some 22 times more potent than the CO₂ that would be released if allowed to burn or rot in the open air. The reservoir created is an environment very different from a free flowing river to which the river inhabitants are adapted to. Dams too prevent fish migration upriver, usually to spawn. Just like the salmon, some of our fish species migrate upriver too for spawning such as the *kelah* and *terubok*. The water flow regulation too causes a flow regime that is very different from what the inhabitants are used to. For example, during the dry season with a low water flow, fish take the opportunity to lay their eggs. Furthermore, dams release water from the bottom of the reservoir. This water is very cold, again producing a very different river environment. Dams are likely a cause of why in a survey of freshwater species in peninsular Malaysia it was found only 122 of the 266 species were found (Wilson 1994).

Rivers too carry sediments that are necessary to build and to maintain river deltas. Dams prevent this from causing and for example the Nile delta, slowly crumbled into the sea. The sediments too carry nutrients necessary to maintain mangroves necessary as a breeding ground for many marine species. Fish catch has dropped at the Nile mouth.

Note that the sediments stored behind dams render them useless at some point. They then need to be decommissioned, which is an expensive affair. Thus the description of dams as a green energy source is not an accurate one (McCully 1996).

Dam issues are suitable for students to again study the tradeoffs between several competing requirements.

- 7. Photosynthetic ceiling.** There is a finite amount of sunlight reaching the Earth and thus there is a limited amount of photosynthesis that can take place. That is, there is a limit to the amount of plants that can be grown. It is estimated that we would be utilizing most of the photosynthetic capacity by 2050. That is, we will be using most of the terrestrial sunlight for our purposes and there would be little left to support, for example, natural forests.

The next three issues involve our production of toxic chemicals, spread of alien or exotic species, and global warming.

- 8. Toxic chemicals.** We are releasing toxic chemicals in the form of pesticides, insecticides, herbicides, and numerous others as byproducts of those products that we want, poisoning rivers and oceans, the air and the soil. Their effects were first documented by Rachel Carson in her book *Silent Spring* (1962) that started the environmental movement. Many of the chemicals are endocrine disruptors, mimicking the natural female estrogen, causing birth defects, such as undescended testis, uterus defects, and reducing sperm fertility. These effects apply to most organisms be they reptilian, birds or mammals. If they get more severe the future of animal populations will be uncertain (Colborn et al. 1996).

Ironically, the people suffering the most pollution are the Inuits (Eskimos) that live far from civilisation in the Arctic. This is because they eat the top predators – seals and big fish that have eaten further down the food chain and thus have concentrated the pollutants as they go up the chain. The result is they have among the highest concentration of pollutants such as PCBs and DDT. For example, in the polar bear, the other top most predator in the Arctic, the concentration of PCB is 3 billion times relative to that in water. Some of the pollutants act as endocrine disruptors. The Inuits thus have many birth defects (Colborn et al. 1996).

And as mentioned above, soil pollution is killing off mycorrhizal fungi at the peril of plant lives and thus our lives.

- 9. Introduction of alien or exotic species.** We have been introducing organisms into new ecosystems often far from their origins either consciously or otherwise. And they have created havoc to the environment to such an extent that it is considered the third most pressing problem after global warming and habitat loss (Wolfenbarger & Phifer 2000). For example, rabbits introduced into Australia have multiplied so successfully that they are eating away the already sparse vegetation, putting pressure on an already sensitive ecosystems. Rats introduced into Easter Island caused the extinction of its palm trees by eating away its fruits. They too eat away birds eggs and chicks contributing to the collapse of Easter Island, which have no rats before.

Students will learn that a particular ecosystem is stable after having adapted over a long time between its fauna and flora. A new arrival to which they might not have an immunity, or generally not adapted to, might suffer. Introduction of new species have been going on for ages in the past but at a manageable, natural, rate. But with our ocean going ships and airplanes the rate and number of introductions are making ecosystems constantly in flux.

- 10. Global warming.** This is the greatest threat facing us. If global mean temperature increases by 1°C corals will be bleached, killing them. Given its highest biodiversity among marine ecosystems this could lead to devastating follow-on effects. But there is enough CO₂ already in the atmosphere to increase global temperature by 3°C if the early Pliocene, 3 to 5 million years, with exactly the same conditions (CO₂ concentration and amount of received sunlight), is a comparison (Fedorov

2006). A 3C rise could mean a rise of 25 meters of sea level drowning New York, London, George Town and Johor Baru and numerous coastal cities and plains. Some 500 million people would be displaced (Rosli 2007). The Amazon will be reduced to a desert as well as many other parts of the world; Africa will be largely a dry continent (IPCC 2007). With minimum temperature rise (1-2°C), 18% of all species would be extinct, 24% with mid-range rise (2-3°C), and 35% with high rise (3-5°C). The world will be a very different place from what we are used to.

Students must learn what measures must be taken to at least reduce some of the more dire effects, as well as the forces at work ideological positions of some groups, and even governments. For example, some major companies sponsor think tanks that are global warming deniers. Among the sponsors are also academics who are employed, for example, Malaysian-born Willie Soon at Tech Central Station (Sourcewatch 2007c).

11 Population size and impacts. Total environmental impact is the product of impact per person and the population size. Thus, the bigger the impact per person the greater the total impact is. Similarly, a bigger population will contribute a bigger impact. The West is partial to the first problem. Each citizen of the US, western Europe, and Japan consumes 32 times more resources and thus produces proportionally the same amount of waste compared to those in the Third World. The Third World tend to have higher fertility rates than the West. Either way, more resources consumed mean more forests cut, and more CO₂ produced, among others.

Students will learn what the challenges are to reduce impacts per person and to reduce the rate of population growth. The best estimate of least increase is an additional 2.5 billion people as mentioned above. Given the worsening of global warming this will be a real challenge in reducing more CO₂ emissions as well producing enough food.

Theoretical Framework

The theoretical framework to locate these 11 environmental problems could be under such topics as *Importance of Maintaining High Biodiversity* or *Understanding The Web of Life*. This can be used to analyse the interaction of one organism with others and how a demise of one can affect the web and how the web can break down leading, in the worst scenario, to the Sixth Extinction. Another factor detrimental to biodiversity is the extensive genetically modified (GM) crops grown. It is beginning to impact beneficial insects such as butterflies. Also GM crops modified to be water-logged tolerant, dryness tolerant, etc could be produced for planting in previously unsuitable habitat such as wetlands and semi-desert areas further contributing to the decline of biodiversity (RSC 2001, Rosli 2002). Problems in maintaining this high diversity can be discussed – deforestation, pollution, etc., also as a result of impacts per person, and increase in population.

Another topic, *Sustainable Development and Sustainable Consumption* can look at what the limits of development and consumption of resources are that give the maximum level of economic growth possible but still allows the maintaining of

ecosystem services. The challenges to go beyond this level of growth can be analysed – the pressures for employment, the psychological need of a democratic government to show that the public is getting better in material wealth, to catch up with the living standards of the West in the case of the Third World, etc.

Global Warming and Climate Change can look at the causes, consequences, and steps to reduce global warming and its impacts. It can look too into how past societies cope (or perish) with climate change. Apart from Diamond's book, Brian Fagan's *The Long Summer* (2004) can be another source. The topic can look too at the political processes that are resistant to taking the needed steps (US and Australian opposition to the Kyoto Protocol; the position of China, Brazil, etc).

For an approach to combat global warming equitably among all countries, rich or poor, students can look at Contract and Convergence or C&C, or another similar concept, the carbon pie (Broecker 2007). The idea is, first, determine what the acceptable amount of carbon that is safe enough to be emitted annually – which is now determined as 5 GtCO₂ or its equivalent (taking into account methane and other greenhouse gases), the amount the Earth can absorb without increasing the CO₂ concentration in the atmosphere, i.e., the world has to reduce by 80% the current emissions (Stern 2007). The amount of emitted CO₂ is then divided by the world's population to determine the carbon emission per capita per year. Given that the amount of carbon emitted per capita now in the West is higher than that in the Third World another concept that goes along with the above is carbon trading. That is, if the West wants to emit more carbon than their quota permits they can buy carbon credits from Third World countries, which usually have credits to spare. Thus, both gain in the process. This approach would also reward Third World countries that preserve their forests thus providing an incentive not to cut down forests. At the moment many countries still do not see their forests as anything more than for selling as timber.

Under *Federal-State Relationship* students can learn some of the challenges in preserving forests. Under the Malaysian constitution, land (and thus forests) is under state jurisdiction. This makes it difficult for the Federal government to pass laws to conserve forests. On the other hand, State government does not have many avenues to raise revenue. The Federal government administers taxes, especially the important revenue source, income tax. Thus forests become an important revenue source to State governments. And of course timber is its most ready form. To reduce this dependency the Federal government must provide some means for State government to raise taxes, or to share a portion of the taxes on condition that forests are preserved, say, as a national or state park. At the moment there is reluctance for the State to establish a national park (like Taman Negara) because it would have to cede control to the Federal government. On the other hand, it is harder for the State to get the necessary qualified staff to work under the State government because of the less well-paying salary structure.

Another resource under state control is water. Again it is harder for the Federal government to have a uniform conservation policy for the whole of Malaysia. Water availability, and especially clean water availability, is becoming serious. For example, the state of Selangor has exhausted its supply of clean rivers for its water supply. All its clean rivers have been dammed. It is now planning to import water from neighbouring states.

New Technology to Combat Global Warming looks at what new technologies are being proposed (and to debate the proposals) to reduce CO₂ emissions, such as solar cell, wind generated electricity, carbon sequestration, nuclear fuels, hydrogen fuel cell, biofuels, and more efficient motor vehicle engines, more efficient lightings and more efficient homes to conserve electricity. Students can learn that, often, new technologies that are supposedly more efficient and thus better have their negative side effects, for example, biofuels to replace fossil fuels. There is a price to be paid. The student learns that there are no real alternative solutions apart from reducing consumption, of any resource, be it fuel, food, or forest products. That is, they need to reduce their own impact on the environment.

Deniers of the existence of environmental problems can be addressed under *Refuting Environmental Deniers*. Diamond lists a set of the deniers' "one liners" that there are no such problems or that there are other issues more important than the environment (see pp 503 – 514). For example, "technology will solve our problems", "the environment has to be balanced against the economy", "if we exhaust one resource we can always switch to another", "look at how many times in the past the gloom-and-doom predictions of the fearmongering environmentalists have been proven wrong", "there are a vast difference between present society and the past societies that have collapsed", etc.

Conclusion

The Earth is in dire straits. If we continue with our *business-as-usual* habits then the Sixth Extinction will be upon us. Among its main causes are global warming and the subsequent climate change, habitat destruction, and overconsumption of resources. These causes are imbued in Diamond's (2005) 11 environmental problems that need to be solved. An environmental education that looks at these causes and how to address them, which includes economic and social issues, is necessary if we want to avert the worse effects of global warming and avert the Sixth Extinction.

To quote Wilson (1994) on environmental ethics, "The ethical imperative should therefore be, first of all, prudence. We should judge every scrap of biodiversity as priceless while we learn to use it and come to understand what it means to humanity" (pg 335)

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Footnotes

- ¹ Edward Wilson is Professor of Biology at Harvard, Richard Leakey is a world famous paleoanthropologist, Roger Lewin is an Associate of the Peabody Museum at Harvard University, and Niles Eldredge, a paleontologist, is the Curator-in-Chief of the permanent exhibition "Hall of Biodiversity" at the American Museum of Natural History and adjunct professor at the City University of New York.
- ² Unless otherwise stated, facts here are referenced to Diamond (2005).
- ³ Reported in the *New York Times*, Alexei Barrionuevo, 24 April 2007," What is happening to the bees?". Also in *Science*, 16 March 2007, Mysterious Bee-haviour (in *Random Samples*)⁴ Extinction rates are from Thomas et al. (2004), and temperature ranges are from Stern (2007)⁵ Introduced by Aubrey Meyer of the Global Commons Institute, <http://www.gci.org.uk/>. See also the report in *The Ecologist*, Vol. 29, No. 2, March/April 1999.

The Ethics of Environmental Education: The Malaysian (Malaysian Nature Society) NGO Experience

Angela Hijjaz

As an environmental NGO in Malaysia, where there is no environmental education in schools, it was obvious to all members of the Malaysian Nature Society that if we are to save anything of our unique biodiversity we would have to educate the public to appreciate it. With some understanding of its complexity and outstanding world treasures, then Malaysians may be in a stronger position to protect it. Without knowledge they are oblivious to the losses that are incurred daily and are therefore in no position to participate in any debate on the merits of conservation.

Our rationale was a simple one: if the government was unwilling to embark on educating within the school system, then we would have to establish independent initiatives that would try to fill this gap. Education has been and continues to be a strong and consistent priority of both WWF Malaysia and the Malaysian Nature Society, and I have been privileged to work with both organizations. The objective is to reach as many people as possible with the minimum of resources at our disposal, and perhaps the most successful programme in this respect was the Bata van that traveled the country, at least the peninsula, for over 20 years. A single staff member of WWF Malaysia visited hundreds of schools every year, staged environmental activities for students and is remembered to this day for his programmes that were a new experience for all the students who were accustomed to a very different learning environment. Eventually when the van died, the programme ceased as funding also dried up, but it was a very successful initiative, but only because of the dedication of that one person who was able to function efficiently with minimal back up and constant dedication.

Subsequent programmes at WWF tried to engage people from a greater distance, but therefore were unable to command the undivided attention of a real activity. The Rangers programme tried to get children to sign up for a magazine with activities and information that was based on a very successful programme in Europe that had been run by another WWF national office. This probably lasted for 4 years, but international funding that had been provided assumed that it would reach a level that could be self sustaining in that time and would no longer need external support. This was not the case, and without the funding the programme had to stop.

WWF Malaysia is now focusing on modifying the established curriculum in both primary and secondary schools to introduce the environment as case studies in the compulsory subjects and text books used in Malaysian schools. So in Science classes they would look at environmental problems and how this is relevant to the subject, or in language studies the text would include the environmental message. This requires a sustained examination of school materials and working with the Department of Education in order to achieve this, and would also require a huge capacity on the part of WWF Malaysia to achieve. The funding for this is still being sought, and is not likely to be attained in the immediate future. With environmental activism, there is always the dilemma that so many areas require urgent attention, leaving little capacity to plan educational initiatives for the future. Education is part of what we would like to see, but on the other hand if we do educate this generation and then wait for them to make a difference, then we may well have lost more than we would if we focus instead on trying to save what we can in the here and now. An acute lack of resources within the NGO environment hampers effective action on both fronts.

Perception is a problem here: because environmental NGOs are representing the public, even if members of the public are not involved, they seem to think they have a certain ownership of NGOs that can hold them accountable. Education is always the first thing that comes to mind for members of the public when they think of environmental problems: someone has to teach people to pick up rubbish and to be civic minded, and MNS should do this. Unfortunately they do not engage in the same manner with the Ministry of Education, they would not tell that truth to the Ministry as they do not like to make a fuss, but they will tell the NGO to do it. The same now applies even to our members of parliament and our government ministers, NGOs are tolerated because they have a role to fulfill. They do not seem to realize that NGOs have taken on that role because the government, for whatever reason, has not done so. How can NGO possibly be responsible for educating a country of 24 million people on an issue for which it has no resources? The public, and the government, do not want to hear this, they want to see evidence that you are indeed fulfilling your mission to educate the public about the problem, and if you don't have an education programme in place, you are immediately challenged to provide one, because everyone agrees that education is the answer to the problem.

Hence it is politically unacceptable for an environmental NGO not to have an education programme, even if it is extremely demanding of resources that the NGO just does not have to spare. The Malaysian Nature Society has been a little luckier than WWF Malaysia in sustaining an environmental education programme, mainly because it has a body of member volunteers who also believe that education is important and are willing, even if on an *ad hoc* basis, to help see that outcome. MNS actually has a very small membership, currently less than 4,000 nationwide, with volunteer run branches in each state, and only a fraction of those are active. Possibly less than 200 of those members would attend even a single event in a year, the rest being armchair conservationists who are happy to provide their subscription just to support.

The basis of Branch activities run by volunteers, is to organize trips that are of interest to those volunteers themselves, and that they think would interest others. So each follows their own passions. They take members to places that otherwise would

be extremely difficult to visit, and provide knowledge and understanding for members who participate. This is a general form of education that is based on the belief that if people know what is in the forest or the coral reef, and have some understanding of the wonders of its biological systems, they will be more inclined to act if that natural asset is threatened by development. It is an intangible form of education, but it does work on the basis of experiential learning rather than learning from pictures in the National Geographic or from the Discovery Channel. MNS volunteers provide multiple events every weekend for the education and enjoyment of its members; there is a huge choice especially from Kuala Lumpur / Selangor Branch that is the largest and most active branch in the country. The most successful of these activities is the annual Raptor Watch held at Tanjong Tuan in Melaka in the first week of March every year. At that time, mixed flocks of migratory raptors cross the Malacca Straits at the narrowest point on their way to China, Japan and Siberia for the northern summer breeding season.

Depending on the weather, thousands of birds can be seen on any given day, at low altitudes as they have flown and glided across the straits. Once they arrive over land, the thermals carry them up again, and they change course to the north to continue their journey. Because there are fewer thermal currents over water, they have lost altitude by the time they arrive, and in bad weather many do not make the distance and are lost; they are large birds that cannot power their crossings without the thermals that lift them to gliding heights. There is much to explain to visitors at this event, and because the arrival point is at one of the last remaining lowland forest reserves on the coast, there is the added attraction of a walk, guided or not, up to the lighthouse through the lowland Dipterocarp forest. Usually turtles can be seen in the water from the lookout, making it a special destination, while down on the beach volunteers are taking schools and visitors around the rocks and sandbanks, picking up whatever they can find (and replacing it, of course), explaining it and getting the engagement of the children and adults. It is a huge event every year, supplemented by talks, exhibits and food stalls that make it exceptional.

Each year, there would probably be 40 or 50 volunteers as well as permanent staff involved with the Raptor Watch, and we occasionally get corporate sponsorship, but this varies from year to year. Visitor numbers can be up to 2,000 over that weekend, but whether they go back educated is something we cannot be sure about. Last March, we signed up about 50 new members who were presumably impressed by what they saw.

One of the main targets of the Raptor Watch is primary and secondary schools that are involved in the MNS school nature club programme, Kelab Pencinta Alam. For an annual fee of less than RM100, the school is provided with teaching materials to support teachers of extra curricula club activities or to utilize for their classes. In Malaysia only teachers registered with the Ministry of Education may talk or teach in schools, so it is not possible for MNS to organize activities within the schools ourselves, but we can provide interesting venues for teachers looking for trips for the students to places of interest and then engage with the teachers and students face to face. As MNS has several centres where it can provide such learning experiences, we have gradually evolved into a provider of such services, and it has finally become a profitable exercise for MNS, if one does not include the value of the corporate

sponsorships that enable such capacity, such as Shell helping to maintain the facility at the Forest Research Institute, FRIM.

MNS has a Nature Education Centre at the FRIM just outside Kuala Lumpur where overnight camps or day long activities are run by permanent staff rather than by volunteers. By utilizing the resources of FRIM, the participants can experience the canopy walk, the arboretum, the various collection of plants and just the sheer pleasure of staying somewhere unthreatening that has huge trees and clean streams. Perhaps the most popular activity is the night walks looking for herpetofauna, with responsible adults who can explain what is found and help educate children about the wonders of nature.

A second facility is the Kuala Selangor Nature Park that this year is celebrating its 20th anniversary. Created by MNS volunteers, when the state government agreed to turn an area adjacent to a mangrove forest into a park instead of a golf course, the park has had a checkered past but continues to be an excellent environmental education venue. School groups can camp or stay in chalets, many educational modules have been developed using the mangrove or secondary forest habitats as the class rooms, and at this park there is a real chance of seeing wild life, from the many waterbirds, to simple but fascinating mud skippers on the tidal flats, or sea otters playing in the canals.

MNS also developed a city nature walk behind its headquarters in the Federal Hill area of Kuala Lumpur, where secondary forest thrives and a simple short trail leads through the forest and across a clean stream, where plants are labeled and the resources of the society are available if explanation is needed by groups of visitors.

We also have chalets at the Boh estate in Cameron Highlands, that can be rented by school groups wanting to have a highland experience, but we do not have staff there who can run education programmes. We do however have an excellent partnership with the botanical gardens in the Universiti Malaya campus, at Rimba Ilmu. Usually we employ a graduate student from the botany department to help HQ staff run programmes for schools and corporate groups, that try to engage people with plants and their importance. For many years I have conducted a regular nature walk for the public in these gardens, talking about plants, their history, their scientific significance, and how they influence our survival as a species.

All of the initiatives of MNS are geared to adults as well as children, and of course there is room for improvement, but with the growing demand, at least within the urban area of the Klang Valley, for environmental education, we seem to have reached the profitable break even point and are now recruiting staff to expand the programmes. However, no matter how effective our programme might be, we can't reach everyone, and the doubt must remain that a one off experience is not going to change behavior or long term understanding. We do not reach enough children or adults, and although the ethical justification for what we do cannot be doubted, we do have to weigh the benefits as against focusing on other activities. However while it supports itself financially, we will of course continue, but I personally do not feel that it has sufficient reach to really make a difference.

I hope MNS as a membership based organization, will grow more rapidly in the future than it has in the past. With the increased exposure to nature that television now provides, there will be some viewers who will look for a more real experience, and they will seek out a community of like minded people who are interested in natural history, in experiencing some aspect of it, and being changed by that encounter. That experiential learning is far more important than studying it in a classroom. Nature needs to be a part of daily life to be understood, whether it is watching the weeds grow in the pavement or having a pet that provides insight into wild behavior. One can learn about the structure of a flower from a book, but if a student has never handled a flower how can he or she be swept away with the wonder that is such an intrinsic part of nature study. At MNS we try to bridge this gap, and hopefully we will make a difference for many people.

Challenges by Japanese High School Students for Better Environments

Yoshihisa Shimizu

1. The Stockholm Junior Water (SJWP)

The international Stockholm Junior Water Prize contest, was started in 1997 and aims to encourage young people's interest in issues concerning water and the environment. The award is given annually to an outstanding water project of a young person or a small group of young people. With this, the competition seeks to involved in inspire young people to a continued engagement in water and related subjects.

While the global water environment remains in peril, the future depends on our ability to manage this life-sustaining resource. Today's youth are indeed tomorrow's leaders and must be encouraged to pursue water-related careers or our scarce supply will risk further erosion. The finalists at the international Stockholm Junior Water Prize competition are the winners of national SJWP contests. The national and international competitions are open to pre-university people between 15–20 years of age who have conducted water related projects focusing on local, regional, national or global topics of environmental, scientific, social or technological importance.

For the last five years, the author has been acting as a judge in selecting the national junior water prize from the researches of Japanese high schools. After selecting one, the author will advice the winners and will work with them in preparation for the international competition, the Stockholm Junior Water Prize held in August. The Japanese teams have won the grand and semi-grand prizes in the last five years. In this paper, the researches and challenges by these high school students are explained and the author's experience with them are discussed.

2. Protecting the Life Sustaining Groundwater of Miyakojima-island” in 2004

Miyakojima-island is a rare island in the world that has no river and depends on groundwater for all of its drinking water. Miyakojima-island is located 2,040 km from Tokyo (the capital of Japan), 290 km southwest from the main Okinawa Island and about 65% of the land is used for agriculture. The groundwater supply is polluted with extra nitrate due to the excess use of chemical fertilizer. In the rest of the world, life is also in danger if drinking water is polluted with nitrate; babies have even died drinking such polluted water. The students in Miyako Agriculture and Forestry High school, have been studying the future in agriculture, and are deeply concerned about this. Therefore, the seniors of our high school have taken on this problem, and have decided to develop a new environmentally friendly organic fertilizer utilizing phosphorus accumulated in the soil.

