Education for Sustainable Development
Student Reader

nzaid

LIVE&LEARN
Environmental Education

Building a Sustainable Future
Education for Sustainable Development in the South Pacific

Training Course for New and In-service Teachers

1. Teacher Training Manual
2. Student Reader

LIVE&LEARN
Environmental Education

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Contents

Foreword 2

Week One

Lecture: Environmental issues with global and local significance 5

Tutorial: What is Education for Sustainability? 9

Week Two

Lecture: Links between environmental, social & economic issues 12

Tutorial: Strategies for teaching EFS: Critical Thinking 13

Week Three

Lecture: Strategies for teaching EFS: Combining education in, about and for the environment 17

Tutorial: Linking knowledge to action and change 21

Week Four

Lecture: Valuing traditional practices in EFS 25

Tutorial: Strategies for including traditional knowledge in formal education 29

Week Five

Lecture: Education for Sustainability across the curriculum 35

Tutorial: Opportunities for integrating EFS into school programs 38

Bibliography 42

Foreword

Our World in Crisis

The past century has brought massive changes to planet earth. Those born at the beginning of the twenty first century have inherited a world that is vastly different from those of their grandparents. As of November 2008, the human population has soared to over 6.7 billion people, an incredible number given that the world population only first reached 3 billion in 1961. The dramatic increase in population growth has been accompanied by a rapid rise in the rate of consumption of the worlds resources, made possible by new technologies and wealth, particularly in developed countries.

The ecosystems and resources that support human life and all other life forms are now under threat. Throughout the world unique species of plants and animals, and whole ecosystems are disappearing. Resources that have sustained human population growth (such as fish stocks) are in rapid decline. The by-products of human development (waste and pollution) are threatening the health of our oceans, rivers and air.

Pacific Island countries have only played a small role in creating the problems that now occur on a global scale. However, environmental problems occur at all scales, including individual Islands and communities. Population growth, consumption of resources and pollution has a significant impact on the life of all Pacific Island people. Although Pacific Island countries have made relatively small contributions to global environmental problems, the Pacific Islands stand to be amongst the worst affected. Global environmental problems do not obey national borders, and hence global warming caused by industrialized countries will affect everyone, in extreme cases low lying Islands may disappear under rising sea levels by the end of this century.

Urgent need for action

Over the last few decades there has been growing recognition that humanity needs to change the course of its development to prevent an environmental crisis. The concept of 'Sustainable Development' has been proposed as a solution to the environmental challenges that we face. There are many different definitions of sustainable development, however one of the most popular, from the Brundtland Report *Our Common Future*, is widely accepted:

'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'

The word 'Sustainable Development' is new, however the practice of sustainable development has many examples throughout history. Not all current and

historic practices are un-sustainable. The challenge of sustainable development is to identify ways of living that do not degrade the environment for future generations.

Is education the answer?

People often say that education is needed to solve environmental problems. However, as educators, we must ask the question: *what type of education is needed?* Some of the worlds leading educators have questioned whether our existing school education systems are capable of leading our communities toward sustainability; some have even suggested that education might be a cause of environmental problems. Their main argument is that schooling often aims to develop students' knowledge and skills to fit into roles that exist in society, for example to gain employment in an existing industry. Hence school education often reflects the current needs, wants and values of the broader society. But what if that society is not sustainable? Are schools simply producing more graduates that will continue to live and promote unsustainable lifestyles? Are we training the next generation to continue to over use our dwindling resources?

An alternative view of education is one that also develops students' ability to question and challenge the way their society operates. Education with this goal is more likely to lead to sustainability, because it is more likely to empower young people to drive the changes that our societies need. Education for sustainability is a type of education that encourages students to be active citizens who have a role in 'transforming' how our societies operate. Through EFS, children will be encouraged to see themselves as people who have an active role in shaping a better future. This goal of EFS is reflected in the subject matter, and in the way that EFS is taught (the pedagogy).

The UN Decade of Education for Sustainable Development

The United Nations has acknowledged that learning is the key to transforming societies toward sustainability. In December 2002 the United Nations General Assembly declared 2005-2014 the UN Decade of Education for Sustainable Development (DESD). According to the lead agency UNESCO, the goal of the DESD is to 'integrate the principles, values, and practices of sustainable development into all aspects of education and learning. As the main institutions where the majority of people receive their formal education, schools and teachers have a critical role to play in EFS.