With the goal of protecting the groundwater of Miyakojima-island, the aim of this research is to investigate and to develop an organic fertilizer which is both environmentally friendly and has the ability to recycle the high density of non-soluble phosphorus accumulated in the soil by utilizing a biomass resource (Bagasse: sugarcane squeezed residue). The method utilized was the selection and isolation of a microorganism that we found to have the ability of organic acid generation from the soil consisting of weathered Ryukyu Limestone as a phosphorus dissolving bacterium. Taking its phosphorus dissolving ability as an index and using the bagasse effectively, which is a good organic resource, it was possible to reproduce and recycle accumulated phosphorus in the soil.

These experimental results indicated that there is a way to improve the rate of use of accumulated phosphorus by applying the organic fertilizer that they have studied and developed. It is, therefore, possible that they can establish Low Input Sustainable Agriculture (LISA) and thereby the decrease the nitrate contamination in the aquifer caused by chemical fertilizers by applying the organic fertilizer to the agricultural soil of Miyakojima-island in Japan.

After receiving the Stockholm Junior Water Prize, their work has been conveyed to their juniors and the residents in Miyakojima-island and the research is still continuing. In the future, with a view of building a production facility and with a slogan, “Think globally, act locally in our island,” they would like to take on the challenge to produce an even better fertilizer improving the rate of soil-accumulated phosphorus utilization. Their slogan is “Protect our precious island Miyako and pass it on to the next generation.”

3. "A Tiny Case with Big Possibilities" in 2006

This project is an environmentally friendly and water conserving nursing method for rice seedling production. The students in Katsura High School first started their research from their simple desire to produce new Japanese hydrangea plants. They also hoped that people with handicaps could grow them and become economically independent. Since the year of 2001, they have developed a number of hydrangea varieties that are easier to grow. However, this still proved limited because of the physical limitation of the handicapped, insufficient production facilities, and lack of experts to supervise. These situations led them to consider using the principles of the Wardian Case used in the Great Age of Navigation and to innovate their own Katsura Nursery Case (KNC). The work became easier and more productive for the handicapped.

They also carried out the experiment with the KNC for rice seed germination and seedling production. In comparison to the conventional soaking method of the seed, they could obtain about 93% reduction of water required for seed sprouting and seedling (about 39% reduction of water for the whole rice production). Their experimental results showed that the high humidity in the KNC that can penetrate into the rice seed makes germination possible, which eliminates the necessity for soaking. Additionally, in the KNC sprouting occurred four to seven days faster and seedling with better root growth of higher quality was produced due to the rich oxygen supply. By using the closed system of the KNC, the antiseptic element necessary for the initial treatment of seeds can be also reduced.

The KNC is simple in principle requiring only small cost to built, and can be adapted in various regional conditions in the world. They strongly believe that their KNC can be applied to dealing with water and food shortages in the future. It is their sincere dream that further exploration of the potential uses of their small KNC will eventually enrich the lives of their friends and many people in the world. Even after receiving the prize, they want to dedicate their tiny project to the future and possibility of the promising children.

4. The Future of our World's Environments depends on our Experts of the Future

Since the Stockholm Junior Water Prize contest is held in August every year, the high school students need to prepare for it. The preparations include a paper, poster, oral presentation and discussion with judges. As the national competition in Japan is held in March, they have to do these preparations in a very short period. In Japan in general, a tough entrance examination is waiting for these high school students to get into the university. Most high school students, therefore, spend their time for the preparation of the entrance exam: after the school some students even go to private sectors to study. They do not have enough time to think of their future environment.

After the Stockholm Junior Water Prize contest, once the author asked a high school student who competed there, "Now you have a summer vacation, don't you?" His answer was simple and surprised one, "We have not have any vacation for the last several years." They dedicated almost all of their limited time to the research, thinking of a better environment in the future. The change in educational system may be required. Also, we cannot forget the necessity of a very strong support from the teachers and parents.

There are challenges ahead for our world's environment. Increased need, stressed supplies, pollution and geopolitics seem to be muddying our future. We, however, should have a different outlook. We must believe that how we use this precious resource and return it for reuse will help define the future of humanity. We are deeply involved in the cycle of environment and are committed to the wise and sustainable development and utilization of the world's resources. We congratulate these dedicated high school students and teachers. It may be that their research, discoveries and education will play an important role in the future of this most natural and critical resource.

Environmental Education

Siriwat Soondarotok

The meanings and the importances

The conference of the International Union for the Conservation of Nature and Natural Resources in Nevada, U.S.A. in 1970 concluded that the meaning of Environmental Education is the process that mold humans to appreciate the true value of nature. It includes the development of the necessary skills and attitudes in order to strengthen the knowledge and understanding of the existing environmental problems. Moreover, Environmental Education can also help in making the right decisions and setting up the standard behavior and expression towards facing problems on environmental issues. In addition, the Conference organised by the UNESCO in Tbilisi, Georgia, USSR in 1977 also concluded the meaning of Environmental Education in accordance with the prior meaning which is that Environmental Education aims at development of the right attitudes of the global citizens to care about the environment which includes strengthening knowledge, understanding and attitudes of all citizens, regardless of age and gender, towards environmental issues, and the development of skills in identifying problems and prevention and protection of the environment and emerging environmental issues.

The International Conference organised in Belgrade, Yugoslavia in 1975 leads to proclamation of the Belgrade Charter in which some details are indicated in the followings:

1. Environmental Education ought to consider education on all aspects of the environment. This includes natural and man-made environment such as ecological system, politics, economy, technology, social, laws and cultures.
2. Environmental Education should be a Continuous Life Long Process.
3. Environmental Education should have an Interdisciplinary Approach.
4. Environmental Education should emphasise on public participation in preventing and solving environmental problems.
5. Environmental Education should envisage issues from a world-wide point - of - view while considering the differences of each region.

6. Environmental Education should emphasis the state of the environment at present and in the future.
7. Environmental Education should consider development and growth while having awareness about the impacts of these on the environment.
8. Environmental Education should help the public to notice the true value and the necessity in participating in solving and protection of environmental problems at the local, national and global levels.

The Conference in Belgrade is considered as the very first International Environmental Education Workshop. The 8 above mentioned principles could therefore be considered as guidelines that all countries should follow and adjust based on conditions in each country. At present, the concept of sustainable development have gained substantial attention, and involves the role of education. At an initial stage, the Earth Summit Conference in 1995 leads to the agreements, and among one of the those is Agenda 21 "Programme of Actions for Sustainable Development". Agenda 21 is an important master programme that leads to an equilibrium stage between the development and the conservation of the environment which can help provide sufficient natural resources for all global citizens at the present and in the future time.

In 1997, UNESCO organised an International Conference on Education for Sustainability -in Greece, and consequently in 2002 in Johannesburg in South Africa. The latter emphasised the topic of integration of the concept of sustainable development into educational systems at all levels. The consequence is the proclamation of the Decade of Environmental Learning: 2005-2015.

Laddawan Kanhasuwan (1998) introduced guidelines for management of Environmental Education as follows:

- Environmental Education should be arranged in accordance with specific target groups based on appropriateness. The education could be provided to an education in school system which includes kindergarten, primary, secondary and university levels, and to general public which could be arranged as an education for outside school system.
- The characteristics of the process for such education should consider levels of difficulties, interest, ability to learn and usefulness for each particular target group.
- Coverage of knowledge in Environmental Education in order to achieve goals of Environmental Education, the contents should cover the following issues:
 1. Ecological System
 2. Development and population
 3. Economic
 4. Politic

Management of Environmental Education in the School system.

Management of Environmental Education in school system in each educational level should be differentiated due to differences in the ability the learning the concepts and differences in qualification backgrounds of each particular target group. The Environmental Educator should be well aware of such differences. The target group who are in the early ages such as in the kindergarten level, must be handled via apply more simple concepts, and more complicated concepts should be used for the older students in primary, secondary and university levels, respectively.

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Environmental Education In Malaysia: A Case Study of University of Malaya, Malaysia

Suzana Ariff Azizan

Abstract

Environmental problems such as pollution, green house effect, and acid rain are amongst the popular main topics of major discussions lately. These problems have reached a critical level, and if no action is taken, it will not only threaten economic performance but also bring negative impact to the human development. These environmental problems are probably the result of a lack of knowledge and understanding of the field. Ignoring the problems will create an epidemic that could affect the sustainability of mother earth. In order to overcome this situation, it is necessary to create awareness in our society on the importance of protecting our earth, which is the main objective of environmental education. Environmental education (EE) will not only teach us to value our surroundings but it is also an ideal method to show how humans should interact with the environment. Out of this concern, it is apt that every educational institutions adopt EE subjects in their syllab. This paper will discuss the practise of EE in Malaysia with special emphasis on University of Malaya (UM).

Introduction

The deterioration of the environment has become a horrifying reality today. The rapid growth of population is one of the contributing factors that has worsened the situation but the main reason from which environmental problems arise are, from within the human being itself. It is the human attitudes towards nature that triggers environmental politic. Sadly, we only started to pay attention to our environment after the problems have already severely affected our daily lives. Due to that, education on environmental is a necessity. EE plays the most important role in educating the society to develop and to increase their awareness on the importance of natural environment. We have to learn how and what should be done, and how to act wisely in taking good care of our environment not just for our own benefit at the present time, but also to preserve it and ensure the survival of future generations.

According to Encarta World English Dictionary, "environment" is defined as the natural world, within which people, animals, and plants live. It includes all the external factors influencing the life of organisms, such as light or food supply. It is also defined as the conditions that surround people and affect the way they live.

EE is defined as knowledge and studies, which focus on educating the society about the environment and how it functions, the relationship of human and the environment, the cause and effect, to promote awareness of the importance and the dangers of environmental deterioration, and to educate on how to preserve and to protect the earth. It focuses on the behavior towards the environment and how human should treat the nature. EE is a life long learning process that gives literacy to the society on the need to protect their surrounding.

The Environmental Education Council of Ohio (EECO) defines EE as processes that involve a life long learning in understanding the complexity of nature and environmental issues through the using of various approaches and disciplines. These actions can be the results of human attitudes and strategies towards making the world a better place to live. EE is education *in*, *about* and *for* the environment. Education *in* the environment helps us to become sensitive to our surroundings, education *about* the environment helps to make us understand the world around us, and education *for* the environment helps us to care for and improve the environment. (<http://www.eeco-online.org>)

The Needs of Environmental Education

There are several reasons why EE is crucial:

1. The planet we live today will not last forever. It will be gone one day. The earth and its natural resources are not non-exhaustive. Judging by the growth of population today, it is not impossible that the earth will be destroyed faster than we thought. We have already done a lot of damaged to the nature. Maybe some of us do not realize or tend to forget that the natural resources cannot be renewed and the extinction of species cannot be replaced. Although world annihilation is inevitable, at least the process could be delayed by managing it in appropriate way.
2. Environmental education is a foundation for us to look after the environment. It is a basic knowledge for us to understand our ecosystem. Education in environmental will help us to value the earth and teach us how to treat the environment.
3. Knowledge on environment can be used in dealing with the environmental issues. Effective EE will enable us to face the environmental challenge efficiently.
4. We have to be environmental literate in order to achieve sustainable development. EE helps us to plan for the future development. A combination of economic planning and environmental knowledge namely, waste management, environmental ethics and environmental policy, will create a better and healthy World.

History of Environmental Education

The history of education in environment began in 1972 with the Conference on the Human Environment organized by United Nations. The conference conveyed the need for a strong framework for the development of EE. It was later followed by the International Workshop on Environmental Education, which took place in Belgrade in 1975 and the launch of the International Environmental Education Program. Sequence of the workshop, an Intergovernmental Conference on Environmental Education was organized in 1977. The purposed of the workshop was to enable the participating countries members to have their own national policies on promoting EE. In 1987, another international conference was organized by UNESCO (United Nations Educational, Scientific and Cultural Organization) and UNEP (United Nations Environment Program) known as The International Congress. The congress was organized in order to discuss on the international strategy for action in environmental education and training for the 1990s. In 1992, United Nation Conference on Environment and Development (UNCED) also known as Earth Summit was organized in Rio de Janeiro. During the summit, Agenda 21, a plan towards sustainable development for the 21st century was launched. And in September 2002, World Summit on Sustainable Development was held in Johannesburg, South Africa in order to review the improvement. (<http://portal.unesco.org>)

Environmental Education In Malaysian Education System

It is no doubt that Malaysian educational institutions particularly the universities have played a great role in supporting the concept of sustainable development. Malaysian universities have shown a great performance in creating the awareness of the importance of protecting the environment. Historically, the topic of environment is not in the universities curricula until 1970s. Since independence in 1957, the focus of country's development is solely on the economic progress especially on the physical development. No interest is put on the environmental aspect. However, during the Third Malaysia Plan (1976-1980) the government started to realize the need to incorporate the development plan with the environmental situation. It is seen as a crucial step in order to ensure that the economic development plans will not bring severe damage to the environment. And it had come to an agreement that educational institutions should be used to stimulate awareness on the importance of environmental conservation (Chelliah, 1983). It was indeed a turning point for environmental education to be as one of the aspect in the government policy. Since then, universities begin to include the environmental elements in their studies programs.

Environmental Education at University of Malaya

Environmental studies are interdisciplinary subjects that cross the boundaries of conventional discipline. It is a subject that combines a different set of knowledge with the ultimate goal to equip people with the knowledge, attitudes and skill in solving environmental issues. Institutions of higher learning are the best place to foster awareness towards environment since this is the place that produces leaders that will shape our future. Realizing the responsibility, University of Malaya (UM) has taken the role in promoting environmental related programs and courses that will enhance students' enthusiasm towards natural environment. At UM, the environmental related courses are being offered at several faculties with various approaches. From 14 faculties of UM, 8 of them are offering environmental courses whether as a core subject or an elective subject. These subjects are offered at the Academy of Islamic Studies, Faculty of Science, Faculty of Engineering, Faculty of Arts and Social Sciences, Faculty of Education, Faculty of Law, Faculty of Built Environment, and Faculty of Economics and Administration.

Besides of EE at the undergraduate level, environmental related studies are also offered to the postgraduate students. Several faculties namely the Institute of Postgraduate Studies, Faculty of Science and Faculty of Engineering are currently offering master program on environment. The EE courses offered are aiming at enhancing the quality of students in the context of environment consciousness. The methods of teaching EE focus on two components, classroom activities and field works. The subjects cover diverse of topics related with the needs of current situation; this includes policy issues, management and ethics. The curriculums are designed for students to participate actively in the classroom and students are encouraged to develop their own ideas and views. The classes usually emphasize case study analysis and problem solving methods. The use of mix approaches i.e academic and practical skills will allow the students to look at the environment issues in various perspectives.

Practical skill is delivered through field-based explorations. These will give the opportunity to the students to deepen their understanding of current environmental issues. The experience based learning process will not only give informative input to the students but also at the same time create an enjoyable learning experience to them. Besides fun, the teaching method applied also improves students' way of thinking and in making decision. These knowledge and practical experiences are useful when they are facing the real world upon graduating. Normally students' assessments are based on two elements, which are course work and final examination. The course work includes mid semester examination, written case analysis, and presentation. Also, there are certain EE subjects that require assessments to depend solely on the practical skill. Evaluation will be measured based on students' performance during the practical period. The objective is to encourage students' creativity and to be wiser in decision-making and action.

Besides formal education, University of Malaya also provides facilities for environmental activities. Open to the public, *Rimba Ilmu* or The Forest of Knowledge is a botanical garden that was set up in 1974, modeled after a rain forest garden concept. Situated in University of Malaya, Kuala Lumpur campus, *Rimba Ilmu's* mission is to generate and promote awareness and knowledge of tropical plant life and its environment, ecology and conservation. Some activities that are conducted by *Rimba Ilmu* are guided garden walks, environmental exhibitions and workshops. The environmental education courses at UM are design to cater the needs of current environmental situation. It is hope that knowledge and skills gained from the institution not only benefit the students themselves but also the planet as a whole.

Benefits

There are several benefits that can be derived from EE, and they are:

1. Better understanding of the environment
By taking these courses students will have a better knowledge regarding the topic. The experiential learning adopted gives the opportunity for students to understand the relationship between human and the environment. Students will learn the needs and importance of the environment. This consequently will instill love and concern towards the environment.
2. Raise awareness on the importance of environment
Direct contact with the nature helps to develop students' awareness of environment and its problems. The students will be exposed to the various issues pertaining Mother Nature and its environment. This will give them ideas on how they can contribute in protecting and preserving the environment and allow students to be more responsible with their surrounding and to appreciate the environment intrinsic value.
3. Form an ethical society
Throughout the courses, students are taught to look at the impact of human actions on environment and how the environment influences our life. These will discipline the students and help them to be environmentally ethical, thus to think wisely and make appropriate decisions to protect and preserve the environmental value.
4. Enhance students' good characteristics
The strategies applied in the curriculum such as the development of critical thinking and skills motivate students to build up good characteristics in them. This includes making the right decision, problem solving and learning to work as a team.

5. Produce a balanced human being

With EE in their syllabus, it will balance the students' life so that it does not solely focus on career-based education in the various fields they are originally doing; for instance, law, engineering and architecture. In other words, besides being academically successful and advanced, they will also be knowledgeable and competent of the environment that surrounds them.

Conclusion

As environmental problems becoming more serious every day, EE has become more important. In order to become an environmentally responsible society it takes more than a formal education. EE must be conveyed through both, formal and non-formal education. The formal education will equipped students with the theoretical part of EE and the non-formal education received from outside the classroom will help students to practice, explore and experience the knowledge they gain from the classroom. The combination of both sources will be a perfect formula to spread EE and thus, promote and produce an environmental literate society that is vital to save the planet and the future of mankind.

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Analyses of Case Studies on Implementation of Environmental Education In The Asia-Pacific Region – The Case of Kuala Selangor Nature Park

Nagarajan Rengasamy

Introduction

Kuala Selangor Nature Park is one of the parks that are actively conducting Environmental Education programs in Peninsular Malaysia. There is a suitable ecosystem and facilities to conduct various kinds of environmental programs at this park. This park is managed by Malaysian Nature Society for Selangor State Government. The activities listed in Kuala Selangor Nature Park are being adapted from a wide variety of sources. They are being conducted so that adults, students, youths and families from Kuala Selangor and Malaysia can gain greater understanding and appreciation of the environment, especially for the complex ecological relationships that exist in forest and the value they serve as places of learning, recreation and inspiration, as well as providing clean water, air and preventing flooding.

The Kuala Selangor Nature Park (KSNP) Environmental Education Program is being designed to stimulate nature lovers and educators who will use the material for daily life, education and other purposes. It will also encourage them to use their imagination to think of other activities that are important to their community to use in the Kuala Selangor Nature Park. The Environmental Education Program has been designed to be user friendly. The activities concentrate on the ecological aspects of Mangrove forest, Secondary forest and man-made lake system. It also includes other aspects of learning and development, including cooperative problem solving, leadership, communication, judgment and basic outdoor skills. The environmentally-centered activities focus on the basic ecological principles, so that students can gain a foundation for understanding the value and relationship that exist in forests, even in urban areas. These provide many services from protecting watersheds and reducing the hazards of flooding to providing a connection with the natural world within the expanding confines of urban and suburban development.

Finally, this park teaches relationships, those of the child or youth with their environment; and their community at large. Children and youths today evolve in a society that is increasingly disconnected from the natural world. It is necessary to provide experiences that establish a conscious relationship between young people with the environmental and its cycles.

Background

Kuala Selangor, situated approximately 60 km north of Kuala Lumpur, is noted as one of the most important areas for coastal mangrove and riverine diversity in the west coast of Peninsular Malaysia. The Kuala Selangor coastline is recognised as one of the important staging and wintering sites for migratory water birds due to its extensive mudflats and mangroves. These habitats also support the robust local economy through its fisheries communities. Various sea products e.g. jellyfishes and cockles, are exported to East Asian markets. Kuala Selangor was also the focal area of an extensive migratory water bird-ringing programme fifteen years ago. Since then, there have been many changes. The construction of a coastal bund has left a healthy band of mangroves on the seaward edge. However, the inland mangroves gradually dried up and has been replaced by regenerating secondary forest.

Further along the coast, land was cleared for saltpans and a new township. As a result of this, the water bird migratory inland roosting site was destroyed. In response to this, the Malaysian Nature Society (MNS) excavated shallow lakes, with islands, as wildlife habitat. Set within 800 acres of coastal mangroves and secondary forest, the lakes and vegetation support a wide variety of animals and plants. An IBA (Important Bird Area, accredited by BirdLife International), KSNP is one of the 'must stop' venues for birdwatchers. KSNP shelters a wide variety of habitats as well as over 156 species of local and migratory birds, mammals, insects, mollusks, crabs, fish, reptiles and amphibians. It is also home to many special animals among which are the mudskipper, mud lobster, king crab, otters, leopard card and silvered leaf-monkey. Some of these flora and fauna are nationally and globally threatened.

The establishment of Kuala Selangor Nature Park (KSNP) was proposed in 1987 by MNS as an alternative to a then proposed golf course. It is currently the only nature park managed by an NGO, in collaboration with the Selangor State Government. Based on the three pillars of the park objectives i.e. nature conservation, education and awareness, KSNP today is recognised for its wetland conservation work and habitat protection. Local businesses and communities have benefited economically from the existence of the nature park and the mangrove belt along its coastline. The park is visited by an average of 16,000 visitors per year consisting mostly of local and international students and visitors.

Local Communities of Kuala Selangor

The local communities in Kuala Selangor consist mainly of the fishing community (e.g. Pasir Penampang), schools, urban housing areas adjacent to the park and rural villages. There are six villages within the Mukim Pasangan.

Environmental Education Program in Kuala Selangor Nature Park

1. Adult

a. Guided Tour

- Program that designed to implement the love for nature. Information given is on Flora (the species, usage, habitat) and fauna (the species, habit, habitat).
- Importance of Nature in human life

b. Flora Enrichment

- The flora enrichment program is a program to replant tree species that is already here or to reintroduce the species that is suitable to the area. This is to help regenerate the forest.
- Mangrove Reforestation / Replanting
- This is a program using species that are already established in the mangrove forest. Participants will enjoy themselves planting the seedlings in the mud.
- Plantation is in the empty spaces of mangrove forest where the trees have died and there are no natural seedlings growing.
- Coastal Tree Enrichment
- Replanting of coastal trees in order to enrich the environment of KSNP.
- Example of tree that has been planted is Bintangor (*Collophylum inophyllum*), Eugenia spp., Bungor and etc.

c. Awareness Talks

- Awareness talks focus on topics such as Mangrove Forest, Milky Stork and Fireflies.
- It explains the importance of conserving nature, the impact of development and how we can help as an individual and as communities.

d. Bird Watching

- This is the best activity that is normally being held early in the morning or in the evening.
- During the activity, participants will be introduced to the resident birds (all year round is here – in Malaysia) and the migratory birds (seasonal – migratory season will start in mid September until mid March).
- Discussion on bird conservation issues are also conducted.

[An organization of local villagers, established by MNS are now work independently. Taking care of nature especially the Fireflies in Kg. Kuantan and educating the local community about Nature is the main role of this organisation].

2. University / College Students

- a. Mangrove Ecological Tour
 - Introducing the students to the mangrove forest, the importance of the forest and why it should be conserved. This is important because they will be the next generation of conservationists.
 - The information includes the mangrove forest structure, the adaptation and species of KSNP.
- b. Environmental Education Talks
 - Educate participant on conservation, ways they can help in conservation
 - Sharing of experience of the beauty of nature and its relationship with humans. This will make them realize that how much they actually depend on nature.
- c. Environmental Team Building Activities
 - Nature Craft
 - * Teach on how to reuse "rubbish" and turn it into crafts. This is the "fun-education".
 - * Example: an empty can of soft drink can be turned into a peacock, or a penholder.
 - Nature hunt in teams, they have to find clues, which are hidden in the surroundings. Not only they has to find the clue, they have to know a little bit of the nature in order to find the next clue.

[Selected students from local schooll who are interested in nature. Future generation for nature enforcement. Being taught in theory and practical practices].

3. School Students

- a. Guided Tour (basic)
 - Information on Flora & Fauna of KSNP and the importance of Nature
- b. Mangrove tour with slide show
 - Information on Flora & Fauna, especially in the mangrove forests, the specialty of mangrove and the importance of conserve the mangrove forests and nature.
- c. Night Walk
 - To teach participants about nightlife of the nocturnal animals. Teach them why and importance to conserve things that you might think is of no use to human (we didn't see them!).
- d. Nature Craft
 - Making simple crafts from nature - young coconut leaf turn into grasshopper, Ketupat, kris, mudskipper.
- e. Paper Recycling
 - Teaches the students to appreciate nature more by recycling
 - Teach them ways how to save paper and what will happen to this world if they kept throwing paper.

(17 trees are felled just to make 1 tone of paper)

- f. Blind Trail
 - Teachers the self to appreciate the gift of sight.

Special Project

1. Nature Education Program
 - a. Managed by Department of Environmental and MNS
 - b. Helped by: KSNP Officer, PAPARAN, and Friend of KSNP.
 - c. Focusing on school students especially schools which has registered as Kelab Pencinta Alam (Nature Lovers Club).
2. Volunteering Program
 - a. Focusing on school, university, college students and caorporate communities.
 - b. Volunteering on daytrip program such as "gotong royong" (cooperating in doing atasks) and replanting program.
 - c. The nearby school student are trained to be local guides / facilitators. Named *Rakan Taman Alam* (Friends of KSNP).
 - d. PAPARAN = local community from several villages.

Special Activities

1. Bukit Melawati Visits
2. Rise Field Visit (Tanjung Karang – Bird watching)
3. Kampung Kuantan Fireflies Visit – with slide show
4. Visits to Kampung Ekonomi Nelayan, (Sungai Buloh/Jeram) – Bird Watching
5. Clay Pot Center Visit (Demonstration / Bukit Rotan)
6. NEC / FRIM Visits
7. Dark Cave

Latest Programs

1. Certificate Nature Guide Course
 - "Advanced Courses for Nature Tour Guides
 - 2-week course attend by 48 participants. Organized by PERHILITAN, *Majlis Tindakan Pelancongan Malaysia, MNS, KSNP Majlis Daerah Kuala Selangor.*
 - Reason: to educate more people on nature guiding and on nature itself.
2. New Environmental Education Center
 - Local Bank HSBC sponsoring KSNP for three years for this Environmental Program.
 - The EEC establishment is for students and visitors so that they can get more knowledge about nature.
 - EEC will be used as Talks Center and as seminar room

3. Interpretative Center

- Information on Nature; that is flora and fauna.
- Basic information with pictures for more understanding. The basic information that is displayed can be deepened by reading the books that are displayed.

Community- Based Education -- The Colquitz Watershed Stewardship Education Project

Gloria Snively

Along the Cowichan River, surrounded by the smell of cottonwood resin, an elementary school student discovers that dragonfly larvae look like aliens. In a quiet wetland, a middle school teacher marvels as a guest expert shows his class how to fold cat-tails into duck shaped toys and send them downstream with wishes. In a municipal office, a bureaucrat considers a community proposal, initiated by an elementary school class, to create a new park. Since 1994, the Colquitz Watershed Stewardship Education Project (CWSEP) has been bringing students, teachers, and the community together to experience educational turning points like those above. Headed by teacher Lenny Ross, the award winning project has successfully instilled an environmental ethic in students of all ages and their teachers by connecting them to the watersheds in which they live.

Flowing through two school districts near Victoria, B.C., Colquitz Creek is an urban salmon-bearing stream affected by development, runoff, encroachment and other negative impacts from the increasing population density within its watershed. The care of watersheds like the Colquitz is often championed by local naturalists and activists who feel a sense of stewardship towards their local environment and community. Creeks are much longer lived than people, and so it is crucial to pass on this ethic to young people who can continue to act as stewards of natural places in the future. Fostering this ethic, however, is difficult through textbook-based classroom learning. Depressing environmental stories of polluted rivers and decreasing salmon returns may actually turn students off of learning about their environment (Sobel, 1996). How then, did this project manage to instill a strong environmental ethic and sense of stewardship in the students and teachers who participated in it?

Inspired by a growing number of environmental education programs, including the Streamkeepers program and Project Wild, which were becoming available in British Columbia during the early 1990's, Lenny Ross developed the CWSEP during a summer at the Wetlands Institute in the U.S. Over the years, the program has branched out and changed course, but throughout all of these changes, the essential goal has remained the same. "Students learn", according to Ross, "to appreciate their environment, understand scientific concepts of watershed ecology and take action to help the watershed, and thus become responsible citizens of their community."

A watershed, as defined by ecologists, is an area which drains into a common body of water, such as a river or stream. As well, the term can be used to describe a turning point in a process. The point at which a course of events is irrevocably altered may be described as a 'watershed moment'. The CWSEP began with such an event, in which political and school district boundaries were set aside in favor of a new method of defining borders – the watershed of Colquitz Creek. Ten schools were identified within those boundaries, and at each school an environmentally minded teacher agreed to participate. Grant proposals were prepared and submitted with successful results due to the clear focus, goals, and objectives of the program. The project was on its way with a budget to work with. Over the years, a variety of methods have been utilized to engage students in learning about their watershed. As well, changing focus slightly each year has kept the CWSEP fresh for the growing number of teachers who implement the program in their classroom year after year. In the 1999 – 2000 school year, classes went on watershed tours of Colquitz Creek while teachers used curriculum materials developed around music and literature. The following year, teachers received a curriculum package focusing on fish biology and their classes traveled to the watershed of the Cowichan River to compare it to the Colquitz. Other years have tied into community events such as Rivers Day or Science and Technology Week. This flexible focus has also helped the project make use of available funding which may require that specific themes are addressed. The essential components of the program, however, have remained the same each year and are as follows:

- Development of curriculum resources and provision of in-service training for participating teachers
- Implementation of curriculum materials and resources in the classrooms of participating teachers
- Field trips, during which classes participate in field studies and environmental assessments, often assisted by high school students who have received special training.
- Students then work on class projects and stewardship activities such as planting native plants or cleaning up streams
- All participants are involved in a community celebration during which they help educate members of the public and are recognized for their accomplishments.

Together, these components make up a project that has catalyzed 'watershed moments' for students and teachers alike.

Teachers as Students

An integral part of the CWSEP's success has been providing curriculum resources, in-service workshops, and the knowledge of local 'experts' to teachers involved in the program. Many of the teachers who have taken part in the CWSEP do not have science backgrounds. Lenny Ross' own professional background was originally in special education. The opportunity for professional development motivates teachers by giving them the resources they need to tackle topics like stream ecology and bird identification. Through the years, these resources have variously included lessons in fish biology, contributions from local government agencies such as park departments and water districts, guest speakers from the local natural history society, a partnership with musician Holly Arntzen to create classroom activities which use songs

celebrating watersheds, and a guide using a literature-based approach to investigating freshwater ecosystems.

According to Lenny Ross, teachers are also attracted to the program because "As research out of the U.S. shows, if you integrate education around an environmental theme, children's test scores across all aspects of the curriculum go up because the learning is relevant and meaningful to their world. Such socially responsible education affects more than just grades. Student behaviour improves as children see that their work is valued in the community, and teacher enthusiasm goes up because they know this type of education is effective and it feels worthwhile when they see they are having a positive effect on the community as well. (Lieberman & Hoody, 2000) As one teacher said, "It makes for a really strong personal connect and that's how you make a change."

The program also benefits from the sense of community which develops between the teachers as they take on new challenges at workshops or eat meals together while planning the year's activities. In 2001, the project partnered with the Freshwater Eco-Centre and Vancouver Island Trout Hatchery in Duncan, B.C. to assist in adapting activities for a "Fish Ways" manual, which provided teachers with activities for exploring the biology and ecology of fish with their classes. At the in-service in Lenny Ross' school, teachers sat in groups for a hands on lesson in fish anatomy and ecology facilitated by a naturalist from the Freshwater Eco-Centre. This included watching a fish dissection, counting rings on fish scales, and discovering that they could tell, even with paper bags on their heads, that the skin of a flounder, embedded with star-shaped scales, feels like sandpaper.

Students as Teachers

The Colquitz Watershed Stewardship Education Project has involved teachers and students from Grade 1 to Grade 12. In general, any class that has expressed interest in the program has been allowed to participate. As a result, it has been necessary to develop relevant and challenging components of the program to suit students of various ages. When high-school students became involved, the project partnered with Streamkeepers, a college-level course provided through the Department of Fisheries and Oceans Canada, to train them in the skills needed to assess stream quality. Students were provided with sophisticated equipment which enabled them to determine the pH, oxygen content, and temperature of streams, as well as with training in many aspects of stream stewardship. This group of students, through the vision of middle school teacher Angus Stewart, evolved into the "Stream Team" and began helping with field trips for younger students.

In the 1999/2000 school year, participating classes spent a day touring the entire watershed of Colquitz Creek, from its headwaters at Beaver Lake, through their community, to where the creek meets the ocean. By visiting three different stations along the creek and taking short hikes, the classes experienced the watershed first hand and began to see how it connects their community. Students examined water quality, sampled and identified stream invertebrates, and completed reflective activities to record their impressions of the experience. Throughout the tour, high

school Stream Team students acted as teachers. Set up at stations along the route, the Stream Team students helped with activities for three or four classes a day, each day throughout the week. Given the opportunity to teach the younger students, on an ongoing and repetitive basis, the Stream Team participants quickly became adept at sharing their knowledge and acted as role models for the younger participants.

Students as Scientists

As much as the CWSEP has positively affected the teachers and students involved, it has also had tangible successes in improving the quality of the Colquitz watershed. Early in the program's history a group of high-school students from Spectrum Community School became involved with the project. Using their Streamkeepers equipment provided by the CSWEP, they recorded water quality data from the creek and used this data to plot graphs. By doing so, they discovered that an area known as Quick's Bottom, just downstream from the headwaters at Beaver Lake, had an elevated water temperature and low oxygen levels which would be deadly for salmonids. As it happened, many schools in the area were also involved in a "Salmonids in the Classroom" program where they were provided with equipment to rear salmon fry in their classes. These fry were then released into appropriate streams, including Colquitz Creek. The favored location for salmon releases in the Colquitz Watershed was just upstream of the warm, low oxygen area discovered by the students – an area that they renamed "Quick Death Bottom". After this discovery, it was decided that a new location for salmon releases should be found. A nearby park was located, safely downstream from the "Quick Death" area, where earlier habitat enhancement projects had already created excellent conditions for salmon fry. Classroom-reared salmon fry began to be released into this new location, greatly improving their chances of survival.

Students in the Community

After field trips are completed each year, students participate in class projects which apply their knowledge of environmental stewardship. Stream cleanups, plantings, and recycling projects have all taken place. Salmon have been raised in classrooms, invasive plants have been removed, and storm drains have been marked. Classes have done research projects to create posters and help educate their community about their shared watershed. At Strawberry Vale School, where Lenny Ross teaches, mapping activities took place. In becoming more aware of their watershed, students and teachers noticed an open natural area near their school, owned by the Municipality of Saanich. Students helped work on a community proposal that resulted in this land being designated as a park, which the students named "Strawberry Knoll".

As well, the program has involved community festivals. Displays have been erected in a local mall to highlight student's work, and celebration concerts featuring local musician Holly Arntzen – who has also contributed to curriculum resources - have brought together participants to finish the year. In 2001, students came together from four school districts to Fort Rodd Hill National Historic Site near Victoria to highlight what they had learned in an ecology fair called the Salish Sea Festival.

Watershed Moments for Schools

The CWSEP has had lasting effects not only on students, teachers, parents, and community members, but on entire schools. In the case of Strawberry Vale School, the elementary school where Lenny Ross teaches, the project has been partly responsible for inspiring a new school design. Located in a semi-rural area within the Colquitz Watershed, Strawberry Vale was intimately involved with the CWSEP from its very beginning. Not only Lenny Ross, but almost every teacher in the school, was involved with the project each year. When, during the project, the opportunity to build a new school arose, the teachers' interest in environmental education helped to shape the new school. Landscape architect Moura Quayle interviewed the teachers to determine what kind of school they wanted, and discovered that Strawberry Vale was the perfect school to pilot projects with an environmental focus, reflecting the natural features of the semi-rural area in which it was located.

The new school and its grounds incorporated many features to allow children to learn, play, and interact with the natural world. The school is designed without eaves troughs. Instead, water pours off the roof in a waterfall-like fashion, past windows where students can observe the water cycle in action. The water then goes into a ground drainage system and eventually runs into a swale which empties into a newly created seasonal pond on the school's property. Drains in the parking lot also lead into the pond, and have been painted with yellow storm drain marking fish to indicate that they lead to fish habitat. Between the school and the pond is a native plant garden approximately 100m long by 20m wide. This garden was created over many years with the participation of students who helped fundraise and create interpretive signage, as well as teachers, the parent association, district grounds and facilities staff, and other school staff. Ongoing planting and mulching days that take place at the school engage everyone, including the school custodian who has come to accept mud and leaves being tracked through the halls as a minor inconvenience when compared to the exciting and important learning that is taking place.

Students at the school who have been involved in the creation of their garden and ponds have developed a stewardship ethic that they readily apply to the greater community. When they discovered that a neighboring grove of Garry Oak trees was suffering from misuse and neglect, the students and staff took action to remove invasive ivy and add leaf mulch to the soil. These wild places near their school also provide opportunities for study. The pond and garden are regularly used for lessons about habitat requirements, aboriginal uses of plants, and more. Local experts have come to the garden to teach the students about traditional uses of plants and to make wild teas. Heavy snows this past year revealed dozens of birds searching for seeds and shelter amongst the shrubs. Red-winged blackbirds and marsh wrens have nested amongst cattails growing in the pond, and mink and great blue herons have been seen on the school grounds as well. Over the years, students have been able to learn about pond succession as the pond gradually filled in, and recently they raised funds to dig the pond out and start over so that future classes can continue to enjoy and learn from it.

Some years, the students and staff of Strawberry Vale shared their watershed moments with others when the CWSEP end of year festival was hosted in part at their

school. Participants from four other schools were able to rotate through various activities in different classrooms including storytelling and watershed models. Class projects were displayed in the hallways, a watershed drawn on the floor flowed towards the gymnasium, and students led tours of their school garden and pond, explaining how their school fits into the watershed of Colquitz Creek.

Aside from opportunities to practice stewardship and to study, the garden, swale, and pond also provide the students at Strawberry Vale the very important opportunity for unstructured play. "You can walk down the trail at recess", says Lenny Ross, "and think there's nobody in the garden, but as soon as the bell goes, kids pop out everywhere. They are down at their own level, in the thicket, and if you join them and ask what they are doing they go on forever about the rooms and shelves and castles they have created." This kind of unstructured play has been shown to contribute to children's creativity and problem solving abilities, and also to be instrumental in fostering the environmental ethic that the CWSEP strives to create (Louv, 2005).

Assessment

Because of the longevity of the program, which began in 1994, teachers involved have been able to see students who participated in the program in elementary school grow up. They have observed these students carrying a sense of stewardship and an environmental ethic with them into university and beyond. The ponds, gardens, and lasting dedication to environmental programs at Strawberry Vale school are one legacy of the project. Through a partnership with the Sea Change Marine Conservation Society, the watershed tours continue as part of the Living Watershed Program. The high-school Stream Teams still work to take care of their local watersheds. Today, a middle-school oriented program called Eco-Rowing, which also involves yearly themes, extensive networking amongst teachers, and the knowledge of local experts, continues to provide more "hands on, feet wet" learning for teachers and students alike. So why does this program work? According to Dr. Gloria Snively, University of Victoria environmental and marine education professor:

A major factor is the outstanding leadership of Lenny Ross who is a master environmental education teacher. Lenny is an extremely knowledgeable environmentalist and a visionary elementary school teacher without an ego. By demonstrating a strong environmental ethic and warmly welcoming all teachers and resource persons who want to participate, Lenny himself contributes significantly to the program's success. (Personal communication, March, 2007). Aside from this leadership, some identifiable "watershed moments" from the program are likely major factors:

- a) The program was created in a focused manner. Having clearly stated goals and objectives made it easy to 'sell' the program when applying for grants and other funding, as well as asking for the participation of community partners. By 2001 the program had 29 community partners including parks systems, government agencies, local non-profits, two universities, the local natural history society, artists, and musicians.

- b) Resources and in-service workshops were conducted for participating teachers that provided them with the knowledge, resources, and confidence necessary to prepare units on watershed ecology to teach in their classroom. Many of the resources were not necessarily science based. Musician Holly Arntzen recorded a CD of environmentally themed music and worked with Lenny Ross to create a teacher's guide to use the CD in their classroom, and materials using a literature-based approach were also used.
- c) Students came to field trips prepared. All the classes who took part in watershed tours or other activities had completed a watershed unit in their classroom beforehand, which meant they were primed for the hands-on experiences of closely observing the creek.
- d) Stewardship projects were involved – being able to clean up litter, plant shrubs, or even create a new park gave participants a taste of success and the feeling of truly making a difference in their community
- e) Finally, the student's efforts were recognized. Community celebrations and eco-fairs that showcased the students work meant students accomplishments could be shared with the larger community, giving them a true sense of contribution.

Finally, an unspoken strength of this program is perhaps simply the amount of time students are given to have direct contact with nature - a factor that has been shown to directly affect students' performance (Louv, 2005). The success of this program has garnered it recognition at both the provincial and national level. Experiencing success with their stewardship projects, feeling a sense of pride as they educate their community, and spending time in nature all help to foster an environmental ethic in the students who participate. Most significantly, however, the students have experienced critical moments that have allowed them to see themselves as an integral part of their watershed. Having made this connection through the CWSEP, they cannot help but care for the environment in which they live.

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Pam Murray is a writer and park naturalist from Victoria, B.C., who currently lives in the Bowker Creek watershed. In 2001, as a naturalist at the Freshwater Eco-Centre in Duncan, B.C., she participated in the CWSEP by helping to deliver the "Fish Ways" in-service workshop. Over the years, Pam heard many positive comments about the CWSEP, mostly from other naturalists who told her how much fun it was to help out with Lenny's program. This paper could not have been written without the generosity and patience of Lenny Ross, who also provided all of the photos and illustrations.

Community-Based Environmental Education: A Study of Three Canadian Cases

Gloria Snively

Abstract:

This paper reflects on a community-based approach to environmental education that has emerged in Victoria, British Columbia, Canada. Community-based environmental education brings students, teachers and community resource persons together for extended periods to learn from one another on local environmental problems which are of interest to them and at the same time yields valuable information. These approaches were selected because they involve students frequently experiencing the natural world and allowing them to have a sense of wonder, understand basic ecology concepts, and develop environmental citizenship.

In this paper I describe three environmental education projects: the SeaChange Eelgrass Education Program, Seaquaria in Schools, and the Colquitz Watershed Stewardship Education Program, and identify some of their predominant features. In all three projects, a high priority is placed on engaging students in first-hand experiences with plants, animals and nearby habitats; a focus on the processes of inquiry and problem solving, community involvement; and to varying degrees the exploration of local environmental issues and engaging in ethical considerations. I discuss the typical characteristics of the three projects and highlight the range of possible benefits they have delivered and acknowledge some of the barriers faced. Although the projects involve students in exploring topics and issues related to local ecosystems, the focus is also outward into the community and on actual topics and problems of interest to the lives of the students. The paper highlights the educational potential of this approach as far greater under these conditions than it has been under the traditionally more restrictive school setting.

What is Community-based Environmental Education?

In both urban and rural schools there is an increased interest in bringing together small groups of teachers, parents, students, resource persons and agencies into community environmental projects. All participants come together to learn with and from each other on some environmentally related project of mutual interest. Community-based environmental education engages various forms of groups working together to support the educational program of the school, and in the process engages the participants in group decision making, negotiation, perspective sharing, action and reflection. Community-based environmental education is based on the premise that schools will not significantly influence the long-term attitudes and behaviors of children unless their families and communities are also involved in meaningful nature appreciation and participatory stewardship efforts. Community-based environmental education is a holistic paradigm of education based on the interconnectedness of communities, natural environments and peoples, and the interrelatedness of social, cultural and natural phenomena. It can focus on local issues of environmental sustainability, development, economics, recreation, aesthetics, and politics. Its scope encompasses the personal and the local, and radiates outwards to national and global awareness. Its pedagogy is experiential, interactive, group centered, participatory, integrated, interdisciplinary, and action oriented.

Mitchell Thomashow (2002) believes that environmental education can be taught from a perspective that is deeply informed by personal experience and reflection. Through hands-on participatory learning and reflection, concerned citizens, teachers and students are provided with the tools needed to become reflective-environmentalists:

The ecologically aware citizen takes responsibility for the place where he or she lives, understands the importance of making collective decisions regarding the community, seeks to contribute to the common good, identifies with bioregions and ecosystems. . . . and is committed to mutual and collaborative community building. . . . The ecologically responsible citizen recognizes that he or she lives a life in nature, in conjunction with other people, in the common interest. (Thomashow, 2002, p. 139)

Much of the literature on effective processes for changing values, habits, and attitudes highlights the value of 'word of mouth' messages, and the norming of new behaviors by role modeling by early adopters (Rogers, 2003). Work on voluntary behavior change for sustainability stresses the value of people trusting others to discuss and model change (Herriman, Willets & Partridge, 2006). Ecological responsibility emerges from engagement in both the content and process of public participation. From such experiences and insights, and through shared experiences with trusted others, students are better able to develop ethical considerations and an attitude of environmental citizenship. Thus, talking to students about environmental citizenship is far less effective than adults demonstrating and modeling simple ways of expressing care through the handling of organisms or engaging them in the restoration of a nearby habitat.

Case Study Examples

A good example of community-based environmental education is the eelgrass education and restoration program, conducted by the SeaChange Marine Conservation Society (Wright, 2007). There a community conservation group collaborates with high school and middle school teachers to engage students in the conservation and restoration of eelgrass communities that have been affected by agricultural and/or industrial pollutants, or other urban pressures. Students learn to identify the diversity of species that inhabit an eelgrass community, conduct beach transects, and construct maps of the eelgrass. After researching the history of an eelgrass bed, students might conclude that the eelgrass bed is less dense or not as extensive as recently as 10-20 years ago. Over time the students will notice changes in the density and width of the eelgrass bed they mapped and will engage in lively discussions as to why this has happened. Students at all grade levels can participate in restoration of eelgrass as part of a community effort to restore damaged fish habitat. Over the past four years, community conservation groups in 22 communities on the extensive British Columbia coastline have involved school students and families in mapping and restoration projects.

West Wind Sealab Supplies, a biological supply company in Victoria, established a Seaquaria in Schools Program (Carolsfeld & Carolsfeld, 2007) and placed chilled seawater aquaria into local elementary, middle and secondary schools. Resource staff who are SCUBA divers stock the sea-aquaria with common local intertidal and less familiar subtidal marine organisms: sea stars, anemones, urchins, crabs, snails, limpets, barnacles, fish, and worms. Often students have the opportunity to assist in these collections, as they participate in field studies, and sometimes they even witness the divers come back from the ocean with the sea animals. Together, they set up teams of students who are responsible for monitoring the health and well being of their classroom aquarium, using data sheets to record their observations each day. Because the sea aquaria are continually available to the students, they can be used to weave environmental awareness into the student's everyday lives. As students care for and observe these ecosystems, they learn about the stewardship skills essential for the preservation of our marine ecosystems and natural resources. In so doing the aquaria foster a passion for learning and critical thinking in many areas of the students' life.

The Colquitz Watershed Stewardship Education Program (Murray & Ross, 2007) engages middle school students from grade 1 to 12 in the restoration of salmon bearing streams. The students identify beetles, mosquito larva, fly larva, and beetles and match their findings with a key to identify organisms that are tolerant or intolerant to pollution. By knowing which organisms are intolerant of pollution, they can determine the health of the stream. The students use test kits to calibrate dissolved oxygen and pH levels in the water, determine the average speed of the water, where in the stream bed the water flows fastest and so on. From their observations and inquiries students determine the best location to release salmon fry into the stream. By locating the safest place to release fry, there is a much greater proportion of juveniles living and returning to the stream. The project, along with other salmon enhancement initiatives, is credited with bringing salmon back to a stream that had not seen salmon return in over 25 years. By the end of their studies, children will have observed birds, searched for amphibians and insects, studied habitat

with quadrates, surveyed wetlands, mapped local watersheds, tested the water quality, identified ways to restore habitat, and participated in habitat restoration, and shared their accomplishments and concerns with their community at local festivals.