Purpose of this module

The *Introduction to Education for Sustainability Module* was specifically developed for teacher trainers, to guide delivery of an introductory course on Education for Sustainability. The module aims to provide pre-service and serving teachers with an increased understanding of EFS and skills to implement EFS in schools. This modest aim is intended to contribute to an increase in the quality and quantity of EFS delivered in schools.

Ultimately the goal of this module is to play a role in the development of students who have the knowledge, attitudes and skills necessary to take action and make changes in their communities towards a more just and sustainable society.

Teaching strategies / pedagogy

This module introduces student teachers to new ways of teaching and learning related to best practice in EFS. Therefore it is appropriate that teaching strategies taught to students are modelled and reflected in the way the course is delivered. In other words, this is a course that practices what it preaches. Teaching strategies are centred on a *critical thinking* approach, where students are expected to more than passively receive and accept the new ideas that they are presented with. Critical thinking requires students to actively think about information and experiences that they receive. This type of education is 'learner centred', where the students are given the opportunity to express their opinions, listen to other views, compare and contrast information and experiences and make their own judgements and conclusions.

In addition to learning about how to implement EFS in their schools, student teachers will also critically reflect on the ability of the school and education system to support effective learning for sustainability. This outcome is consistent with the goals of EFS itself and contributes to developing teachers who may one day be involved in 'transforming' the future of the education system.

Module development

Live & Learn Environmental Education developed the module, in partnership with the Ministry of Education and the School of Education, Solomon Islands College of Education in the Solomon Islands. This initiative was made possible through generous funding from NZAID for the Building a Sustainable Future project. This regional project aims to assist in reaching the Millennium Development Goals by giving a practical, enhanced profile to the central role of education and learning in the common pursuit of reducing poverty and promoting sustainable development in the South Pacific.

Learning Outcomes

On successful completion of the Introduction to Education for Sustainability course students can:

1. Identify local and global environmental problems
2. Identify impacts of environmental problems on local communities
3. Describe common understandings of the terms 'sustainable' and 'sustainable development'
4. Identify the key aims and characteristics of Education for Sustainability
5. Identify links between environmental, social & economic issues
6. Contrast the concepts of critical thinking and learner centred education with rote learning
7. Identify educational approaches that are 'in' 'about' and 'for' the environment
8. Suggest ways to integrate education 'in,' 'about' and 'for' the environment to design more holistic EFS programs
9. Explain the value of linking knowledge to action
10. Carry out a school environmental action project
11. Identify a range of potential school environmental action projects
12. Compare and contrast traditional uses and management of natural resources with contemporary technologies and natural resource management
13. Explore the value of traditional knowledge to Education for Sustainability
14. Explain differences between formal education and indigenous education
15. Apply strategies for teaching using traditional knowledge
16. Identify resources available in the local community that may be used to teach EFS using traditional knowledge
17. Analyse the case for incorporating EFS across the curriculum (e.g. in language studies, mathematics, economics etc)
18. Identify EFS content in the school curriculum
19. Suggest opportunities to incorporate EFS across the curriculum
20. Describe the 'whole school approach' to EFS
21. Identify opportunities to undertake EFS through extra curricular activities
22. Examine barriers to EFS implementation in schools, and suggest solutions

Week One - Lecture

Environmental issues with global and local significance

Five case studies of Pacific Islands environmental issues are presented below. These will be analysed for discussion in lecture one.