Characteristics of the Programs

Reflecting on the commonalities of the three programs and how they work gives a sense of how community-based environmental education programs operate. Some of the case study programs have a greater emphasis on action and reflection, and there are differences in degree of outward focus of the program—whether to change some aspect of environmental issue in the community. These commonalities and differences as described below are based on the writer's description of their programs (See Carolsfeld & Carolsfeld, 2007; Murray & Ross, 2007; Wright, 2007). Additionally, the project leaders were interviewed informally and took part in focus group discussions in which aspects of the program were discussed. This type of process, placing questions, discussing and sharing, was important for exchanging ideas and creating understanding of other people's thoughts and assumptions regarding the characteristics of the three programs. The three programs are by no means exhaustive of community-based environmental education initiatives, however since the programs can be described as exemplary, understanding their shared characteristic may be helpful in planning future community-based environmental programs. What follows is a discussion of the typical characteristics of the programs and a discussion of the ways in which they have brought people together to learn, discuss, take action, and reflect.

Experience Based

All three programs enrich the students' appreciation and understandings of local ecosystems by allowing frequent first-hand observation of and interaction with living organisms and habitats—active versus passive. Whether observing organisms and habitats in the field or in saltwater aquariums in the classroom, students see plants and animals interacting with one other over time and space in meaningful ways that foster concern and care for environmental conditions. The Eelgrass and Colquitz Watershed Programs place a strong emphasis on field activities that will produce a specific environmental benefit, whereas Seaquaria stresses active learning in the schools, building connections, opportunities and capacity to work with a variety of field programs more effectively.

Focused Programs With Broad Connectivity

Each of the three programs focus on a single theme (eelgrass, Seaquaria, the Colquitz River) and makes connections to broader environmental subjects. This enables a more in-depth exploration of a local habitats and environmental problems of concern to the students. Both the Colquitz Watershed Project and Seaquaria in Schools had their origins in aspects of Fisheries and Oceans Canada's "Salmonids in the Classroom" program in which students raise baby salmon in the classroom by extending the action learning component to stress locally important ecosystems and related environmental issues.

Ecosystem Understanding

The three programs stress basic ecology concept such as habitat loss, restoration, sustainability and stewardship as it relates to a specific local ecosystem. The basic concept of ecology is that all things are connected. The myriad living and non-living elements—soil and water, plants and animals—are functioning members of a single natural community to which we also belong and upon which we utterly depend for the means to life (Callicott, 1982; Knapp, 1989).

Integrated and Holistic

A common feature of each program is a high degree of holistic learning achieved through the integration of subject areas. The subjects included most frequently are the language arts, science, math, social studies, and the arts. By identifying a focused theme students are able to draw connections between different processes (environmental, social, cultural, economic, political, aesthetic, recreational, and health and safety).

A Spiraling Curriculum

All three programs engage students at the primary, middle school and high school levels. Thus, to varying degrees, concepts and skills are stressed at the various grade levels with increasing levels of sophistication. For example, in Seaquaria, students learn about organism and their habitats in the primary grades, marine ecosystem in the intermediate grades, and global ecological systems and interconnections at the secondary level. With regard to skills, students learn increasingly sophisticated forms of mapping. Participants report that the level of knowledge and the ability to make connections and think ecologically is much higher when the concepts and inquiry skills are revisited at planned intervals in the school curriculum.

Peer-Teaching

Peer teaching in which an older student mentors or teaches a younger student is a way of learning that is used effectively in both the Seaquaria in Schools and the Colquitz Watershed Stewardship Project. Middle school students who have had Seaquaria in the elementary school pass on their expertise when they move on to a middle school and participate in outdoor field trips with their peers.

Modeling

The teachers and resource persons involved with all three programs attempt to model an environmental ethic during the process of teaching. As teachers, SCUBA divers, and resource people care for plants and animals and protect local habitats, the students learn about the stewardship skills essential for the preservation of ecosystems. It is hoped that by modeling the careful handling of organisms and by protecting sensitive habitat, these programs will foster a "sense of wonder", a passion for learning, and a personal environmental ethic.

Meet Regularly

A feature of the case study programs is that the resource staff and teachers meet regularly with the teachers to provide resources, feedback, and support.

Teacher Resources

Examples of support to teachers include expert speakers, field-trip resource persons, information materials, handbooks, access to tools and equipment for the collection of data not normally available, access to research data, feedback on projects, on going phone and e-mail communication, and media articles. Project leaders report that when teachers are given personal attention and support materials there is a deeper personal commitment to use the curriculum materials successfully.

Teacher Training

To varying degrees the program's organizers provide teachers with detailed information on how to organize learning cycles complete with advance information, on-site activities, and classroom follow-up activities. Opportunities are sometimes provided for substantial participatory curriculum development with interactive workshop. Team teaching, where a SCUBA diver/naturalist, or master environmental education teacher, serves as a mentor or co-teacher with a classroom teacher is a tool that is used effectively in all three programs. The Colquitz Project, under the leadership of Lenny Ross, is an outstanding example of teachers providing in-service for other teachers. All three programs engage over 20 schools that express interest voluntarily. Project leaders report that once a school volunteers to participate, and the teachers attend an in-service workshop and receive help with getting started, the school quickly becomes independent.

Partnerships and Collaboration

Collaboration and partnerships serve as the core support for each community-based environmental education program. In all three programs, the schools, parents and community resource persons are encouraged to be involved in planning school programs and participating in the school's formal and informal activities.

Community environmental educators know that there is so much to do—so much that needs to be cared for, built, repaired, restored, observed and loved that there is a chronic shortage of resources, time and money. Forming partnerships with parents, organizations, local industries, and youth groups helps get the job done. Efforts have also been developed to involve representatives from local colleges, universities, oceanographic stations and marine biological research stations.

Family Participation

Teachers will not significantly influence the long-term attitudes and behaviors of children unless families are involved in meaningful nature appreciation efforts. To

varying degrees the three programs cited here have taken steps to share information with families and to involve parents in field trips and community activities that spring spontaneously from the project. Parents need to be aware of the goals and objectives of the program if they are to reinforce similar concepts at home. Teachers can also offer suggestions as to what parents can do at home with their children to foster positive attitudes and behavior toward the environment.

Outreach

Community based projects delivered a number of benefits in the communities by extending their learning, or creating structural changes in their local area. For example, the Colquitz Project organized public events on watershed sustainability, and successfully lobbied for an area designated for development to be converted into a public park.

Nature Celebrations

In all three programs the team leaders involve the students, parents and community in nature celebrations. Project teams frequently host displays at their own schools, as well as high schools, universities, shopping centers, community centers, and public festivals where students acting as spokes persons draw enthusiastic crowds.

Grass Roots, "Bottom-up" Programs

It is perhaps revealing that Seaquaria originated through the special interest of some students and parents, the eelgrass conservation program originated from the eelgrass education and restoration field experiences of one coastal conservation group and fanned outwards to a coast wide campaign to educate others about eelgrass habitats, and the Colquitz Project has been sustained through the interest and hard work of classroom teachers. These are programs that have been sustained through "grass roots", "bottom-up" not "top-down" efforts, and are not mandated by the Ministry of Education, Department of Fisheries and Oceans, Ministry of Environment, or universities.

On Site Leadership

Perhaps the success of the three programs lie in the on-going personal commitment of the program leaders who are respected at deep levels by teachers for their expertise, practical ideas for the classroom and field, and their genuine commitment to the goals of producing environmentally literate citizens. As one teacher commented "It's the energy, enthusiasm, and passion of the leader for the subject, so that I jump on the tails of the leader's jacket and say OK, I'm coming along for the ride." Another teacher connected leadership to creating a sense of the group. "It's leadership. I need some directions and some support and I can try to do things as best I can on my own but still know there's a place I can go if I'm having difficulties. I like how the leaders bring everybody together to remind us of our goals and to remind us of our responsibilities and make us feel that we're still part of a worthwhile group and we have directions" (Ross, 2003: 140). By warmly welcoming all teachers and resource persons, and by giving generously of their own time and energy, these remarkable leaders contribute significantly to the success of their programs.

International Connections

Networking internationally is a goal for all three programs. Because there is a global crisis with seagrass in general, Nikki Wright of the eelgrass conservation program hopes to establish international links with schools worldwide that are adjacent to eelgrass meadows and have an interest in developing eelgrass restoration projects. Seaquaria has already established links with Brazil and its Seaquaria curriculum is easily exportable. Students in classrooms half way around the world could view the marine organisms or different marine ecosystems and share projects, issues and celebrations with networking classrooms. Who knows what future environmental projects networking students might initiate?

Longevity

All three programs have established working relationships with schools and teachers over a period of many years. The Colquitz Watershed Stewardship Education Program has involved teachers and schools for over 13 years, Seaquaria in Schools has involved teachers for ten years, and the eelgrass program for seven years. The high retention rate of teachers for the Colquitz and Seaquaria programs is due in large part to the high level of involvement required of teachers, so that they use curriculum packages in the classroom before students participate in the actual field trip.

Funding

All three programs described have had a remarkable impact on the effectiveness and extent of environmental education in the Victoria region. However, government support and funding has been very limited, particularly in the case of the eelgrass and seaquarium programs. Support for these two programs has come largely from Parent Advisory Councils, who, with assistance of the programs' own facilitators; obtain funds from governmental gaming programs and special environmental grants from financial institutions, service groups and Foundations. Individual school funds are used to a lesser extent, generally only after a school is involved for some time in the programs. As local universities become interested research about these programs and their impacts on learning processes, some governmental research funds have also helped support the actual program development, and local branches of Fisheries and Oceans Canada have helped access money from Foundations. The Colquitz Creek project has been more successful at accessing school and institutional funding, possibly as it is a project that was initiated within the school system, but it also faces challenges for long-term funding and support. In all cases, the "individual champions" have put a large amount of their own time and money into program development and implementation, and the programs could not have started or carried on without this infusion. Clearly, the personal commitment and passion of the individual champions and the challenges faced by the programs have enhanced their local impact. However, the ongoing challenge is to secure their long-term sustainability in a fashion that doesn't rely so much on the sacrifices of these individual champions. The governmental or commercial institutional support that could provide this, unfortunately also generally requires conforming to institutional mandates, norms, and diluting local content, thus losing the advantages and local relevance that is at the core of the success of the projects described here. This will be an on-going challenge

throughout the world, though the Brazilian example indicates that solutions are possible.

Conclusion

This paper has shown that there are a range of characteristics common to community-based environmental education programs, and a range of possible benefits to this approach. The case study scenarios show the approach to be valuable in achieving significant changes in both how people interact with the natural environment and how they interact with each other in schools, neighborhoods and communities. The way that this approach recognizes community and individual expertise is aligned with a decentralized model of authority where agencies facilitate and support citizen action rather than dictate and direct.

Partnerships and team teaching, to the extent that it involves classroom teachers, SCUBA divers, naturalists, parks staff, aquarium staff, and in some cases scientist and/or university professors working in close cooperation with each other, has cracked the classroom walls. Developing on-going relationships with a nature center and the naturalists who work there fosters growth in awareness and appreciation of nature, but in addition models cooperative efforts to understand and solve environmental problems. Such innovative cooperative approaches break down the walls so that teachers and students can work together in teams on problems which interest them and which at the same time yields valuable information. At the elementary level, such programs disregard the traditional subject area boundaries and follow a holistic approach to teaching that more closely approximates real problem solving required to solve real life environmental problems.

This kind of dynamic, multi-layered approach which engages students and environmentally sensitive adults exploring ecosystems and encountering environment issues together, certainly develops different and presumably more positive attitudes, values, and behavior toward the environment than the traditional, more structured classroom approach. Furthermore, we can make the assumption that programs that involve students in attempts to solve actual environmental problems are engendering a social commitment that may have a lasting effect on their behavior. Community-based projects model hopeful, concrete solutions. An underlying assumption and beacon of hope is that with so many people working together to act as stewards for the planet, we can make a difference!

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Networking Schools

If you are interested in networking with one or more of the community-based environmental project leaders described in this paper, please contact the following:

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Seaquaria in Schools: Cathy and Yogi Carolsfeld

e-mail: wwsealab@shaw.ca

web: there is a seaquaria section on the World Fisheries Trust website (www.worldfish.org)

Thinking Like an Ocean: Towards Co-existence Between People and Nature

Gloria Snively

Abstract:

Most major problems in the world today are a result of the differences between how nature works and how people think. Humans evolved from a co-existing relationship with nature, not from a place as controllers or dominators. In thinking about a framework for environmental education, we need to understand the human organism and nature relationship. Children need to comprehend the key connections that exist among people, trees, rocks, fish, sea stars, wildlife, and other entities. Environmental educators need to stress the connections that people have with the planet and promote this concept in their programs. We must be equally concerned with the human element as well as the non-human aspects of nature. This approach stresses respect for diversity and all forms of life: personal, cultural and ecological.

If children are to develop a sense of connectedness with the natural world, they will need to have frequent positive experiences with the plants, animals and habitats of their local area. Providing frequent opportunities for such experiences is the beginning stages of developing an environmental ethic at the early childhood level. But increasingly, young children and teenagers spend most of their time indoors and involved with activities that keep them essentially isolated from the natural world. The challenge set forth to environmental educators is to develop programs that enable all students, regardless of where they live, to engage in frequent positive experiences in the out-doors and to develop a personal relationship with nature.

But how can teachers in both rural and urban settings instill in children a feeling of connectedness to the universe, and develop environmental ethics? This paper explores what we mean by an "ethic of ecological harmony" and a "universe of connections", and provides teachers with practical activities for enabling children to develop a personal ethic of environmental harmony.

Ecological Harmony Transcends Boundaries

The development of an ethic of ecological harmony begins when young children have positive experiences of "connections" with natural environments rather than through books, words, or facts, that provide direction and impetus for developing environmental ethics.

Increasingly, children have become alienated from nature with motion pictures, television, videos, teaching machines, computers, and on-line "talk rooms". Each one selects and separates. "It is difficult to experience and attach deep feeling to a film or video. A video of a tide pool is not a tide pool. Seeing a film or reading a book will not bring children closer to the reality of nature or to have a relationship with our fellow living beings" (Snively, 1989, p. 2). A feeling of connectedness to the natural world requires personal experiences in it (Cohen, 1988; Wilson, 1993; Snively, 1989). Increasingly, the way we live essentially cuts us off from nature. Most of us in the industrialized world spend 95% of our lives, from birth to death, indoors (Cohen, 1988; Louv, 2006). We rarely feel the wet rain, see mosses or lichens up close, taste seawater, feel the squish of mud between our toes, or hear the rustling of leaves. Our temperature and light controlled homes, schools, high rise buildings and shopping malls isolate us from the realness of the natural world.

A number of cross-cultural studies indicate that positive experiences in the out-of-doors during childhood represent the single most important factor in developing a personal concern for the environment (Palmer, 1993; Wilson, 1994, 1997). One study by Wilson (1997), p. 2) involved semi-structured interviews with children (ages three to five). Results included more expressions of fear, dislike and violence than of appreciation, caring and enjoyment. Rain was referred to as something the children did not like and that could make them sick. Wild flowers were viewed as dangerous because they attract bees, which might sting you. A number of children expressed fear and/or indicated that they'd perform violent acts if they were close to such creatures as butterflies and baby birds. Their responses included "Kill it," "Grab him and rip him apart", "Step on it", and "Cut the bird's mouth off". A similar study conducted by Simmons (1994) with nine-year old children in large urban cities uncovered similar misunderstandings and expressions of fear. The children expressed fear of big trees and other vegetation: "Branches could fall off," "A tree might fall down," "There might be itchy weeds." The children also expressed fear of animals and bodies of water: "A bird could swoop down and get you," "Fish are poisonous and may bite you," "You could get hurt because there are too many rocks." My own work with children at the seashore (Snively, 1986) reveals similar statements from young students ages nine to twelve: "Sea urchins are poisonous, don't touch them," "Blennies (small fish) can give you an electric shock, you could get electrocuted," "Sea anemones are poisonous and will paralyze you". "Yuk. I can't go out on the rocks covered with slimy seaweed, my shoes will get dirty". Referring to a sea star, "I'm afraid to touch it, its got suckers. You pick it up."

Although many seashore animals in tropical waters are poisonous and dangerous in a variety of ways, the organisms of our temperate intertidal Pacific coastline are generally quite harmless to humans. As these studies indicate, unfounded fears and misconceptions tend to develop early in life. These results are not surprising,

considering that most young children and teenagers have very little actual contact with living things and they tend to be more familiar with wild places through TV and stories about witches and wild beasts than through direct experience (Chawla, 1988). According to Louv (2006) the real disorder lies in a society that has disengaged children from nature and imposed on them an artificial environment for which they have not evolved. From this viewpoint, children suffer from what is being called "nature deficit disorder" which can be described as a condition caused by "the cumulative human costs of alienation from nature, among them: diminished use of the senses, attention difficulties and higher rates of physical and emotional illnesses. (p. 34).

Today, many places where young people live, play and go to school are almost devoid of vegetation and other opportunities for direct contact with nature. Playgrounds tend to be dominated by cement, asphalt, and metal and plastic equipment. Children growing up in such settings may never have the opportunity of having the kind of significant experiences in nature that have motivated many environmentalist to devote their lives to protecting the natural environment (Wilson, 1997). On the other hand, frequent positive experiences in natural settings can foster attraction and respect for wildlife (Chawla, 1988; Snively 1989). Such learning occurs not only in the cognitive domain, but also in the areas of self-esteem, emotional development, and aesthetic appreciation as well (Iozzi, 1989). Wilson (1984), a Harvard University scientist and Pulitzer Prize winning author, defines "biophilia" as "the urge to affiliate with other forms of life." He and his colleagues argue that humans have an innate affinity for the natural world, probably a biologically based need integral to our development as individuals. The biophilia theory, although not supported by all scientists, is supported by a decade of research that reveals how strongly and positively people respond to open, grassy landscapes, scattered stands of trees, meadows, water, winding trails, and elevated views.

How can teachers in both rural and urban settings instill in children a feeling of connectedness to the universe, and develop an ethic of environmental harmony? To help teachers design experiences that will enable children to develop environmental ethics we must be clear about what we mean when we talk about an "ethic of ecological harmony" and "universal connections".

An Ethic of Ecological Harmony

Environmental ethics deals with nature, plants and animals and the human-environment relationship. Elliot and Gare (1983) define an environmental ethic as being "an ethic, which allows that future generations, non-human animals and non-sentient nature are all morally considered" (p. x). Holdgate (1990) posits that the basis of human actions must be shared principles and that it must be based on a code of values that reflects a deep sensitivity to the ecological interdependence of the planet, and a respect for all its forms. Khan (1995) identifies some elements of environmental ethics as including:

- appreciation that humanity is not above and apart from the rest of nature, exempt from its dynamics and constraints;

- recognition that there is intrinsic value in the conservation of all naturally occurring life separate from any instrumental value that it may have for humans;
- given that all living involves some use of other living beings, acceptance of an ethos of 'treading lightly" in all respects. (p. 43)

When we develop an ethic of ecological harmony we foster a perspective that celebrates both uniqueness of and commonality across cultures while reconciling humankind with the natural world. We change ourselves as persons; we develop attitudes of care and respect to those around us, including non-humans and the whole environment. A healthy mind environment is also necessary for us to live happy, fulfilled lives.

A Universe of Connections

Environmental ethics is based on the notion that all of creation is connected and unified. As the naturalist John Muir said, "When we try to pick out anything by itself, we find it hitched to everything in the universe" (quoted in Knapp, 1989, p. 5). It is interesting that this view, which is traditional in Indigenous peoples' thought, has most recently been emerging primarily through the work of scientists. From biology we learn that there is virtually no significant genetic differences between all humans, and that the genetic differences between all living organisms is relatively minor. From ecology we learn of the subtle interconnections within and between ecosystems. The view that the world is a functioning system, and not composed of discrete entities to be described and treated individually is not new in Western culture, even though many of the scientific facts which support it have come to light only recently. As Collicott (1982, p. 41) states,

The basic concept of ecology is that the myriad nonhuman natural beings—soil and water, plants and animals—are functioning members of a single natural community to which we also belong and upon which we utterly depend for the means to life. Collicott knew that consciousness is central to our experience as living beings and latent in the emerging science of ecology were vast implications for religion and philosophy.

We are seeing the limitations of the view that the earth is a dead planet made of inanimate rocks, oceans and atmosphere merely inhabited by life. A root metaphor is the Gaia hypothesis that sees the planet as a living organism that carries on many of the same functions as an animal or plant (Lovelock, 1988; McQuire, 1993). The theory is that our planet is, itself, a gigantic living organism composed of organs (the oceans, forests and continents), each with its own quasi-biological function: such as photosynthesis and tectonic plate motion. Although most scientists balked at the idea taken to such an extreme, during the past few years scientists in a variety of fields have elevated Gaia to the status of a respectable paradigm that may prove useful in analyzing past and future conditions of the Earth.

By becoming aware of these universal connections we gain what is called environmental consciousness or environmental identity. Mitchell Thomashow (2002) has described this identify as getting people to "perceive themselves in reference to nature, as living breathing beings connected to the rhythm of the earth, the biochemical cycles, the grand and complex diversity of ecological systems".

Children are capable of seeing the patterns in nature and of understanding the patterns that connect all living beings. As Gregory Bateson asks:

What pattern connects the crab to the lobster and the orchid to the primrose—and all the four of them to me? And me to you? And all the six of us to the ameba in one direction and to the backward schizophrenics in another. (1979, p. 8)

The message is clear. There are patterns that connect all life forms. We all have our characteristic forms and behaviors, we all require sources of energy, we all fit into environments where we are at home and we are all compelled by some mysterious force or spirit to survive and reproduce. Beyond this, recently we have learned that every cell contains enough genetic patterning to reproduce an entire organism. Without any doubt we are all fascinated with these interconnections; none perhaps more than children who sense the simple wonder that we are all interconnected in complex ways and who can feel delight, deep feelings of joy, and inspiration to learn whenever we open ourselves to the vitality and complexity of nature's patterns. However, seeing "the patterns that connect" and developing an ethic of environmental harmony is so abstract that in order for students to understand what we mean by environmental ethics the constructs should be embodied in concrete educational experiences that engage students in personal and real world situations. The following are some examples of how children can directly experience nature to develop a sense of empathy that can lead to an environmental ethic.

Bonding With the Natural World

It is important that children have ample opportunities to bond with the natural world, to learn to love it and feel comfortable in it, before being asked to take personal responsibility for decisions that affect wildlife. Young children who are close to nature relate to it personally and emotionally. This message has been repeated in many ways over the last century. In her book, "A Sense of Wonder," Rachel Carson claimed that when introducing a child to the excitement of nature, "It is not half so important to know as to feel." Such experiences awaken a sense of wonder of the beauty and spirit of life, and excite a curiosity or mystery inspired by nature. We take children away from these strength-giving landscapes when we ask them to deal with distant ecosystems and environmental problems. Rather, we should be engaging children more deeply in the flora, fauna and character of their own local places. The local seashore, the nearby pond, the woods behind the school ground, the local urban park are places to start.

Bonding With Baby Animals

Children are drawn to baby animals, so let them cultivate this empathy. This natural emotional connectedness is the foundation of the idea that everything is connected to everything else. Baby ducks, guinea pigs, hamsters, a white rat in the classroom enable children to gently handle and observe a living animal. Hatching baby chickens or ducks in a classroom incubator, from egg to newly hatched chicks or ducklings can be the highlight of the year. Excursions to animal petting zoos or a particular farm are excellent opportunities. Stories, songs, close encounters with animals in the wild,

or in zoos or aquariums, or as carefully selected pets at school or in the home are excellent opportunities.

Acting Like Nature

Knowing that children enjoy “becoming” things rather than objectifying them, why not take children to the seashore, let them experience tidal pool animals first hand, and set them out to experience life as a bird, a sea star or hermit crab. Children love to soar like a seagull, slither along the ground like shore crabs, be a beautiful sea star, a sparkling jeweled diatom, a leaping humpback whale. By “becoming” a plant or an animal in its natural habitat a child can come to understand the ecological situation of living organisms. After a few days of tide pool play the children slowly step back and look at their fellow living creatures without feeling separated from them. A central premise of the bonding model is that if learners become deeply bonded to nature at an affective and sensory level, they will be inspired ethically to protect and sustain nature (Snively, 1989; Hammond, 1996-7; Goekler, 2003).

Focusing Activities

One way of enabling children to “see the patterns that connect” is by marking and observing something that is slowly growing—such as a weed, flower, garden vegetable, shrub or house plant. Several things happen during such a focused investigation over time. Most of us, when we take a walk through the forest, we see only the flowers that are in bloom at that instance, at that viewing. Only when children mark a specific flower so that we can observe it on a daily basis do they discover that the flowers of many species have dropped their petals by the next day. The flowers they see the next day are new ones that were not open the day before. Establishing an interactive “nature center” in the classroom is one way to invite children’s active exploration and involvement. This nature center can feature such objects as rocks, pine cones, bird feathers, snail shells, clam shells, different types of bark, bird nest, snake skin, crab molt, and different types of leaves. To hold the student’s interest, both the teacher and the students should frequently add new items.

Watching a bean seed sprout in a jar on the window sill, watching birds, butterflies and squirrels from a window, walking barefoot in wet squishy sand, allowing a caterpillar to walk across their hand help children feel comfortable hiking in unfamiliar woods. Once children are aware of the ongoing changes that are happening to individual plants, they can begin to see changes in small habitats: an old tree stump, nurse log, a weed lot. An old rotting tree stump supports hordes of other plants and animals. The roots, bark and inside wood, and the spaces between them provide protected homes for countless cities of moss, lichens, ants, snails, millipedes, mushrooms, fungus, leaves, flowers, fruit and cones. What kinds of plants grow on tree stumps? Children can be asked to map a stump, measure and graph plant growth, or the rate at which leaves decay, or worms appear in the under soil. Walking through a hilly forest or uphill from a small pond, children can begin to observe and record how plant communities change with elevation, depth of soil, shade and water. Lily pad flowers bloom during the day, and close up in the late afternoon and nighttime. Common changes that happen over the course of a day, or over many days, and the relationships between an organism and its habitat are little known to most children unless required to focus their attention on specific examples.

During such experiences the children are developing a sense of connectness with the natural world, and see the patterns that connect all living and non-living things. Baby plants and animals grow. Plants grow faster in sunlight. Predators search for prey. All plants and animals have a home. Spring follows winter, fall follows summer. All living things strive to exist—witness the weeds growing in the crack in the wall. Organisms have life cycles, birth, growth, maturity, death and decay. Without water organisms die. Would it surprise these children to learn some day that all those living creatures have DNA that is very similar in all of them?

The Art of Being Present

To help children become effectively engaged in nature, teachers can encourage careful observation and creative interpretation. Observational skills can be fostered through such questions as: How does it move? What does it eat? Do you see how it is getting its food? I wonder what will happen next? An extended inquiry engages the children not only in observation, but also predicting, inferring, ordering, classifying, analyzing and interpreting. When teachers show interest in the children's new understandings and discoveries about the natural world, and by looking with interest to what the children have found, they are encouraging their students' curiosity to ignite. Teachers can demonstrate interest by being attentive to the students' questions, and they need not always know the correct answer. Learning with the children is half the fun, and nothing will burst a child's buttons more than to teach the teacher something new.

talking to children about the care of plants and animals and "treading lightly" is far less effective than demonstrating simple ways of expressing care. Care and respect can be modeled through the gentle handling of plants and animals in the classroom and establishing outdoor habits for wildlife—attending to the proper care and handling of tide pool organisms at the seashore.

When given the chance to explore, children will have many questions about their environment: Why can't we see the stars during the day? Where do the birds go in the winter? How did so much sand come to the beach? Do all the crabs that live under this rock belong to one family? Are they related?

Young children tend to develop emotional attachments to what is familiar and comfortable to them. After careful observation, children will name rocks, plants, trees, and wild animals; and can have emotional attachment to even barnacles and rocks. An observation activity that I have done many times with children at the seashore challenges them to find a very special rock that they would like to "get to know more personally". The rock should be one that doesn't have life on it, such as barnacles and snails, because the life might not survive the necessary handling required for this activity. Once the children have found just the right rock, I ask them to sit down, make themselves comfortable, and quiet their minds. In a soft quiet voice, I ask them to observe the special features of the rock— its colors and patterns. Look for red, green, yellow, orange, brown, black, white. Look for different designs—lines, dots, squares, triangles. Close your eyes and observe the details of your rock with your hands. Open your eyes and observe the colors and patterns again. Now close your

eyes and observe its shape again. Smell the rock. Touch the rock to your cheeks, your lip. Give the rock a name. Now make up a story about your rock. Then, after a few minutes, I ask the children to open their eyes and introduce their rock to a partner. Point out all its special features. Then tell each other your story. Be dramatic! Whether doing this activity with children or adults, their enjoyment is obvious. The first time I did this activity with children age 8-10, they were so emotionally connected to their rocks that they would not leave the beach until we agreed to take their rocks with us—a task made difficult because most children chose much larger rocks than I had anticipated. I now ask the children to find a special rock—perhaps a polished beach pebble—one that fits into their pocket.

Exploring Mini Environments

Woodlots and parks in cities can be great places for exploring mini environments. The children can find a small part of an environment that looks interesting: a mossy wooded area, a piece of driftwood, a clump of mosses and lichens, a root system, tree bark, a flower blooming. The mini environment should be no larger than the width of their hand. Tell the children to watch the spot for five minutes.

What happens? What things change? What things move? What things remain the same? Close your eyes and try to picture the place. Do this over and over until you remember every detail. Make up a story about your mini-environment. Relax and let your thoughts bob like corks on a sunlit sea. Share your environment with another person. Explain why you chose your environment. Turn your back and describe the details of your mini environment. Have your partner face away from his or her environment and describe the details to you. Tell your stories to one another. Be expressive!

Early experiences in the natural environment are critical because many lifelong attitudes and values are shaped during the first few years of life. Young children who develop sensitivity to the beauty, mystery and cycles in nature are more likely to behave in ways that are protective rather than destructive of it. If children do not develop such attitudes, there is a risk they never will (Wilson, 1984, 1993, 1997). Over the past 40 to 50 years many nature and environmental education programs have developed creative games, role plays, sensory awareness activities, and guided fantasies to help children develop a “sense of wonder”, an appreciation of the beauty in nature. Excellent resources for teachers include *Sharing Nature With Children* (Cornell, 1979), *Hug a Tree* (Rockwell, et al, 1983), *Project Wild* (1998), and *Once Upon a Seashore* (Snively, 2001).

Teachings of the Elders

Land to the Native people of North America, and to Aboriginal peoples worldwide, is more than simply a place, a piece of rock and soil, a commodity. Land embodies culture, history, and the remains of distant ancestors. Land is sacred, the source of all life and the basis of identity. An overriding sense of Aboriginal perception is that of gratitude for nature’s bounty and beauty, and respect. Aboriginal children are taught to respect nature, not just plants and animals, but rocks, water, fire, the whole of Mother Earth and beyond, because we are all connected.

The Indian sense of education is that nature informs us and it is our obligation to read nature as you would a book, to feel nature as you would a poem, to touch nature as you would yourself, to be a part of that and step into its cycles as much as you can. (Mohawk, 1996, p. 11)

Many Native people view animals such as deer, frogs, ravens, wolves, killer whales, as people. Trees symbolize healing power and the sacredness of all life. It is said that Native people rest beside them with a feeling of mothering power. We should not treat others and ourselves unkindly because we would know that we are abusing the environment and ourselves. This message has been repeated over the last century by Native and non-Native people alike. A Zen master claimed, as described by Knapp (1989) that:

Our true nature is an aspect of a universal consciousness. We are more than our body and mind. The universe is not outside of ourselves. The mountains, the sea, and the stars are part of your body and we are connected to all life.

If we truly believe this, claims Knapp, then problems with other people and nature are not only "out there", they are also "in here" within us. We would not pollute the environment to the degree that we do because we would know we are polluting ourselves. If we truly believe that our modern land ethic is causing cataclysmic upheavals on this planet, then we must find radically different ways of educating our youth. I believe that Indigenous pedagogy has much to offer because it teaches a renewed sense of earth as home, a connection to the land and all living and non-living things.

Louise Milburn is a Anishabe woman who is considered by many to be a master traditional teacher. Lenny Ross, a teacher at Strawberry Vale Elementary School in Victoria, invited Louise to take his grade 4-5 students on a fieldtrip to a small nearby forest. Louise took the students to a huge old cedar tree and asked the children to move closer around the tree, to "get to know the tree". She told the children a little of the importance of Grandfather Cedar Tree and asked them to introduce themselves to the tree. One by one, each child would bow or nod and give his or her name to the tree. "My name is Annie, I'm pleased to meet you." "Now gently touch the tree, instructed Louise. Feel its energy and listen to what it has to say to you." Nearby was a large blue gray stone protruding from the bed of needles on the forest floor and Louise also encouraged the children to touch the boulder and feel its powers too." Now I want everyone to lie down on the ground under the tree. Make yourselves comfortable. Close your eyes and be very quiet and still". As the children silently reflect, Louise drums and sings softly. After about 10 minutes, she asked the children to open their eyes and talk about what they experienced. "What did you hear?" she asks. " Did you feel the wind? Did you feel the power of the tree?" The students had much to say. In Lenny's words:

The children, and the parents who were with them, showed a great sense of awe in this small forest glade. They talked in hushed tones of the images they saw or the experiences they had. One talked of a sense of warmth that came from the ground and connected the cedar, the stone and themselves. Others revealed personal situations that troubled them and commented on how they had felt comforted. One

little lad who often had difficulty slowing down, or relating to others went back to the tree to hold it and said, "I never thought I would be a tree hugger!" (Personal communication, March, 2007)

On another occasion Louise took some children to a stand of oak trees. When the children became silent, she said: "I want you to locate a special tree. When you find the tree, stand in front of it, hold out the palm of your hand to the tree and slowly walk toward it. Stop when you feel something, like the energy of the tree, the interconnected energy coming up from the earth, coming up to you". According to Lenny,

I was amazed that all of the children reported feeling something—"like a force field buzzing around the tree." The students stood still for what seemed like a very long time, simply moving their hand gently around the tree, usually two to five centimeters from the rough bark. Louise encouraged the children to feel the blood (sap) of the tree moving up its trunk, just like the blood moving in your veins, and to really know the tree was a living thing. Children were quick to make connections. Several noted both they and the tree were being sustained by the earth, and they told Louise of how the trees make us oxygen and we make them carbon dioxide so we can both live and breath. They combined their existing knowledge from class studies, with this new personal experience of a living tree facilitated by their Aboriginal educator, to create a deeper, more profound understanding of the world and their place in it. (Personal communication, March, 2007)

The book *Rediscover: Ancient Pathways-6–New Directions* (Henley, 1989) is an excellent educational guide that draws on the traditions of North American indigenous peoples. The guidebook is rich with descriptive activities for Native and non-Native youth that focus their attention on personal, cultural and environmental awareness. As one example of a typical activity, the students are asked to locate a "spirit spot". This activity is similar to a "solo" activity familiar to outdoor environmental education leaders, except that it adds a spiritual dimension. A spirit spot is a place imbued with power. North American Aboriginal peoples recognized the special powers which could come to a person by placing one's self in the right frame of mind and the right location.

This activity is most successful in a wilderness setting—in a forest, along a stream, or on the shoreline; but I have done similar activities in large urban gardens and urban parks. In setting the stage, the leader tells the students of Native traditions where youth their age would spend long periods of time alone in search of spirit guardians. In finding Spirit Spot the leader must explain a few rules: First, the Spirit Spot must be a place where they feel close to nature. If possible, the spot should be in a location where no other individual can see them. Silence must be maintained at all times. The leader explains the signal for the end of the Spirit Spot – a loud drumbeat, high-pitched flute, or conch-shell blast.

The leader encourages the students to express how they feel. What did they see? What animals did they see? Did they imagine themselves to be connected to nature? How?

As a follow-up activity the students could be given paper and watercolors, crayons, felt pens and colored pencils. The leader ask them to try putting the images from their Spirit Spot on paper. It needn't be like a photograph, it could be just colors.

If possible, the students return to the same location each day, to experience the same place under different conditions: sunny, shady, windy, foggy, calm—and the many animals that might approach them; a spider spinning a web, butterflies, birds, squirrels, deer.

Spiritual leaders who have walked the earth in times past and present such as Buddha, Mohammad, Jesus and the Dali Lama talk about finding the still waters within. Many of the spiritual masters speak about spending time alone in nature, receiving direction from "the Creator". Native peoples worldwide talk about spirit time, dreamtime, and calming the mind so we can achieve a harmonious relationship from within, and with the whole of creation. It is in our stillness that we receive direction, clarity and understanding.

The best aspects of the traditional teachings of our elders contain fundamental time proven, not short-term solutions to environmental problems. They reflect fundamentally different worldviews, containing workable ideas and beliefs about the role of humans in the scheme of things, and appropriate attitudes towards our universal community: other animals, other natural entities, and humans. It is perhaps time for the notion of indigenous teachings to help inform us all.

Conclusion

Some existing school curricula attempt to address environmental issues by suggesting well intended solutions that achieve limited success: recycling pop bottles, riding bicycles to school, filling up with unleaded gas, planting an indigenous flower garden, purchasing an acre of rain forest in the Amazon jungle. As important as such activities are, if this is all we do, we are not addressing the fundamental problems that exist in today's industrial societies. It is the search from within that will help give students the harmony and balance that is needed to meet the demands and rigors of contemporary life, develop appropriate environmental values, and lead them to discover their gifts, interests and true selves.

It is in this time of crisis on the planet that a collective effort is necessary because we need thousands of master teachers everywhere—worldwide—working together with a common focus, intent and mission—to heal the planet and ourselves. By frequent positive physical experiences with nature, whether through urban parks, plant gardens on top of high rise buildings, or in the forest we are able to enjoy and reflect upon the "glue" that holds together all the living and non-living entities on our planet. And it is precisely because we can feel this connection that there is some hope for our species as participants in life who have learned enough about power, action, consumption, interconnections, reflection, beauty and harmony to destroy or support all the world's amazing life forms.

As a child, I knew my woods and my fields. I could follow the creek that ran through the forest on our farm to its source. I experienced farm animals (horses, cows, sheep,

goats, pigs, chickens, geese, turkeys) giving birth, growing up, sickness and death. I could walk along secluded Pacific coast beaches and not see another person in sight. A child today can tell you about the Amazon rain forest and tropical coral reefs, but not about the last time he or she explored the woods in silence, followed a streambed to its source, or lay in the woods listening to the wind and watching eagles soar overhead.

I have been blessed to teach environmental in both elementary and secondary schools where wild nature was a nearby walk or an hour's bus ride away. Teaching environmental education at the University of Victoria has been a delight with its nearby forests, seashores, ponds and lakes—all within a 15-minute drive from the university. Teaching environmental education for me has been easy. The plants, animals and entities of wild nature have been the teachers, enabling my students to contemplate the beauty and interconnectedness of the earth's systems. The real challenge to environmental educators worldwide today, and into the future, will be to devise new creative ways to provide students of all ages with frequent positive and thoughtful experiences with plants, animals, and natural systems in large urban cities where access to natural systems is all but destroyed. Such knowledge may inspire teachers to choose a different path and develop radically different, yet common sense transformative methods for teaching environmental education—methods that lead to a nature-child reunion.

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Proposal for Environmental Education Based on Religious Ethos: Focusing on Common Values in Diverse Cultures and Religions

Azizan Baharuddin

Introduction

- Statement of Problem: Need for environmental ethics to be the basic of environmental education.
- Role of Religion: Source of worldview and ethics
- Inclusivism vs Exelusivism
- Analogy between cultural and biological diversity
- Need to understand the disparity Between Ideals and Reality in Religion
- Need to draw upon the resources of religions for functional ethics, for earth-human relationships
- Proposal for methods of working:
 - Re-examination of resources; exploring of textual (worldview + meaning), rituals and experiences (codes of conduct) evidences of the religions/traditiona
 - Examination of non-religious ecological philosophies
 - Harmonizing or complementing statements of ethics with ecological/scientific data; creation or mutual borrowings (scientific, religious and philosophical)
 - Standardising the principles of ethics. Examples of Miller (Ethics based on Science; not so much in religion).

Religion (its role)

- World religions have been instrumental in formulating views of nature and in creating perspectives on the role of the human in nature
- The examination of different religious worldviews will be critical in the task of analyzing the roots of the environmental crisis as well as in proposing solutions
- Environmental Ethics as one of the bases of Guidelines
- Religion has been one of the most powerful forces in history. The teachings of religions have shaped the lives of people
- Generally defined as an organized system of beliefs, ceremonies, practices and worship that centre on one supreme deity/ universal source of power and love.
Functions of Religion
- Sense of security (certainty, protection, salvation)
- Sense of individual fulfilment

- Meaning to life
- Purpose of life
- Destiny of humans
- Knowledge's of rights and wrongs
- Obligation to others (deity, environment and other human).
- Characteristics (Resources) of Religion
- Belief in deity/ transcendent being
- Doctrine (accepted teaching) of salvation
- Code of conduct
- Use of sacred stories
- Religious rituals (acts and ceremonies). Looked at from the perspective of environmental education, in each of them there could be a resource for precepts, attitudes and conduct (ethics) towards nature.

Towards a "New" (Universal) Environmental Ethics

- If a new ethics is to capture the minds and hearts of people throughout the world, it must have roots in their diverse traditions and must emerge out of these traditions
- The new ethics has to be preceded by a transformation in the way people think and behave; it must not be seen to be externally imposed
- Must be constructed in the form of an extension of development of core values and principles that people respect and have accepted
- In this context, contribution and leadership of the religions is critical
- Religion need to help further the growth of man's ethical consciousness/ awareness in this age of global interdependence
- Interfaith dialogue is important
- Huns Kung: No survival without a world ethics; No world ethics without religious peace; no religious peace without religious dialogue. (Tucker + William 1997: 314)

Reconciling the different religions

- The fact of diversity/ plurality of religions must be accepted and dealt with.
O mankind! We created You from a single (pair) of a male and a female; and made you into Nations and Tribes, that Ye may know each other (Not that ye may despise each other). Verily the Most Righteous of you are the best in your deeds; and God has full knowledge and is well acquainted with all things." (Q 49: 13)

"If He had wanted it, He could have made everyone the same. But to test your faith He made you as you are. Vie with one another in good works, you all will return to Him. He will show you what you have disagreed upon." (Q 5: 48)

- So "standardisation" (presentation in a universal format) of religious values/ precepts for a standard environmental ethics may mean the putting together of common values, on the one hand whilst on the other, constructing ethics which are religion/ culture specific
- Clarification of meaning of plurality
- Accepting and respecting plurality
- The ethics of dialogue of religions/ cultures (For example Q al-nahl: 125)
- The need for religious dialogue for peace
- Dialogue towards a common environmental ethics a good e.g. of "dialogue of life" instead of dialogue of theology/ doctrine.

Issue concerning religion

- The gap between ideal and reality. Weber: religion, opium of the people (low end). Religion as way of life & as a means to be at one with the universe (high end)
- Difference between belief and faith
- Faith may not be equated with belief
- Faith is a way of learning into, and making sense of, life
- Faith is the dynamic system of images, values and commitments guiding one's life.
- However belief alone need not push a person to action. Role of science
- James Fowler 6 stages of faith: intuitive, initiative faith of childhood, conventional, independent, universalizing, self transcending faith of full maturity (Quest for meaning and value)
- Muhammad Iqbal & Henri Bergson: 3 stages of faith/ religious of life. From blind faith to identification with source of the religion
- Question of the "creation" of faith
- Followers of religions have different levels of understanding and commitment. Important to understand that we may be dealing with the level of minimum of proper understanding and commitment
- The need for followers of religion to understand and take science on board before its ethics can be used as a basis for environmental education
- Scientific knowledge/ experience as a source of faith, alongside the religious beliefs. Environmental Ethics, Worldview and Beliefs
- In the secular perspective, moral progress means extending the rights to live/ survive to species that are non-human
- 2 contending major world-views man-centred, nature/ bio centred
- 4 Principles of man-centred worldview
- Man is the most important species on the planet. He is different and exists apart from the rest. He is responsible over them
- There will always be more resources, and everything is for man
- All types of economic growth is good and the potential for growth is unlimited
- A healthy environment depends on a healthy economy. Our success lies in how efficiently we can control and manage the planet for our benefit.

Criticism of the anthropocentric World View

- On balance we are becoming more ignorant because we are loosing cultural knowledge about how to inhabit our places on the planet sustainability, while impoverishing the genetic knowledge accumulated throughout millions of years of evolution. Most research is aimed to further domination of the planet. Considerably less of it is directed at understanding the effects of domination. Less still is aimed of developing ecologically sound alternatives that enable us to live within our nature limits.
(David Orr, Environmental Educationist)
- *We can break the mountains... drain rivers, flood valleys... pour toxic chemicals into the soil, pollute the air with acids, rivers with sewage..., we can invent computers capable of processing 10 million calculations per second. For what? So that we can increase the volume and speed with which to move natural resources through the Consumer economy to the*

junk pile & waste heap. Instead of a technological wonderland, our progress is bringing us to a (wonder) waste world.
(Thomas Berry, Theologian)

Life-Centred World View

- As with the anthropocentric view, it has variations; but its basically a number of basic beliefs include:
 - Nature exist for all species, not man alone; he cannot live apart from nature
 - There will not always be more resources for man; and it is not all for him
 - There are types of economic growth which are harmful. We should encourage types of growth that can sustain the earth and not those that will degrade it
 - A healthy economy depends on a healthy environment
 - Our success depends on how well we can work with the environment; the earth is a complex, dynamic system. We must accept the facts that complete information are not available to us for a thoroughly efficient management to be possible.
- Environmentalism as a rejection of modernism. Recently, 71% of respondents in a UK survey thought that government should give higher priority to environmental policy even it is means higher prices. (Pepper, 1996:4)
- Environmentalism (e.g. Alternative health movement) against the backdrop of doom-laden thinking may be part of bigger late 20th insecurities
- Many people suffer 'future shock' – the globalization of the world into one big commercial, electronic and cultural system; their inability to cope with this leads to extreme biocentrism or environmentalism
(Pepper: 5)
- Point: we have to 'sort-out' the apparent conflict between the human-centred secular worldview and the religious worldviews which may seem necessarily "man-centred" but not as in the secular sense
- What may come out of our analysis is something that lies in between these 2 opposite poles
- This middle/ view path is supported by many people as indicated by (Pepper 1996: 37) which points out to "faith in the adaptability of institutions and approaches to assessment and evaluation to accommodate environmental demands".

Contribution of Religion to Discourse on Environmental Ethics and the Issue of the Environmental Crisis (Case Study the Islamic Faith)

- Many dimensions can be looked at but contributions may be categorised as below: (Basic of information/ suggestions, history, Sacred Texts & *Hadith*)
 - Worldview, beliefs, cosmology
 - Values
 - System or codes of conducts; laws pertaining to environment
 - Historical relics of success stories.
- But we must be weary of the disjuncture between ideals and reality
- Some measure of the community living sustainably can be seen in the relics of Fez (Morroco), Granada (Spain), Istanbul & Konya (Turkey), Udaipur (India), Isfahan (Iran) etc.
- The challenge for religious communities today is to reinform themselves of the knowledge and understanding which they are supposed to possess and to add to this body of

understanding current knowledge and information for immediate & future use and implementation

- The green ethos inherent in the religions may not have been properly understood and only unconsciously used, in the past.