SOLOMON ISLANDS: THE PLUNDER OF PARADISE BY ASIAN LOGGING COMPANIES

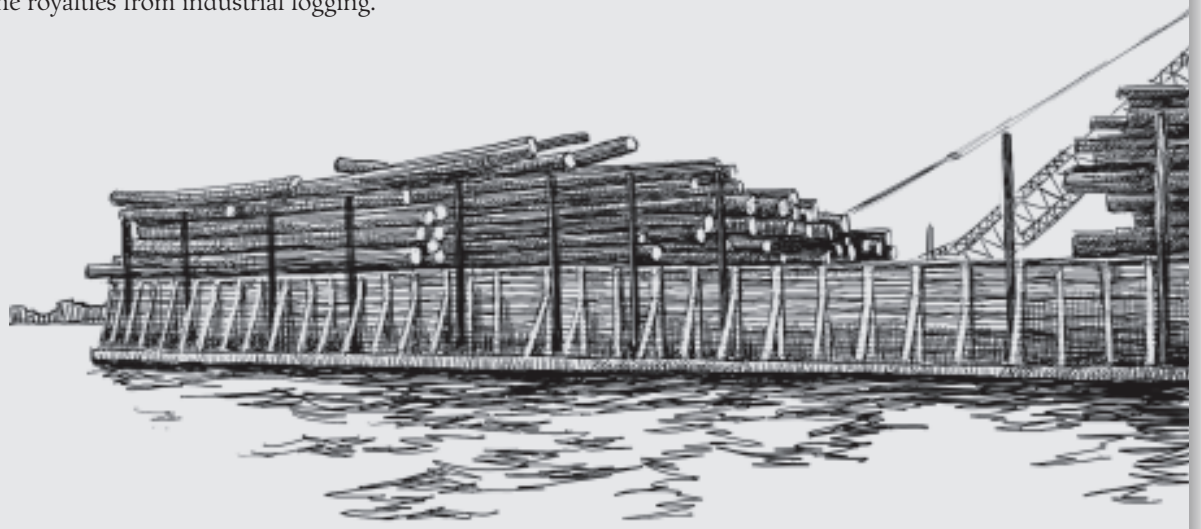
On a group of Melanesian islands in the South Pacific, a tragic plunder is taking place. Logging by mainly Malaysian companies has increased in the last five years to more than 3 times the estimated sustainable yield. In other words the forests are being logged at more than three times faster than they are growing. In less than ten years all the productive lowland forests will be logged. The forests are rich tropical rainforests with thousands of unique plants and animals. As well, a diversity of cultures and people who customarily own and rely on the forests are under threat.

Sixty percent of government income comes from taxes on log exports but tax avoidance, transfer pricing (the value received from the log buyers is greater than that officially declared) and logging company-connected corruption is common. Yet small scale harvesting carried out by the landowners themselves is rapidly expanding and contributing significant returns to the local economy and can make up to 40 times more for resource owners than the royalties from industrial logging.

Logging in Solomon Islands is dominated by Malaysian and to a lesser degree, South Korean companies. The companies largely do their deals with the government and landowners in secret. Common logging company practices used to reduce tax payments and in country profits, are transfer pricing, under reporting of log prices, and tax exemptions. In 1993 is was estimated losses for Solomon Islands due to under reporting of log prices and underpayment of duties was US $40 million, or approximately one third of the total export value.

The Malaysian company logging has been described as the worst seen in any tropical forest. Sediment washed from unplanned bulldozer skid tracks and poor roads is destroying the island's fragile coral reefs. The rich coral reefs shelter many different types of sea life, which is the main source of protein for the local people.

Source: World Rainforest Movement's bulletin Nº 34, May 2000



OVER-FISHING ON THE INCREASE IN ASIA-PACIFIC SEAS DECLINE IN VALUABLE FISH SPECIES, BETTER MANAGEMENT REQUIRED: FAO REPORT

6 August 2004, Rome/Bangkok -- The management of fishery resources in Asia-Pacific needs to be improved, as over-fishing is increasing and the abundance of more valuable species has declined, according to an FAO report presented to the Asia-Pacific Fishery Commission.

FAO's report affirmed that fisheries and aquaculture are of vital importance for food security and the economies of the region, but cautioned that improved management of these activities is required in order to secure the sector's future.

Production has already peaked

The Asia-Pacific region is the world's largest producer of fish, for both aquaculture and capture fisheries (which account for 91 and 48 percent of total world production, respectively). FAO reported that there was rapid growth in marine capture fisheries in the region between 1950 and 1990, but this has slowed down over the last decade. The trend over the past 30 years has been from larger sized bottom-dwelling fish towards smaller pelagic -- or open water -- fish.