Metaphysics/ Cosmology vis-à-vis nature

- Many writers have written, as with other religions. Mainly looking at Ozdemir, I (2003), Iqbal, M. (1928), Mansoor, P. (1995)
- Nature is to be read for its meaning (in phenomena and in all that is in it). It is the second book of God. It has meaning and purpose. Nature is a collection of mirrors which continuously pass on, one after the other, so that man may know the One who is being manifested (I was a hidden treasure, I desired to be known, I created creation that I may be known)
- The immediate purpose of the religion in asking man to observe nature is to awaken in him the consciousness that nature is a symbol to awaken a higher consciousness in himself which would enrich his relations with God in the context the universe/ nature
- To ponder nature is to have an idea about God's existence and His presence through whatever He creates; and to have a moral feeling of obligation towards transcendental Being.
- To be good to nature is to worship God & vice versa
- Nature and ethics are a matter of fact at the very core of the religious weltanschauung. To see arising out of the natural world a transcendent (revealed) ethics
- Nature (phenomena and parts), man, (his feelings, aspirations, experiences) and the Transcendent are not separated from one another.
- "Not without a purpose did we create the heaven and earth and all in between Q 38: 27"
- Respecting the balance of nature
- "Everything created is measured out (gender, *qadr*, *taqdir* etc.) and all are not separated from God. When He creates anything He plans within it its powers or laws of behaviour, called in the sacred text its guidance and command/measure by which it fits into the rest of nature."
- Nature is Muslim

Islam : Submission to the will of the creator
Muslim : One who attains peace as a result of submission

- The entire universe submits to God's laws (its guidance/*qadr*). Nature submits by behaving according to its 'laws' (inherent nature, way of functioning)
- Don't you see that it is God whose praises all beings in the heavens and on earth do celebrate, and the birds with wings outspread? Each one knows its own (mode of) prayer and praise. And God knows well all that they do (Q 24:41-42).
- Only humans are free to obey or disobey the will (ways) of God (Q3:83)
- Other species are also communities like humans
(Q6: 38) There is not an animal that lives on the earth, nor a being that flies on its wings, but forms part of communities like you. Nothing have we omitted from the book. And they all shall be gathered to the Sustainer in the end.
- Nature not only for humans

(Q 5510-12) and the earth has He spread out for all living beings, with fruit thereon, and palm trees with sheathed clusters, and grain growing tall on its stalk, and sweet smelling plants and all living things.

- Based on the Quranic view of nature, Muslims live in a world that is alive, meaningful, purposeful, and more importantly like themselves, even prostrating before God. The immediate result is the discovery of the uniqueness of all creation and integration with it, physically and spiritually. When the devout look at their environment, everything seems to be somehow familiar & friendly. Moreover everything is a symbol & a sign pointing to an all-wise & all-merciful Creator, sustainer, Cherisher. (Ozdeimer 2003: 19).

Principles and values underlying the use of a greener Science and technology in the Religious view

- *Tawheed* – unity of God; also an all-embracing value when unity refers to that of man nature, knowledge and values
- *Khalifah* – man is not independent of God; is responsible and accountable to Him for his S&T activities (impacting on nature/environment); man has not exclusive rights to anything; responsible for maintaining and preserving nature's integrity; No such thing as conquest or domination over nature
- *Ibadah* – Contemplation of the unity of God, the pursuit of knowledge is a major one. *Ibadah* is an obligation for it leads to *tawhid* which is an integrating factor for scientific activity
- *Ilm* – knowledge – Its pursuit is an *ibadah*, obligatory. Two types – *fard-ain*, such as ethics and morality which is essential for individuals to survive and *fard-kifayah* which is necessary for the survival of the whole community. So, environmental education is both individually and communally-requisite knowledge, both *fard-ain* and *fard-kifayah*. The pursuit of knowledge for the benefit of the individual, community and nature is *ibadah*.
- *Haram* – *Haram* is all that is destructive for man as an individual, and the environment. The word destructive is to be understood in its physical, mental and spiritual sense.
- *Halal* – On the other hand, all that is beneficial for the individual, society and environment is *halal*. But an action may be useful for an individual but not for the society and the environment. Then the concept of *adl* (justice) comes into the picture.
- *Adl* – Justice. *Halal* operates on the premise of the distribution of *adl*.
- *Zulm* – tyranny. *Haram* propagates tyranny. Three categories of *zulm*: man to God, man to man, man and nature. Thus scientific and technological activity that seeks to promote *adl* is *halal*, if it promotes alienation and dehumanisation, concentration on wealth in fewer & fewer hands, unemployment, pollution and degradation, then its *zalim* and therefore, *haram*.
- *Dhiya* – wasteful. A major characteristic of *zalim* science and technology is that they destroy human, environmental and spiritual resources and generate waste.
- *Istislah* – public interest. Science & technology which draw their legitimacy from *istislah* (counting the interest of public and the environment) is the chief supplementary source of Islamic law.

Similarities and Commonalities, Analogies

- Islam and Hinduism
- The concept of *tauhid* and *sanatar dharma*
- "The external essence of life" – unites all beings with the universe and with God. Perception of underlying unity between man and environment.
- Islam and Christianity

- The concept of trusteeship/*Khalifah*/vice-gerent." nature is to be taken care of by man" it is a trust /*amana*.
- Islam and Buddhism & Taoism
- Concepts of impermanence. Nature has no absolute existence of its own. It is only a sign/ manifestation of That (God) which cannot be described by any form.

Science & Environmental Ethics

- For environmental ethics and education to be effective it is crucial that people understand the hows of environmental problems and the whys of what they should and should not do
- Science (biology, physics, chemistry etc) is fundamentally critical/ useful for the above.

Integrating Religion, Science in Ethics

- Examples of Miller's ethical principles which are "supported by science and religion"
- We should try to understand and cooperate with the rest of nature rather than try to dominate and conquer it. The earth does not belong to us; we belong to the earth
- We should work with the rest of nature to sustain the ecological integrity, biodiversity, and adaptability of Earth's life-support systems for us and other species
- Every species has a right to live, or at least to struggle to live, simply because it exists
- We have the right to defend ourselves against individuals of species that do us harm and to use the individuals of species to meet our vital needs, but we do not have the right to cause the premature extinction of any wild species
- The best way to protect species and individuals of species is to protect the ecosystem in which they live
- We should not inflict unnecessary suffering or pain on any animal we raise or hunt for food or use for scientific or other purposes
- We should strive to live more lightly on the earth, not because of guilt or fear, but because of a desire to make the world a better place
- Connection with the Earth Charter.

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Introduction To Marine Studies For Youth

Koh Kian Choon

Objectives

- To expose to youth about basic marine life
- To expose and give hands on experience on coral reefs
- To introduce different kinds of coral reefs in Tioman Island (off the south-east coast of Peninsula Malaysia)
- To know the uses of coral reefs to human target group
- Youths aged between 15-18
- Youths from outskirts of Malacca (a southern state in Peninsular Malaysia)
- Youths love our environment
- Youth are the future leaders of our country

Types of Environmental Camps

- Marine camp
- Mangrove ecosystem
- Highland ecosystem
- Forest ecosystem
- Beach and river ecosystem

Why Environment Education now?

- To save Mother Nature
- To expose the younger generations on what they should do for the society
- How we need to instill the love for nature for youth.
- To minimize the destruction of Mother Nature through education.

Activities

- Ice breaking
- Lecture from fisheries department
- Lecture from WWF
- Visit to marine park
- Night outing in shallow waters

- Snorkeling
- Environmental games
- Interview with locals
- Log book
- Presentation of findings
- Sampling of dead corals

Participants, criteria

- 40 youths three different districts
- Multiracial
- Science class students
- Must produce marine scrapbook
- Draw a marine poster

Introduction to Safety Precautions in Boat



Team work...Sand Creature



Environmental Games



Interview with Local Chalet Operators



Groups Discussion/findings



Get to Know the Sea



Responsibility for Nature – A Challenge for the Engineers

Nik Meriam Nik Sulaiman

- In 1854 Chief Seattle of the Squamish Indian Tribe wrote to President Franklin Pierce pleading for betterment of Indian people and the environment...

“Teach your children what we taught our children:

That Earth is their mother. Whatever befalls the Earth befalls the children of the Earth. If they spit upon the ground they spit upon themselves. People did not weave the web of life; they are merely strands in it. Whatever they do to the web they do themselves” (source: Ponting, C.A., *A Green History of the World*. New York: Penguin Books, 1993)

Some definitions

- Engineering is the profession in which a knowledge of the mathematical and natural sciences, gained by study, experience, and practice, is applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind

(The Accreditation Board for Engineering and Technology (1982) – US)

- A professional engineer is competent by virtue of his fundamental education and training to apply the scientific method and outlook to the solution of problems and to assume personal responsibility for the development and application of engineering science and techniques especially in research, designing, manufacturing, superintending, and managing. An engineer is a person qualified by aptitude, education, and experience to perform engineering functions

(The Profession's Definition of an Engineer)

- Responsibility may be defined as acting in a way that responds to problems in consideration of values
- If the mentioned professionals should develop into ethical responsible agents,
it is important that they acquire the qualifications, which make them able to identify and manage problems and values, not merely on the level of appearance, but also on a more basic level, including the cultural context
- During their education, they should achieve the ability to understand this context, both as cultural specific, and as a result of a historical process, in which they take part. They should obtain the ability to reflect their own way of thinking and acting critically, as culturally and historically influenced beings.

(quote: Jens Christensen – Working paper 9 on *Technology, Environment and Society*, Dept of Development & Planning, Aalborg University, Denmark, November 2004)

Complexity of man's relation to nature

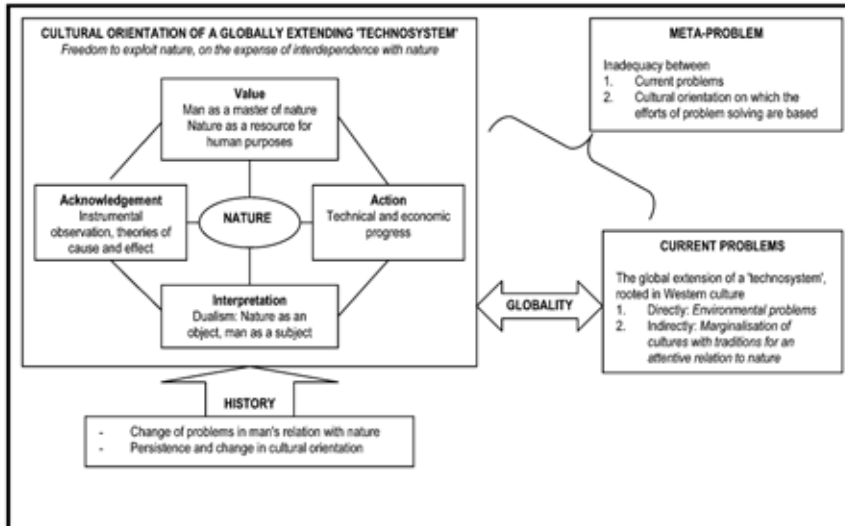


Figure 1: A view on problems in man's relation to nature.

Values in man's relations to nature

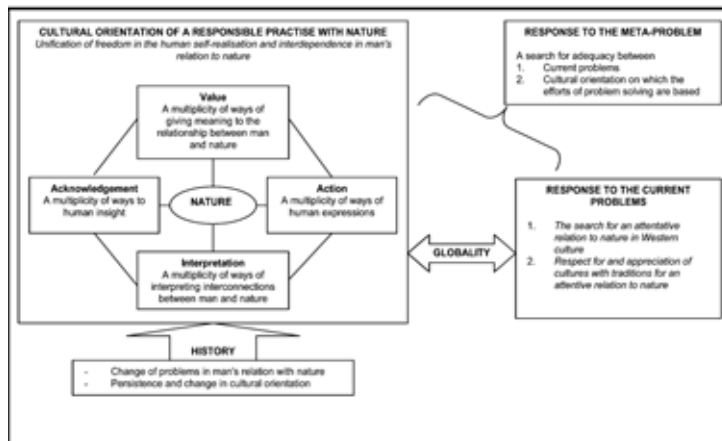


Figure 2: A reference for discussing values in man's relation to nature.

In the traditional role, engineers are capable of transforming the environment in unprecedented way

- Material selection – can alternative materials be used? Can less material be used without compromising function or reliability?
- Manufacturing process – this covers all aspects relating to the life cycle of a product, process or service, starting from raw material extraction to ultimate disposal
- Energy use – the quality and types of energy consumed for society's needs directly affect environmental quality. It represents the most pervasive and perhaps one of the most important areas related to engineering.

Do engineers need to be environmentally literate?



- **According to ABET 2004-2005 criteria, Students must be prepared for engineering practice through curriculum culminating in a major design experience based on knowledge and skills that include the following considerations:**
 - Economic
 - Environment
 - Sustainability
 - Ethics
 - Health and safety
 - Social and political.

The need for environmental literacy

- What is Environmental Literacy?
 - The capability for a contextual understanding of an environmental issue to enable analysis, synthesis, evaluation, and decision making at a "citizen's" level.

- **Nominal**

- ability to recognize many of the basic terms used in communicating about the environment and to provide rough guide working definitions of their meanings
- Functional-a broader knowledge and understanding of nature and interactions between human social systems and other natural systems
- Operational-progress beyond functional literacy in both breadth and depth of understanding and skills
- Levels of environmental literacy. This is a course given to engineering undergraduate students in UCalifornia, Berkeley. Students are challenged to consider:
- ramifications of stakeholders in the network
 - o players, methodologies and conceptual problems of risk assessment
 - o appropriate technological solutions for third world countries from the point of view of sustainable development and not only from industrialised nations' corporate business interests

Example: The social implications of technology

Engineering is a social experiment embedded in values and concerns of its time: One such example is Global Warming and its implications for Climate Change.

An example: Global Warming – Climate Change

Engineering Solutions for Global warming

- Availability of human resource to teach the subjects
- Acceptance of lecturers to infuse/embed environmental issues in their contents
- Students' response and interest

Climate Change: A Framework For Education About The Interconnectedness Of Environmental Issues

H. Damon Matthews

In the last decade, climate change has emerged as one of the central environmental challenges of our generation. The Earth is warming, and there is now strong scientific evidence that human activities are responsible for this recent warming trend (Intergovernmental Panel on Climate Change, 2007). There is an urgent need for coordinated action on the part of the major emitters of greenhouse gases to reduce the human influence on the climate system. There is also a need to educate the general public about the causes and consequences of climate change, and to promote individual lifestyle choices that can help to reduce our global environmental footprint.

There is a clear link between human activities and global warming. Burning fossil fuels generates emissions of carbon dioxide; industrial activities over the past century have added close to 1 trillion tones of carbon dioxide to the atmosphere (Marland et al., 2007). Carbon dioxide is an important component of the natural greenhouse effect, which maintains a livable temperature on the Earth. Rising carbon dioxide levels in response to human emissions over the past two centuries have increased the strength of the greenhouse effect and warmed surface temperatures. Human activities have also increased the atmospheric concentrations of other important greenhouse gases, such as methane and nitrous oxide (Forster et al., 2007). Continued emissions of greenhouse gases will lead to continued strengthening of the greenhouse effect, which will in turn lead to continued climate warming.

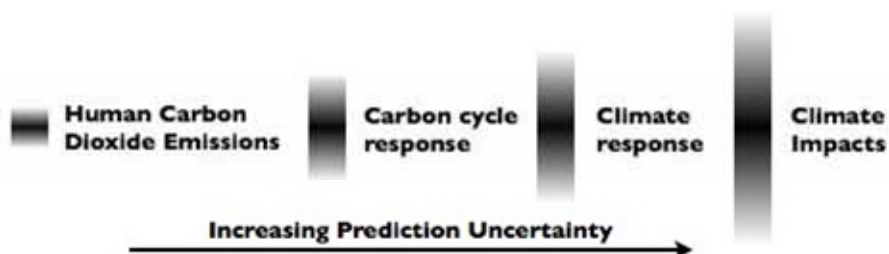


Figure 1: Source of uncertainties in predictions of future climate changes and their impacts on humans and the environment. Increasing uncertainty from left to right is indicated by the length of the shaded bar (Adapted from Jones, 2000 and Schneider and Kuntz-Duriseti, 2002).

This fundamental scientific understanding of climate change is clear. However, there are many uncertainties about the details of how much climate is likely to change in the future and what this will mean for human and environmental systems. These uncertainties are illustrated in Figure 1. First, it is not known how human economies will develop in the coming decades, and as a consequence, it is difficult to predict future emissions of carbon dioxide. Given some level of carbon dioxide emissions, it is not known how the natural cycles which determine the fate of this carbon dioxide will respond; consequently atmospheric carbon dioxide levels are difficult to predict. Given some level of atmospheric carbon dioxide, the precise climate response is uncertain, and consequently so is the amount of future climate warming. Finally, it is not well understood how a given level of climate change will impact human societies or environmental systems. At each stage in this process, the inherent uncertainties are compounded; as a consequence the challenge of predicting the climate impact of human carbon dioxide emissions is by no means trivial (Schneider and Kuntz-Duriseti, 2002).

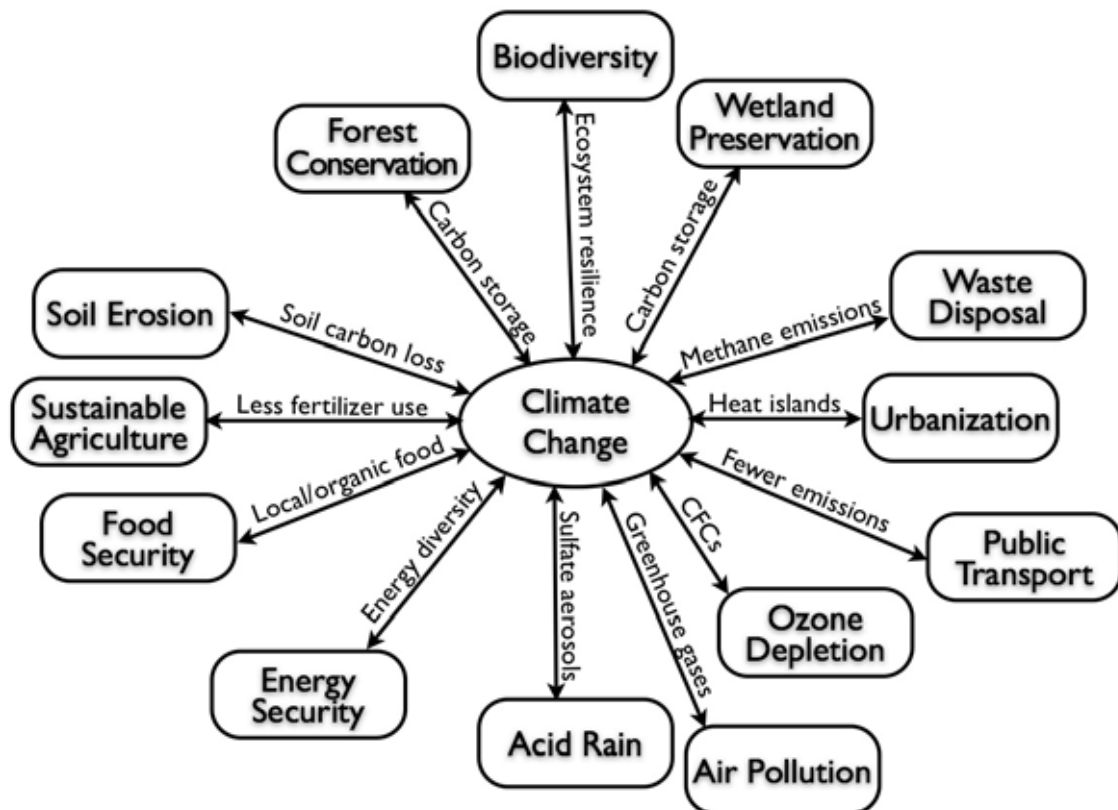
The uncertainties inherent in climate change predictions should not be seen as grounds for inaction to reduce human emissions of carbon dioxide and other greenhouse gases. Impacts of future climate change are unavoidable, and the high level of uncertainty in these impacts implies a high risk of severe negative impacts. Consequently, this uncertainty provides increased justification for action to reduce emissions as a precaution against the possibility of dangerous future climate changes.

Environmental Framework of Climate Change

Climate change is a global environmental issue with global ramifications. Furthermore, climate change can be viewed as a central issue that is fundamentally connected to many other environmental challenges currently facing human societies. Some of these connections are illustrated in Figure 2.

The most obvious links between climate change and other environmental issues can be drawn with respect to atmospheric pollutants. Many of the chemicals which comprise urban air pollution, such as the constituents of photochemical smog, are also greenhouse gases. Furthermore, urban air pollutants are largely the result of fossil fuel use, which is also the primary source of greenhouse gas emissions. Acid rain is caused by sulfate aerosols, also derived from fossil fuel combustion; these same aerosols can affect the reflectivity of the atmosphere and lead to regional-scale climate change (Forster et al., 2007). The same chemicals which deplete the ozone layer are also greenhouse gases (Velders et al., 2007).

Other aspects of urbanization and urban living can also be connected to climate. Public transportation reduces the use of fossil fuels for transport, and can consequently benefit both local air quality and global climate. The growth of cities themselves can lead to local climate warming through the creation of "urban heat islands" with the result that urban centers are often several degrees warmer than surrounding rural areas. Urban waste disposal is also a climate issue, as landfills are a potent source of the greenhouse gas methane (Houghton, 2004).



Conservation of forests, wetlands and other natural areas have important ecological and recreational outcomes, but can also benefit the global climate via an increased storage of carbon in ecosystem biomass (Zhou et al., 2006). Correspondingly, unsustainable forestry practices are economically and environmentally detrimental, and also lead to a net release of carbon dioxide to the atmosphere. Biodiversity itself can be seen as an issue of relevance to climate, as biologically diverse ecosystems are likely to be much more resilient to possible future climate changes.

Human agriculture and land-use also has strong climatic implications. Overuse of nitrogen fertilizers leads to the production of nitrous oxide, a greenhouse gas. Unsustainable agricultural practices, such as over-tillage of the soil, can lead to soil erosion and consequent loss of soil carbon to the atmosphere in the form of carbon dioxide. Encouraging food security through increased production of local and organic food products can reduce emissions of greenhouse gases, through more sustainable farming practices as well as reduced transportation of food products.

Figure 2: Connections between climate change and other contemporary environmental challenges.

Global energy security can also be seen as a climate issue. Current global conflicts over energy security are rooted in reliance on oil resources; a shift away from oil

Figure 2: Connections between climate change and other contemporary environmental challenges.

towards a more diverse energy portfolio that includes forms of renewable energy has the potential to both reduce international tensions and benefit the global climate.

Solutions to the Challenge of Climate Change

Climate change is an issue that strikes at the heart of modern human societies, as its source is rooted in the fossil fuels which currently support and drive the global economy. Ultimately, prevention of future climate change will require eliminating the use of fossil fuels such as petroleum, coal and natural gas (Matthews and Caldeira, 2007). Such a goal is understandably daunting and unlikely to be achieved quickly. However, there are many small and large actions that can be taken immediately on the part of both individuals and governments which will contribute to the necessary transition to a fossil-fuel-free economy.

Given the interconnectedness of climate change with other environmental issues, there is the potential to take action and enact policies that reduce human impacts on the climate system, while at the same time benefiting other aspects of the environment. Such win-win strategies can play a central role in implementing solutions to climate change in solidarity with other environmental challenges.

Forest conservation is a clear example of a win-win, or “no-regrets” policy (Houghton, 2004). Preserving old-growth forested areas leads to the retention of stored carbon, and a reduction of carbon dioxide emissions to the atmosphere. Reforesting areas that have been previously deforested, or restoring damaged ecosystems, can increase ecological diversity, as well as sequester additional carbon dioxide away from the atmosphere. Sustainable and organic agricultural practices can reduce local environmental impacts from overuse of fertilizers and pesticides, and can also lead to soil carbon retention and a reduction of nitrous oxide emissions. Local food and energy production can reduce greenhouse gas emissions that result from the long-distance transport of food products and energy. Decreased long-distance transport of petroleum would also decrease the risk of environmental disasters such as oil spills.

Improvements in urban design, and better use of environmentally-friendly transportation, can improve regional air quality as well as decrease global climate impacts. Increased urban green-space can improve both the quality of city life, and the quality of the environment. Energy conservation can have individual financial benefit, as well as global climate benefits from decreased fossil-fuel energy use. Promotion of renewable energy sources such as solar, wind and small-scale hydro-electric power can improve local energy security and reduce global climate change.

It is important to note here that there are many proposed solutions to climate change that do not classify as no-regrets policies. Nuclear energy, for example, does not produce greenhouse gas emissions, and is thus arguably beneficial for the climate system. However, nuclear energy carries substantial additional negative

environmental impacts, such as the risk of local environmental contamination and the inevitable production of long-lived radioactive waste, that substantially offset any perceived climate benefit. Another greenhouse gas-free energy source is hydroelectricity. However, when implemented at very large scales, hydroelectric projects can have huge negative environmental and social impacts. I would argue that focussing on the implementation of no-regrets policies, rather than on policies that have negative spin-off consequences, will lead to much greater long-term benefit to both climate and the environment as a whole.

A Framework for Environmental Education

Education about the interconnectedness of environmental issues is fundamental to the development of intelligent and beneficial solutions to environmental problems. Climate change provides a clear focal point for environmental education, with the potential to draw conceptual links with many other environmental challenges. I would argue that the most beneficial approach to environmental education about climate change is not to focus on climate as a single and disconnected environmental problem, but rather to draw out the connections between climate change and other environmental issues.

Climate change is fundamentally a large-scale response of the global environment to the human activities within modern industrial economies. Almost every other contemporary environmental challenge, from global deforestation and threats to biodiversity to the dangers of toxic waste, can be characterized by in this same way. It is precisely in the areas where environmental challenges overlap, that there is opportunity for creative and positive solutions to be implemented. Education about the interconnectedness of environmental issues will promote the development and implementation of solutions that have a positive influence on more than simply the primary target environmental issue. Climate change is a complex scientific issue, and poses a significant international challenge to policy-makers, and yet this very complexity presents an opportunity for innovative solutions to be implemented in solidarity with other environmental challenges. Environmental education plays a fundamental role in the conceptualization, development and implementation of such solutions.

The link between human activities and global climate change is well established and accepted in the scientific community. It is critical that this understanding of a significant human influence on climate underpin environmental education about the causes and consequences of global climate change. It is also important to emphasize that solutions to the current challenge of climate change are possible. Furthermore, the interconnectedness of environmental systems presents both a need for and also the potential to enact solutions that have a net positive impact on the environment. In working to reduce human impacts on the climate system, we can reduce human impacts on other environmental systems and move towards a more healthy and harmonious relationship between humans and the world we inhabit.

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Korean Elementary School Teachers' Perceptions of Aquarium Field Trips and Cases of Aquarium Education in the USA and Canada

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ABSTRACT: The purpose of marine education is to produce ocean literate persons and marine aquariums are excellent venues to accomplish this purpose and to inspire conservation of our oceans. School field trips conducted at non-formal settings continue to be an important part of K-12 education in South Korea. Despite the frequency of such field trips, there have been no reviews, surveys or research reports assessing the educational quality and success of school field trips to aquaria. This study had a three-fold purpose: 1) to provide quantitative data regarding Korean teachers' perceptions of the extent and quality of marine aquarium field trips conducted by elementary school teachers in Seoul, South Korea, 2) provide a qualitative description of marine education conducted at selected aquariums in the USA and Canada, and 3) identify recommendations for increasing the success of Korean marine aquarium field trips and improving the quality of aquarium galleries, curriculum materials and programs. A Web survey was designed to examine Korean teachers' experiences and perspectives of aquarium field trips, and a case study conducted at three aquariums in the USA and Canada described the characteristics and qualities of marine aquarium education at those aquaria. The intent was to make recommendations to improve the extent and quality of marine aquarium education in South Korea.

INTRODUCTION

The oceans cover 71% of the earth's surface and are the dominant feature of the planet. Understanding the ocean is integral to understanding the planet on which we live and is essential to sustainability (Cava, Schoedinger, Strang & Tuddenham, 2005). Cava et al. (2005) defined ocean literacy as "the understanding of the ocean's influence on you and your influence on the ocean" (p. 5), and thus the purpose of marine education can be summarized as to produce ocean literate persons.

Marine aquariums and marine science visitor centers are excellent and effective venues for accomplishing the purposes of marine education (Ballantyne, 2004; Evans, 1997; Lamb, 2004; National Oceanic & Atmospheric Administration [NOAA], 1998; Ohara & Nishi, 2001; Würtz, 2001). Many aquaria in North America provide diverse educational programs for students and for the public, and develop a wide range of marine curriculum resources for teachers. In addition, school field trips to museums (including zoos, aquaria and science centers) have been a profound part of K-12 education (Walters, 2006). Millions of children participate in school field trips to these institutions each year (Gilbert & Priest, 1997; Griffin, 1998; Price & Hein, 1991; Rennie & McClafferty, 1995). In this sense, school field trips to aquaria provide many students with significant opportunities for marine education in non-formal settings.

Three public aquariums are affiliated with the Korean Association of Zoos and Aquariums as of 2005, and they are all run by companies (see Table 1), differing from the primary North American model where most aquaria are public non-profit organizations. Despite the fact that each aquarium in Korea accommodates hundreds of thousand to one million visitors every year, they provide very limited educational opportunities for marine education (e.g., a near absence of school programs, and a lack of various curriculum materials for in-

service teachers). In addition, teachers face daunting challenges in implementing marine aquarium field trips¹ (e.g., extremely large group size and the lack of quality marine curriculum materials). As the three aquariums in Korea are all owned and operated by companies, they are required to generate a profit, and thus their focus is likely on entertainment rather than education, conservation, or research. However, some for-profit aquariums like Sea World in the USA and Underwater World in Australia provide rich educational programs and teaching resources. Taking the existence of such large barriers in Korean aquarium field trips and various educational services compared to other aquariums in the USA, Canada and Australia into consideration, we describe and evaluate the extent and quality of marine aquarium education in Korea, and make recommendations for improvements.

Research Questions

The research questions that formed the basis of this study were:

- (1) What is the nature and quality of school field trips conducted at selected aquaria in South Korea, the USA and Canada?
- (2) What are the characteristics and quality of school-based elementary programs, galleries, teacher programs, and educational facilities in selected marine aquaria in North America?
- (3) What are recommendations for both Korean aquaria's educational services and Korean elementary school's successful field trips to aquaria?

Table 1

Aquariums affiliated with the Korean Association of Zoos and Aquariums

Aquariums	KA	SA	BA
Location	Seoul	Seoul	Busan
Ownership	Company	Company	Company
Year of establishment	2000	1985	2001

METHODS

This investigation was descriptive in nature because it involved describing characteristics of a particular phenomenon - marine education through aquaria. This descriptive research utilized both quantitative and qualitative methodologies in order to describe and analyze the extent and quality of marine aquarium education in South Korea, the USA, and Canada.

Web Survey

To describe and analyze the extent and quality of aquarium field trips in South Korea, we created a Web questionnaire that was designed to gain information about aquarium field trip experiences and perspectives of Korean elementary school teachers who have participated in aquarium field trips with their students. The questionnaire consisted of thirty-three questions, with nine sections: information relating to the

¹ Marine aquarium field trips in this paper mean any organized field trips to aquaria, which occur in the context of normal schooling

respondent's background and experience, organizing field trips, on-site activities, pre- and post-activities, worksheets, chaperones, resources and workshops, satisfaction with the aquariums' educational services, and challenges for field trips. In an attempt to explain the purpose of the project and to recruit volunteers for our Web survey, we sent a letter to 37 public elementary schools located in Seoul, Korea. This Web survey was carried out between July 1st and July 20th, 2006, and a total of 125 Korean public elementary school teachers in Seoul responded. The process of this Web survey closely followed the design developed by Carbonaro and Bainbridge (2000). The potential respondents of the questionnaire could participate in the survey by accessing the Website where the questionnaire was located. The questionnaire data submitted by the respondents were automatically analyzed to yield frequencies and were transferred to the researchers for interpretation.

Interviews, Observations and Document Analyses

The three aquariums in North America (Vancouver, BC; Seattle, WA; and Monterey Bay, CA) were chosen for conducting case studies because they have earned a reputation amongst marine educators for having developed excellent educational programs, and like Korea are also located on the North Pacific coastline. The case studies involved interviews with selected staff, observation and analysis of galleries, and document analysis. From interviews with aquaria staff, we gained information about their perceptions of the goals of aquarium field trips and their services and efforts in creating successful school field trips, as well as to ascertain their perceptions of what main obstacles exist for conducting successful aquarium field trips. We observed two elementary programs and the three aquariums' educational facilities such as galleries, classrooms, laboratories, auditoriums and the traveling exhibits to describe their characteristics and quality. In addition, many documents were analyzed such as program brochures, teachers' guides and curriculum materials to help describe those aquariums' educational services. Subsequently, interviews, observations and document analyses were triangulated and crosschecked for recurring themes and corroboration.

TEACHERS' PERCEPTIONS AND EXPERIENCES OF AQUARIUM FIELD TRIPS

The Web survey results indicated that Korean elementary school teachers experienced several challenges during the process of conducting aquarium field trips, and it documented that there are specific needs for improvement in terms of Korean aquariums' educational services and schoolteachers' strategies for conducting successful field trips.

With regard to the obstacles to successful aquarium field trips, more than four in ten teachers (44%) reported the lack of choice and diversity of educational programs as being a very critical barrier because every school group has been provided only one program (gallery tour) regardless of its grade (see Fig. 1). Teachers responded that they consider the link with current school learning topics/ prescribed learning outcome (PLO) as a very important (22%) or important (30%) motivation for their aquarium field trip, but the gallery tour programs are not directly aligned with or related to the prescribed school curriculum. Slightly over three in ten (32%) rated large group size as a very critical obstacle to effective and successful field trips to aquaria because more than half (54%) experienced that the field trip group consisted of about 150~250 students (one grade unit in an average elementary school in Seoul). Also, three in ten rated the lack of marine curriculum materials as a very critical obstacle, and the majority of teachers (77%) expressed interest in

teaching resources such as students' activity books, CDs, Videotapes and teachers' guides. The lack of teacher workshops was also considered a critical obstacle by 21% of respondents, and the majority of teachers reported a willingness to participate in teachers' workshops relating to aquarium field trips, if provided. Almost two in ten (18%) considered the lack of educational facilities in the aquarium as a critical barrier to a successful field trip because there are no classrooms, laboratories or auditoriums for school group visitors.

Q32-1~32-12. What do you think are the critical obstacles for effective and successful aquarium field trip? In terms of ... (% saying describes very critical)

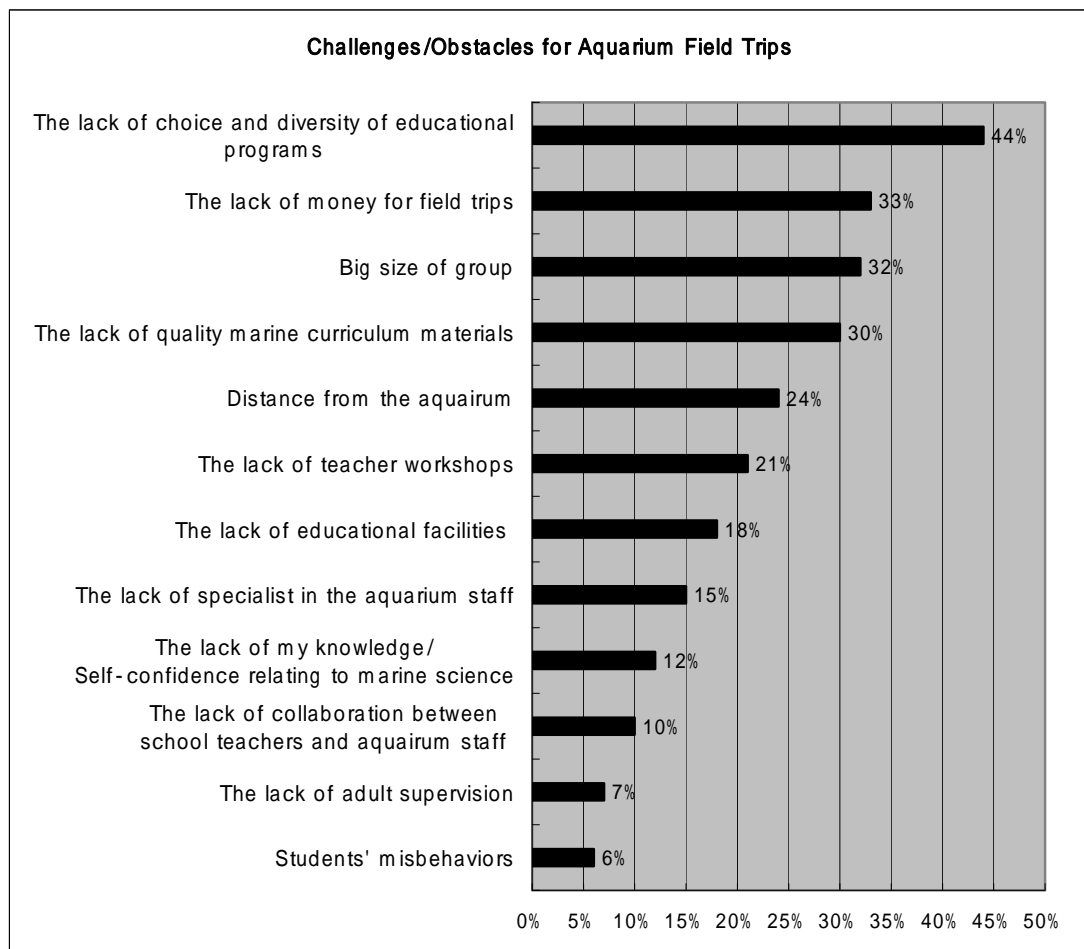


Fig. 1 Critical obstacles for effective and successful aquarium field trip

Regarding the teachers' instructional strategies, close to three quarters (74%) reported they had engaged in pre-field trip activities with students, but that most (70%) of the activities focused on educating students about behavior expectations. Also, more than eight in ten (81%) agreed that student worksheets are definitely needed for assisting students' learning and for evaluating students' learning and participation.

However, the worksheets provided by the Korean aquariums mostly consist of questions targeting simple factual knowledge about marine organisms without stressing basic marine ecology concepts, stewardship and inquiry science. This is contrary to Korean teachers' main purpose for conducting aquarium field trips, which is to understand the relationship between the marine world and our lives.

CASES OF AQUARIUM EDUCATION IN THE USA AND CANADA

The qualitative methods using interviews, observations and document analyses at the three aquariums located in the USA and Canada revealed a series of characteristics of marine aquarium education where school field trips, elementary programs, teacher programs and educational facilities are concerned. The findings from the qualitative methods provided us with useful information to make recommendations to Korean aquariums for improving their galleries and enabling teachers to conduct successful aquarium-based field trips with their students.

Goals of Aquarium Field Trips

The three North American aquariums' educational staff stated that the goal of school field trips to aquaria is to provide students with educational experiences that are not available in their classroom (shorter-term), and to create the next generation of ocean stewards (longer-term). These goals are eventually linked to the aquariums' mission statements. Regarding the obstacles to aquarium field trips, the staff rated funding, justification of field trips and logistics as major potential barriers, however these factors were different from the obstacles that Korean teachers experienced.

Educational Programs for Students and Teacher Workshops

Compared to the Korean aquariums' limited educational programs, the three aquariums in North America provided elementary schools with a large number of programs (see Table 2). In addition, all school field trip programs showed close and direct links with school curricula and the prescribed learning outcomes, which made it easier to connect out-of-school learning with school learning topics. Also, the aquariums provided schoolteachers with diverse teacher workshops (e.g., field trip planning workshops, inquiry-based marine science workshops, and teacher open-houses), which helped the teachers organize, prepare and implement their field trips more effectively. Furthermore, the aquariums provided schoolteachers with a variety of teaching resources such as cross-curricular activities, worksheets, educational CDs, teachers' guides, and orientation videos (see Fig. 2).

Educational Facilities and Characteristics of Exhibits

With regard to their educational facilities, the three aquariums have extended the depth and boundaries of their educational services using not only gallery exhibits but also other educational facilities such as classrooms, laboratories, auditoriums and the use of the traveling exhibits such as the AquaVan (see Fig. 3 and 4). The AquaVan of the BC aquarium is a 32-foot-long truck that brings living marine organisms with curriculum-based programs to landlocked schools.

Table 2

Numbers of educational programs in three aquariums in North America (Elementary level only)

Aquariums	CA	WA	BC	Sum
Gallery Program	6(1)	6	6(10)	18(11)
Lab Program	4	1	1	6
Outdoor Program	.	2	2	4
Outreach Program	4	1	4	9
Event/Immersion Program	1	1	2	4
Sum	15(1)	11	15(10)	41(11)

Note. () represents the number of self-guided gallery tour for school visitors.



Fig. 2 Teacher resource centers in the CA aquarium (left) and various teaching resources provided by the three aquariums (right)



Fig. 3 Educational facilities (Left Upper: gallery in the CA aquarium, Right Upper: classroom in the WA aquarium, Left Lower: laboratory in the BC aquarium, Right Lower: auditorium in the BC aquarium)



Fig. 4 The AquaVan truck of the BC aquarium (left) and its program delivery (right)

In addition, our observations and analyses of the thirty galleries showed that habitats and conservation were the most frequent and important topics, and the aquariums' exhibits' settings shared the following characteristics:

- The three aquariums provide students with sufficient hands-on experiences with living marine organisms at carefully designed touch pools (see Fig. 5).
- Instead of a one-way exhibit, the three aquariums have adopted interaction exhibit settings that enable students to communicate with interpreters and/or manipulate the exhibits or equipment. Fig. 6 shows a girl observing sharks using an underwater camera.
- “Technology Novelty”² is an outstanding characteristic of many exhibitions, for example, the virtual Seafood Restaurant in the CA aquarium (see Fig. 7). In the elaborately set virtual restaurant, a guest can order any seafood from the menu lists shown in the touch screen on the table, then a Cook makes the food which is delivered to the guest’s touch screen. Then, the Cook and other employees give a detailed interpretation of whether the choice was wise or not given the guest’s reasoning.
- The three aquariums’ exhibits share characteristics of a relevant³ setting. In the CA aquarium, the shark exhibit provides not only features of several kinds of sharks but also how the world’s coastal indigenous cultures relate to sharks and rays, helping visitors to understand how closely their lives are related to the marine world (see Fig. 8).
- Since students have different learning styles and knowledge levels, multimodal⁴ settings help students’ learning, effectively providing several kinds of interpretation tools such as main labels, assistant labels, graphics, maps, books, videos and models (see Fig. 9).
- Escaping from two-dimensional settings, the aquariums provide a multisided setting (see Fig. 10).
- The three aquariums designed the gallery exhibits to meet the eye level of young children so that they can access the exhibits easily (see Fig. 11).

² Technological Novelty is defined as an exhibit which contains visible state-of-the art devices or illustrates phenomena that would otherwise be impossible or laborious for visitors to explore on their own (Sandifer, 2003)

³ When exhibits produce a cognitive link to visitors' existing knowledge and experiences it is considered as a Relevant setting (Borun & Dritsas, 1997)

⁴ Multimodal is defined as a characteristic of an exhibit that appeals to different learning styles and levels of knowledge (Borun & Dritsas, 1997)

- The three aquariums devote a great deal of their attention to gallery designs for young children by providing special galleries and decorating the inside of the building with more aquatic environment displays (see Fig. 12).



Fig. 5 Hands-on experiences at the Rocky Shore touch pool in the CAaquarium



Fig. 6 Interactive setting at the Oceans Edge in the CA aquarium



Fig. 7 Technological Novelty setting at the virtual Seafood Restaurant in the CA aquarium

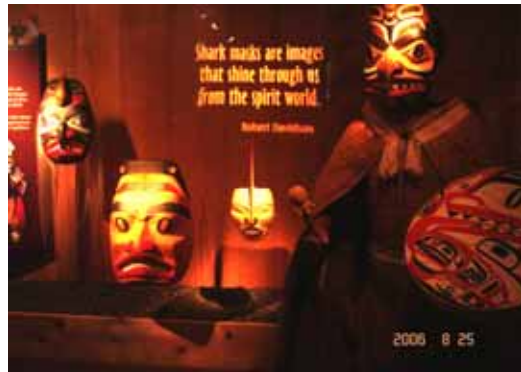


Fig. 8 Relevant setting illustrates cultural relationships with Sharks and Rays in the CA aquarium



Fig. 9 Multimodal setting at the Nature Center in the CA aquarium



Fig. 10 Multisided setting at the Exploration in the BC aquarium



Fig. 11 Accessible setting at the Clownfish Cove in the BC aquarium



Fig. 12 Child-friendly setting at the Coral Reef Play in the CA aquarium

RECOMMENDATIONS

For the improvement of marine aquarium education in Korea, we make several recommendations focusing on strengthening and enriching the educational services of Korean aquariums. We believe that aquarium directors and staff should: (1) coordinate their mission statements with programs and exhibits; (2) develop various educational programs based on grade levels and themes (e.g., Sea star for G 1-2, Jellyfish for G 3-4, Food web for G 5-6); (3) link the programs' main concepts and objectives directly to the school curriculum; (4) develop teachers' programs (e.g., field trip planning workshops and hands-on experiments); (5) develop teaching resources (e.g., program guidebooks, pre- and post-visit activities, and science inquiry worksheets); (6) provide educational facilities such as classrooms and laboratories to implement diverse educational activities; (7) organize education department /divisions and provide educators who are qualified; (8) provide outreach programs for schools and communities that are located a long distance from the aquarium; (9) conduct periodic evaluations of galleries and educational programs; (10) establish a teacher advisory team; and (11) establish networks with other aquariums and organizations relating to marine science to maximize their educational services and functions.

Also, several recommendations focus on elementary school teachers' roles in implementing more effective and successful aquarium field trips. These recommendations encourage teachers to: (1) prepare obvious agendas for the day and share clear goals with students before the visit; (2) implement pre- and post-visit activities; (3) consider group size for the field trips (one class unit of 30-40 students is recommended rather than one grade unit of 150-250 students); (4) consider the use of worksheets (using concept and science inquiry agenda worksheet as opposed to factual worksheets); (5) focus lessons on appreciation of marine life, basic ecology concepts, human impacts on the oceans, and conservation issues as appropriate to the grade level; (6) utilize a chaperone system for safety and logistical reasons; and (7) develop close collaborations with aquarium staff.

CONCLUSIONS

As stated previously, most aquaria in North America express their mission statement citing the phrase, "to inspire conservation of oceans by education", and marine education is defined as education related to

oceans with the purpose of producing ocean-literate people. In this sense, an aquarium is an excellent venue for marine education, and the goal of school field trips to aquaria "to understand the relationship between the marine world and our lives" - is well connected with the aquariums' mission statement and ocean literacy.

If Korean aquariums were to shift from entertainment-centered facilities with a secondary focus on education, to well-balanced educational and entertainment-based facilities, they would better meet teachers' and students' needs and expectations for high quality aquarium learning experiences and at the same time encourage return visits. Students need to understand the role that the oceans play in our lives, and how we impact on the marine environment. Given Korea's location on an extensive and biologically diverse coastline, its marine aquariums are in an excellent position to make significant contributions to the purposes of marine education both locally and globally, and contribute towards producing future generations of ocean literate people.