Dramatic changes in fish stocks

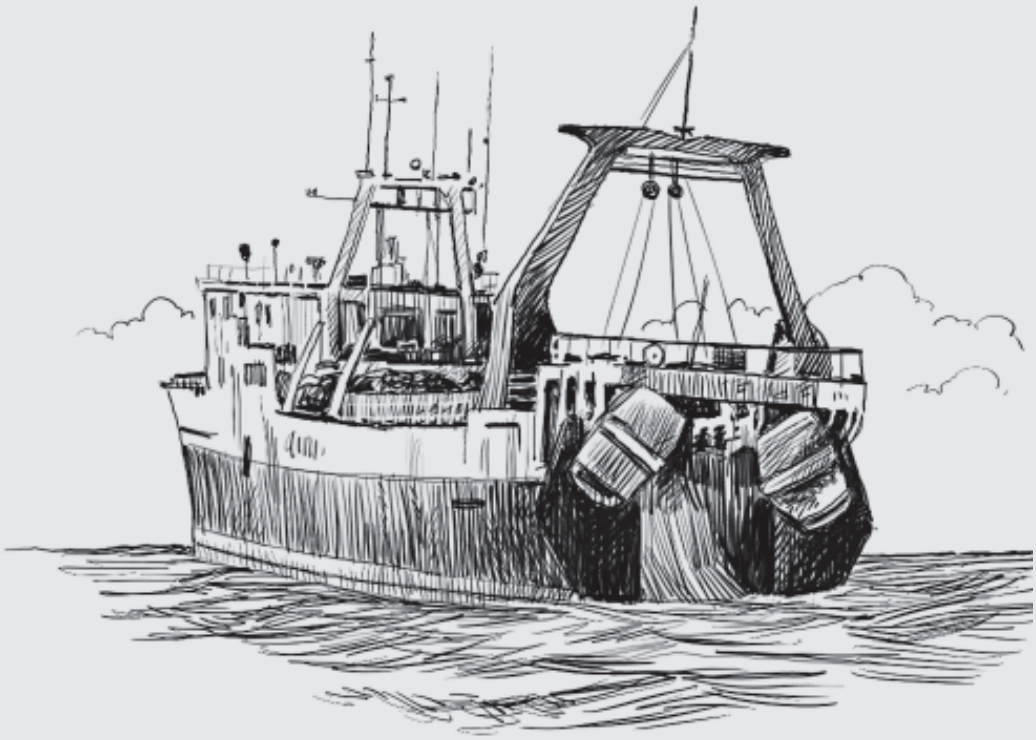
FAO cited a study by the WorldFish Centre of some areas in Asia-Pacific, which suggests that over the last 25 years the amount of fish available has declined to between 6 and 33 percent of their original abundance. In a few instances, the decline has been as steep as 40 percent over five years.

Changes in the composition of fish resources have also occurred, FAO noted. The abundance of larger, more valuable species has declined, while the proportion of smaller fish lower down the food chain, sometimes referred to as "trash fish," has notably increased.

"Demand is fast outstripping supply and prices are expected to rise, resulting in greater incentives to target these fish and aggravate the over-fishing problem in the area," FAO said.

Coastal fisheries in the region will continue to decline unless excess fishing capacity and fishing effort are greatly reduced, the report said.

Source: FAO Newsroom



SUVA'S CREEK BIG POLLUTION PROBLEM, CALL FOR CLEAN-UP

By JILDA SHEM

NABUKALOU CREEK, in the heart of Suva, is highly polluted and needs urgent attention, says a new survey carried out by a group of marine science students of the University of the South Pacific. The study of human debris in the creek aimed at finding out:

- The amount of rubbish accumulated along the creek at low or high tide.
- Who are the main dumpers of rubbish in the creek.
- The overall composition of rubbish.
- What action the local authorities take on the issue.

According to Suva City Council, sewage is the main pollutant in Nabukalou Creek. However, this April study by students revealed that plastic products such as bags, containers, lunch wrappers-including papers and organic litter-were found to be the major debris in the creek.

Restaurants, retailers, factories, fishing stores based near the creek and pedestrians were considered to be possible sources of the rubbish.'The burning of Morris Hedstrom's mall resulted in enormous inputs of burned concrete, steel rods and glass into the creek,' the study said.

'Organic items, which mainly consisted of food particles, were observed near restaurant areas of the creek. At some particular areas of the creek, dead fish were found, especially on Saturdays. Prem Jeet Sinha, a final year marine biologist student at USP who is a member of the marine pollution project, said this was a serious problem as it was a threat to the marine life.

'This is a matter of culture and has to be treated with the classical tools of education, legislation and law enforcement,' Mr Sinha added. Assistant Health Inspector Josephine Koroi said the Public Health Act provided for cleanliness of the Nabukalou Creek through regular water quality tests by Suva City Council. The Anti-litter Decree also helps by providing safety standards for the creek but it is observed to be violated most of the time.

Mrs Koroi said there was a bill proposed by the Ministry of Health, which would specifically look at the welfare of Nabukalou Creek.