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The monkeys of Awajishima: Creating empathy and environmental awareness

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Introduction

In many places around Japan, there are parks or centers where visitors can go to observe and feed the monkeys that live in the surrounding forests. Neither captive nor domesticated, nor strictly wild, the free-ranging monkeys, or Japanese macaques, at these sites challenge the categories usually used to delineate the relationships between human and nonhuman animals, and in doing so, provide an interesting opportunity to examine the complex ways that humans relate to the natural world. The Awajishima Monkey Center on Awaji Island, Japan, is one such site. However, in the Awaji group of monkeys, there is a further circumstance that provokes thought about humans and the environment—every year, in this group of around 200 monkeys, there are infants born with malformations of their limbs. The rate of congenital limb malformations in this group is extremely high. Consequently, there are more than 30 monkeys in the group with some degree of physical impairment from congenital limb malformations. While some monkeys have only very slight differences in the anatomy of their fingers and toes, others have extensive physical disabilities, with hands and feet lacking, or fused digits. In all, since 1969 17.0% of infants have been born with limb malformations, and 17.1% of the population in 2004 were found to live with some level of disability (Turner et al. submitted manuscript). In other populations of macaques, other nonhuman primates, and in humans, rates of limb malformation are much lower, and are generally expected to be under 1% (Morris 1971; Yoshihiro et al. 1979; Peterson et al. 1997; Brignolo et al. 2002).

During the 1950s, 60s, and 70s, infants with congenital limb malformations were born in many groups of Japanese macaques in Japan. In 1979, Yoshihiro et al. summarized knowledge on these congenital limb malformations. There was no obvious pattern of inheritance involved, but older females and females who had already birthed one disabled infant were more likely to give birth to disabled offspring, and rates of congenital limb malformations were found to be higher in groups that humans provisioned with food. Today, the cause remains unknown, but with the exception of the occasional individual born elsewhere, it is only at Awajishima where this phenomenon persists.

Because of the possibility human activities at some level are involved in causing the limb malformations experienced by these monkeys, either through contamination of their habitat or through land use decisions which reduce habitat and isolate the group, this situation is an environmental issue, and a circumstance that links people with the natural world we live in. Furthermore, since the monkeys are our close relatives in evolutionary terms, the Awaji monkeys' limb malformations have the potential to have direct implications for human health and wellbeing. The monkeys at Awajishima provide a poignant example of how our decisions and actions have the potential to carry important consequences for the environment and life on earth.

Learning about the monkeys can help engender empathy with nonhuman animals. These monkeys also create a bridge for helping to teach people in increasingly urbanized societies, and particularly children, about the natural world and about human relationships with the earth's environment. In this paper, I address the question of how the story of the monkeys of Awajishima can contribute to environmental education. I will pay particular attention to the task of teaching this issue to children in an honest, yet hopeful manner, by using the monkeys as their own ambassadors to introduce their situation, and by moving from the specifics of congenital limb malformation at Awajishima to broader conceptual discussions of the precautionary principle and human responsibility for the environment.

Monkeys can facilitate connection with the natural world:

Dr. Jane Goodall, a primatologist, conservationist and dedicated environmental educator, wrote, "*Only when we understand can we care. Only when we care will we help.*" (http://www.janegoodall.org/news/article-detail.asp?Entry_ID=227). Arguably, to be successful, environmental education needs to connect at least these three key elements: intellectual understanding, emotional caring and action. Formal environmental education and environmental science, in a school or university, usually focuses on intellectual understanding, with the assumption that students either already care about the issues or will come to care through becoming more familiar with them at a personal level. However, while understanding about an issue can be, as Goodall suggested, an important prerequisite for caring sufficiently about it to be motivated to help, the emotional connection to the natural world, empathy for other beings living on earth, and the drive to develop an intellectual understanding of a problem or circumstance, can come from other sources as well, particularly through experiencing nature directly (Louv 2006). Goodall also described this sort of experience in her book, *Through a Window*. After the death of her husband, she retreated to the Gombe forest in Tanzania.

It was during that time, when I spent hours in the field with little thought of collecting data, that I came closer to the chimpanzees than ever before. For I was with them not to observe, to learn, but simply because I needed their company, understanding and free of pity. And as my spirit gradually healed, so I became increasingly aware of a new intuitive empathy with the chimpanzees, with these closest living relatives of ours. Ever since, I have felt more in tune with the natural world, the endless cycles of nature, the interdependence of all living things in the forest. (Goodall 1990, 241)

In his recent book, *Last Child in the Woods*, Richard Louv (2006) asserted that many children today are very well informed about environmental issues. Many children know about

recycling and climate change, driftnet fishing and the depletion of the Amazon rainforest. However, often they care deeply about these issues in an abstract sense, and they may have little or no connection to their real-world experience because many contemporary children have not had the opportunity to experience nature in a direct, unstructured way. Facilitating the development of an intimate, emotional connection with nature is an important aspect of environmental education, one which is sometimes neglected in our education systems. Human societies often create a divide, or a distancing between human culture and nature, and many of us grow up feeling that we are somehow separate from nature, and above nature, not as though we are part of the ecosystem in which we live (Louv 2006). Finding and feeling a connection with other life on the planet, and with natural areas can be important for motivating learning about the earth and more fully understanding our relationship with the environment. The Awajishima Monkey Center, the monkeys there, and specifically the circumstance with the disabled animals, can be used as an educational tool to help students forge the connections among understanding, caring and action.

In the most general sense, the monkeys at Awajishima, living in a context that is neither fully wild nor captive, are good ambassadors for the natural world. Monkeys, apes and lemurs, who are our closest relatives in the animal kingdom, tend to be seen as familiar and interesting creatures (Ohnuki-Teirney 1987). In Japanese folklore, monkeys have featured in many tales. Japanese monkeys have also been studied by scientists for many decades, and primatology—the study of monkeys, apes and lemurs—has flourished in Japan with one of the longest histories of primate science worldwide (Asquith 1991). Primates tend to make good beacons for conservation, because people will often relate more to a large, fluffy animal, with some human-like attributes, than to an amphibian, fish or plant.

A place like the Awajishima Monkey Center can become an interface where humans can access other living creatures who inhabit a forest environment. Unlike a zoo, where animals are enclosed and restricted in their movements and behaviours, the monkeys at Awaji come and go as they please, and frequently, the monkeys come down to the feeding area to be fed by people. The monkeys are very accustomed to people, and this means that even an untrained observer is able to examine the behaviour of the monkeys up close, as an active participant in the monkeys' environment, rather than as a passive visitor to a zoo. They can closely observe mothers nurturing their infants, monkeys grooming one another, and feeding in the forest and on the food provided by people, and sometimes witness the fights that break out and reconciliations afterwards. Also, in this group, people can observe a number of individuals with physical disabilities, and they can watch these animals proceed through their daily activities. Although these are not wild animals in the strictest sense of the word, and the access to the natural environment is not totally unstructured, through proximity the monkeys allow people to glimpse wild lives and provide an avenue to develop affinity, a way to cultivate caring about other creatures and the natural world. This sort of experience is especially relevant for children from urban areas, who may have little opportunity to experience the wilderness, and even less opportunity to be near wild creatures. Research shows that children who experience natural spaces and habitats, particularly in an unstructured way, are more likely to care about nature and the environment as adults (Louv 2006). At the Awajishima Monkey Center, adults and children can be participants in the monkey's habitat. In doing so, it is possible for visitors to develop a sense of caring and empathy for these monkeys, which in turn can facilitate

learning about the forest ecosystem that the monkeys depend on to survive, as well as all the other fascinating animals and plants that make up this ecosystem.

Even without visiting the Monkey Centre in person, the knowledge of unique individual monkeys in the group is a useful tool for environmental education. Anyone who has had a pet knows that animals are individuals. However, getting to know an individual animal in a more wild setting can be a powerful experience. Recognizing that individual as a unique being can help bridge the gap between species and encourage caring about that individual and the species to which the individual belongs. Because of their unique limb configurations, the disabled monkeys are particularly easy to learn to identify individually. The issue of congenital limb malformations at Awajishima, is perhaps best introduced by its own ambassadors, the disabled monkeys themselves.

Profiles of individual monkeys

Yuki (Figures 1-4) was born in 1986. At the time of writing, she is the oldest of the disabled monkeys in the group. She moves by walking upright on her back legs, bipedally, in a human-like manner. Although she does not have hands, she climbs trees by pinching the trunk with her arms and using her feet and legs for grip and support. She has borne and raised both disabled and nondisabled infants, carrying them in a variety of positions, often on her hip with the infant pinned to her body by her arm. In 2007, her daughter, Yokam, who has relatively slight hand malformations, gave birth to a nondisabled infant, making Yuki a grandmother. Yuki spends much of her social time grooming with her daughters, Yokam and Anko, who is Yuki's 1 year old, and occasionally grooming with her disabled adult son, Steven J.



Fig 1



Fig 2



Fig 3



Fig 4

Ribbon (Figures 5 and 6) was born in 2001, with extensive limb malformations. Her mother carried her when she was small and held her up to nurse while she developed the strength to hold herself up to the nipple. Ribbon's arms are short, ending just below her elbows, and like Yuki, she does not have hands. Also, her feet have extensive malformations, and are bent in an upward curve. Although she does not have a lot of mobility in her arms, she is able to hold food items by pinching them against her body. When she was an infant, it took her longer than the nondisabled monkeys in the group to learn to move around independently. At first, she developed a hopping style of locomotion, springing forward from her back legs onto her arms, but as she grew older, she learned to walk and run bipedally, running with a bipedal hopping side-step that allows her to travel very quickly through the forest. Ribbon's mother was an older and experienced mother, but she died when Ribbon was four years old. Although Ribbon has older sisters, she spent quite a lot of time by herself for some months after her mother died. By the next summer, however, she could often be seen grooming with other young monkeys. Ribbon is quite a high ranking monkey, and she does not let other monkeys push her around. She can often be seen chasing another monkey away from a preferred food, or sitting near the window at the feeding area waiting for treats.



Fig 5



Fig 6

Pikaru (Figures 7-10) was born in 1992. Unlike Yuki, Pikaru has only given birth to nondisabled infants. She herself has extensive limb malformations, however, that appear to slow her movement. Pikaru is an attentive mother, and has raised an infant every one or two years. During the birth season in the summer, she can be seen carrying her infant, with slow deliberate steps, up the steep side of an embankment, or doggedly following along behind when a young monkey, usually the infant's sibling, races off carrying the baby, who is eventually retrieved by Pikaru's persistent following. Pikaru's oldest daughter, Pikoko, has two offspring, and Pikaru often spends time nursing her infant and grooming her other young sons and daughters, with her sister, Kobato, and with Pikoko.



Fig 7



Fig 8



Fig 9



Fig 10

Biwa (Figure 11-14) was born without hands and feet in 2005. At 2 years old, he is small for his age, but he manages to keep up with the group as they travel, and can often be found playing, rolling around and chasing with other young monkeys. Although Biwa's disabilities do limit some of his locomotion, such that he cannot climb and run as fast as other young monkeys, he still plays with his peers, and grooms with his mother. For at least a year after he was born his mother carried him during group movement, holding him with one arm against her body. He now keeps up on his own, arriving with the group at the feeding area each day.



Fig 11



Fig 12



Fig 13



Fig 14

Through “meeting” a few individual monkeys, students can focus broad, and sometimes abstract issues, such as high rates of congenital limb malformation in another species for unknown reasons, into something that is conceptually real and personally meaningful. Learning about real, living individual animals helps anchor the abstract issue to daily personal reality and in so doing, facilitates the development of empathy, caring and respect.



Figure 15: A mother support-nursing, holding her disabled infant up to her nipple.

From individuals to broader patterns

People with disabilities often rail against the pity of others. They argue that what they need is understanding and accommodation to make society accessible for everyone, not pity, which objectifies people by acknowledging only their disabilities (Wendell 1996). By watching a monkey like Yuki, who has found ways to move and function without hands in the group who has a life that includes her disabilities but is clearly not restricted to them, adults and children develop a respect for the individual, instead of the dead-end emotion of pity. Learning about these monkeys can engender empathy for the kinds of physical challenges these monkeys encounter, and respect for them as individuals who are successfully living their lives.

Learning about individuals can also form the basis for garnering broader knowledge on their behavioural ecology. Through observing individual focal animals, and collecting data on their behaviours, we can learn about and describe the behavioural patterns of disabled monkeys. In my masters research I documented mothers supporting their infants by using an arm to carry infants who could not cling, and by holding them up to the nipple to nurse. These behaviours of support-carrying and support-nursing occurred significantly more in mothers of infants with congenital limb malformations that prevented them from clinging to their mothers, compared to mothers of other infants (Turner et al. 2005). These support behaviours seem to be especially crucial in the first few days of life, when many disabled infants have not yet developed the physical strength and balance to raise themselves up and hold themselves on the nipple, without the ability to cling to their mother's hair. Mothers will support-nurse their infants actively by holding them up to the nipple, and they will also nurse these infants in positions that passively allow them to maintain nipple contact, such as lying down. Occasionally, I have also observed mothers and infants using unique or unusual positions to facilitate nursing for disabled infants, such as with the infant pressed between the mother and a substrate, such as a rock (Turner et al. 2005). Disabled monkeys survive because of their own behavioural flexibility and through extra care provided by their mothers who carry, nurse, and maintain ventral contact with them by holding them with a supportive arm when they are unable to cling. At least in this environment of high food availability, monkeys with disabilities are raised with obvious caring behaviours by their mothers, and will often grow up to have infants of their own.

Respecting these animals, learning about their behaviour, and thinking of them as individuals who fit into a pattern of human-environmental interaction, can open the door for discussion of that broader pattern without the sense of hopelessness that might otherwise emerge from such an issue. We can see that some monkeys do well despite having extensive limb malformations, but then can also point out that this does not obscure the more negative elements of the situation. It is clearly a positive outcome that some monkeys' lives appear relatively unharmed by living with a disability. However, the underlying prevalence of congenital limb malformations, which may one day be traced back to human activities, is negative for the monkeys. The successes of individuals like Yuki and Ribbon can be seen as the proverbial silver lining of the cloud. We can then examine the statistics and point out that not all individuals manage to do as well with disabilities in the wild. Twenty-eight point two percent of disabled infants die in their first year,

compared to 10.0% of nondisabled infants (Nakamichi et al. 1997). Also, sadly, some infants are born with limb absence such that they do not survive for more than a few hours or days after birth.

In a sense there are two, somewhat contradictory take-home messages for environmental education students. First, looking at both individuals and the patterns of disabled monkey behaviour demonstrates that these monkeys with disabilities are flexible and live real lives that are shaped by, but not only about, their disabilities, and they deserve caring and respect, not pity and despair. However, the second point is that the occurrence of the disabilities may very well be because of human actions, so as positive as it is that many monkeys are able to accommodate limb malformation and lead their lives, we still have a responsibility to learn about environmental issues and to change the way we humans treat the earth's environment.

The precautionary principle for a story without a resolution

A child or adult who learns for the first time about the monkeys at Awajishima nearly always will ask why these limb malformations are occurring. However, there is no clear answer to this question. Regarding the cause of limb malformations, Yoshihiro et al. (1979) commented that:

The fact that congenital malformations of limbs occurs at a high rate in the provisioned troops of the Japanese monkey, whose food, including wheat, barley, soy beans, sweet potatoes, peanuts, mandarin oranges, apples, and monkey chow, depends largely on man, seems to suggest the possibility that some materials present in the food cause congenital limb malformation of the limbs in the monkeys. (Yoshihiro et al. 1979, 469)

However, they went on to write that:

Based on the studies from both the genetic and environmental viewpoint, it is impossible to determine the cause of malformation, leaving both genetic and environmental factors as the possible cause. (Yoshihiro et al. 1979, 469)

Complicating these observations even further is the unknown relationship between environmental influences and genetics.

The owners of the Monkey Centre provide excellent stewardship of the Awajishima monkeys, including long-term monitoring of the group, provisioning with high-quality, human-grade foods that are equivalent to those fed to many other groups of monkeys where limb malformations do not occur (Ito et al. 1988), support of behavioural research programs, and actively preventing farm crop-raiding by the monkeys. By preventing crop raiding and maintaining a good relationship between the monkeys and local human farming communities, the owners of the Monkey Center help maintain the long-term viability of the Awajishima macaque group. Also, it is likely that the provisioned food mitigates some of the impacts of congenital limb malformations for the disabled individuals. Still, monkeys continue to be born with limb malformations.

In some ways, this story, without a clear resolution or obvious way for individuals or groups to respond to affect change, may appear to be not well suited for use as a tool for environmental education. There are many stories of how human activities can lead to negative environmental outcomes which can be used to assist in environmental education. One good example from Japan is that of Minamata disease, which impacted the lives of many Japanese people as a result of mercury poisoning from industry dumping heavy metals into the ocean (F. Taniguchi, pers. comm.). In this case a clear cause and effect was established, and a complete story with a resolution can be presented by educators. However, even though we do not know of the cause, the circumstance at Awajishima is still a very good real-world example for environmental educators: there is not always a neat, clear solution to a problem.

Learning about the monkeys of Awajishima opens the door to wide discussions on the topics of how humans treat the environment, the risks we take in applying our often interactive technologies, in our use of resources, and how we measure these risks over intermediate or longer periods of time. If there is a take-home lesson from the congenital limb malformations of the monkeys at Awajishima, it is possibly that human knowledge is neither complete nor perfect, and that we cannot always predict, know, or immediately fix the outcomes of our collective activities.

Through teaching about the monkeys at Awajishima, we can then discuss the relevance of the precautionary principle. The precautionary principle can be defined as:

When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not established scientifically. In this context the proponent of the activity, rather than the public, should bear the burden of proof. (Raffensperger and Tickner 1999, 8)

In this case, “the activity” or activities that may be causing monkey limb malformations is not known. When contemplating what activities might be applicable to this principle, we need to look broadly at human interactions with the environment and consider land use and chemical contamination globally, and the complex impacts of our activities on ecosystems over time. The monkeys at Awajishima show us, and especially because they so charismatically bridge the gap to people’s emotional understanding, that it is better to do our best to keep the environment free of contaminants, to proceed in a precautionary manner, than to assume that the status quo is sufficient. Our actions in the world can have consequences that we do not always understand. Caution in our treatment of the world’s environment is more prudent than assuming that things will be all right and presuming that we can immediately solve whatever problems may emerge.

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Figure Captions:

Figure 1: Yuki with Anko, after a rain storm, summer 2006.

Figure 2: Yuki eating wild yamamomo (*Myrica rubra*) fruit in the forest canopy.

Figure 3: Yuki walking bipedally while carrying her infant, Anko, in 2006.

Figure 4: Yuki (left) and Pikaru (right) nursing their infants while sitting in the forest. A young monkey is self-grooming on a fallen branch between them.

Figure 5: Ribbon running bipedally down a forest slope.

Figure 6: Ribbon holding an orange in the provision feeding area at the Monkey Center in 2007.

Figure 7: Pikaru nursing her infant.

Figure 8: Pikaru sitting with her one year old.

Figure 9: Pikaru carrying her infant dorsally.

Figure 10: Pikaru carrying her one year old.

Figure 11: Biwa climbing along a railing at the Monkey Center

Figure 12: Biwa and another young monkey sitting on a railing at the Monkey Center.

Figure 13: Biwa's mother, carrying one year old Biwa at the Monkey Center in 2006.

Figure 14: Biwa's mother grooming two year old Biwa in 2007.

Figure 15: A mother support-nursing, holding her disabled infant up to her nipple.

Biodata

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Educational Background

BSc Hons Biology, University of Tasmania, 1978

M.Sc Philosophy of Science, University College London, 1979

Ph.D History and Philosophy of Science (science and religion), University of Lancaster, 1989

Professional Career (Including Position)

She is currently a professor at the department for Science and Technology Studies, as well as the Director at the Centre for Civilisational Dialogue, University of Malaya.

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- (i) Richard Foltz, Azim Nanji, Azizan Baharuddin (eds.). 2003. *Islam and Ecology: A Bestowed Trust*. University of Harvard Press.
- (ii) Azizan Baharuddin (ed.). 2002. Proceedings of the Japanese Society for the Promotion of Science Workshop on Environmental Ethics, Regulation and Education. 7-8 January 2002. Universiti Malaya, Kuala Lumpur.
- (iii) Azizan Baharuddin (2001). *The Role of Dialogue of Civilizations in Peace Education*. Proceedings of First SEACSN Malaysian National Workshop. 7-9 November 2001. pp. 41-42.
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Azizan is also actively involved as a consultant for various government, ministries and NGO's in projects/areas related to her field of interest.

Field

The impact of science on society, science and religion; environmental ethics; inter-religious and inter civilisational dialogue

FUMIAKI TANIGUCHI

Educational Background

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Professional Career (Including Position)

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1995-present Philosophy Professor, Konan University

1997-present Honorary Visiting Professor, The School of Education,

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1998-present President, Association of Earth-Environment and Global Citizen
2000-2005 Secretary-General, the Japan Society of Environmental Education
2000-present Honorary Visiting Professor, Center of Environmental Science, Peking University, China
2004-present Director, The Environmental Education Committee of Environmental Council of Hyogo Prefecture
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Education

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Training

2002 Study tour in environmental education at New South Wales Australia
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Experiences

1978-1979 Research Assistant at Kasetsart University Nakhon Pathom
1980-1990 Animal Husbandry officer at National Swine Research and Training Center. Department of Livestock Improvement. Nakhon Pathom.
1991-present Lecturer in Department of agriculture at Phranakhon Rajabhat University
2002-present Assistant Head of Environmental Education Center, Phranakhon Rajabhat University

ANGELA HIJJAS

Born in Melbourne and educated in geography and economics at Monash University, Angela joined the Australian Volunteers Abroad in 1972 to work for the Malaysian government's department of town and country planning. She married a Malaysian, Hijjas Kasturi, in 1973 and helped him establish his architectural practice in Kuala Lumpur. They have a combined family of five children, all now adult. Angela works with several Malaysian environmental NGOs, as a Trustee of WWF Malaysia, and Council member of the Malaysian Nature Society. Her interests focus on her 14 acre compound at Rimbun Dahan

outside KL where she has created the only indigenous South East Asian species garden in the world. Her original objectives were to encourage birds and wildlife and to experiment with landscape design with a particular Malaysian flavour. She manages the Rimbun Dahan Residency programme there, for Australian, Malaysian and South East Asian artists and writers, and the house, gardens and gallery provide a venue for many public events and activities related to culture, design and the environment.

She conducts regular guided nature walks at Rimbun Dahan and at Universiti Malaya for students and the public.

YOSHIAKI ASANO

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Main Working Experiences :

- i. Nature Conservation Bureau, Environment Agency (EVA)
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- v. Senior Fellow, Freshwater Resources Management Project, Institute
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GLORIA SNIVELY

She is an Associate Professor in the Faculty of Education at the University of Victoria, Canada where she teaches science, environmental and marine education; as well as graduate level research courses. She is the Director of the Environmental Education Graduate Program at the University of Victoria. Her professional interests include curriculum development, qualitative research methods, and metaphorical learning theories. She was a primary, intermediate and junior high school teacher, and for the past 35 years she has conducted nature workshops with schools and groups. Her best selling field guide *Exploring the Seashore in British Columbia, Washington, and Oregon*, 1978 is now in its 11th printing. She has published several marine education curriculum books and numerous professional and research articles. Her interests include giving natural history talks and walks to teachers, park interpreters and community groups; and, of course, exploring seashores firsthand. Dr. Snively has a strong interest in Aboriginal education and has taught curriculum development and conducted workshops with Aboriginal communities on environmental, marine education and cultural projects. She is particularly interested in the ecological, political, cultural and conceptual problems specific to rural and urban environments

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Environmental education; marine education; Native Indian education; global education

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Professional Career (Including Position)

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He obtained his Bachelor of Engineering (Electrical) from Universiti Malaya. After working for about 1 and a half years for Pernas-NEC he became restless and rejoined UM as a tutor. Subsequently he obtained a MSc in Knowledge Based Systems from the Department of Artificial Intelligence, University of Edinburgh and a PhD from the Department of Computing, Imperial College, University of London. He is now an Associate Professor in the Electrical Engineering Department, Universiti Malaya. Probably his still restless mind has pushed him to look at the impacts of science and technology on environment and society. He is especially interested in the impacts of dams, genetic engineering, nanotechnology, and global warming.

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She is obtained her BSc. (Hons) from University of Malaya in 2001. She was later absorbed into the Department of Science and Technology Studies, as a tutor. In 2005, she finished her MSc., and from there on she served as a lecturer at the same department.