Source: Wansolwara News Vol 4 No 2 June 1999

RISING SEA LEVELS THREATEN TO WASH AWAY ENTIRE NATIONS

It is projected that global warming will cause sea levels to rise by as much as 5 mm per year over the next 100 years. Rising sea levels threaten entire nations on low-lying islands in the Pacific and Indian Oceans.

As temperatures rise, seas will absorb more heat from the atmosphere, causing them to expand and rise. Ice sheets, such as those in Greenland and on Antarctica, and land glaciers will also continue to melt and further increase the level of the seas.

According to the Intergovernmental Panel on Climate Change (IPCC), by 2080 sea level could rise from 9 to 48 cm in a 'Low Emissions Scenario' and from 16 to 69 cm in a 'High Emissions Scenario'.

Several Pacific island states are threatened with total disappearance and 2 uninhabited islands in the Kiribati chain have already disappeared due to sea level rise.

The people of Funafti in Tuvalu and on Kiribati island are lobbying to find new homes: salt water intrusion has made groundwater undrinkable and these islands are suffering increasing impacts from hurricanes and heavy seas. In the village of Saoluafata in Samoa, villagers have noticed that their coastline has retreated by as much as 50 metres in the last decade. Many of these people have had to move further inland as a result.

Coastal areas around the world will also be threatened by rising sea levels. This will not only affect agricultural areas around the coast but also cities – 13 of the 15 largest cities in the world are on coastal plains. The IPCC confirms that sea level rise is already affecting coastal ecosystems, including coral reefs, mangroves and salt-marshes.

Source: WWF (www.panda.org/about_wwf/what_we_do/climate_change/problems/impacts/sea_levels)

THE WORLDS POPULATION IS 'EXPLODING'

Population growth occurs when a species' birth rate is higher than its death rate or when individuals from outside move (immigrate) into a population. Worldwide, the human birth rate is currently three times the death rate. The world population reached 6 billion in 1999, and we are adding another billion people to the planet about every 12 years. Such rapid population growth is quite new in human history.

Scientists believe people lived on Earth for about 3 million years before the world population reached 500 million around the year 1600. Until then, birth rates and death rates were about the same, keeping the population stable. People had large families, but many children died before the age of five from common diseases. But by the late 1700s and 1800s, more children survived and adults lived longer too, thanks to improved medicine, sanitation, nutrition and farming techniques. In 1810, the world population reached 1 billion and things really began to take off! After 1800, the human population increased rapidly, reaching 2 billion in1930, 3 billion in 1960, 4 billion in 1975, 5 billion in 1987 and 6 billion in 1999.

This rapid increase in population is sometimes called the population explosion. We are currently adding about 78 million people to the planet each year – 13 times the current population of Papua New Guinea! All of these people require food, fuel and homes, straining our planet's natural resource supply. Our planet is a limited system and can only support so many people.

How many people can the Earth support? No one knows for sure.

What we do know is that every environment has a carrying capacity, which is a limit to the number of members of a certain species it can support. Humanity's rapid population growth has the potential to go beyond the carrying capacity of this planet. Usually we think of carrying capacity in terms of animals or plants (e.g. the amount of cows that can live in a paddock or field), but it applies to humans, too. More than just the basics of food, water and shelter are considered when we measure an area's carrying capacity. We also include the quality of life. Because we expect so much more from our surroundings than animals do, we have to be more thoughtful about how many of us can live in one place.

Source: Live & Learn Environmental Education: Discovering Biodiversity An Educator's Guide to Exploring Nature's Variety

Week One - Tutorial

What is Education for Sustainability?

Box 1. Various definitions of Sustainable Development

Definition 1:
Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. *Brundtland Commission (1987)*

Definition 2:
Sustainable development is a dynamic process, which enables all people to realise their potential and improve their quality of life in ways that also protect and enhance the Earth's life support system. *Forum for the future*

Definition 3:
Sustainable development is a broad concept that means meeting the economic, environmental, social and political needs of the present generation without endangering future generations. *Ecoblogs*

Definition 4:
Sustainable development is a method of harvesting or using a resource so that the resource is not depleted or permanently damaged. *Merriam Webster online dictionary*

Definition 5:
The goal of sustainable development is to allow growth to benefit humanity while encouraging a balanced approach that creates a minimal amount of harm. By carefully balancing future and current demands, most environmentalists hope that natural resources will always be available to meet essential needs. *Green Living*

Definition 6:
Sustainable development is development capable of being maintained at a steady level without exhausting natural resources or causing ecological damage.

The Free Dictionary

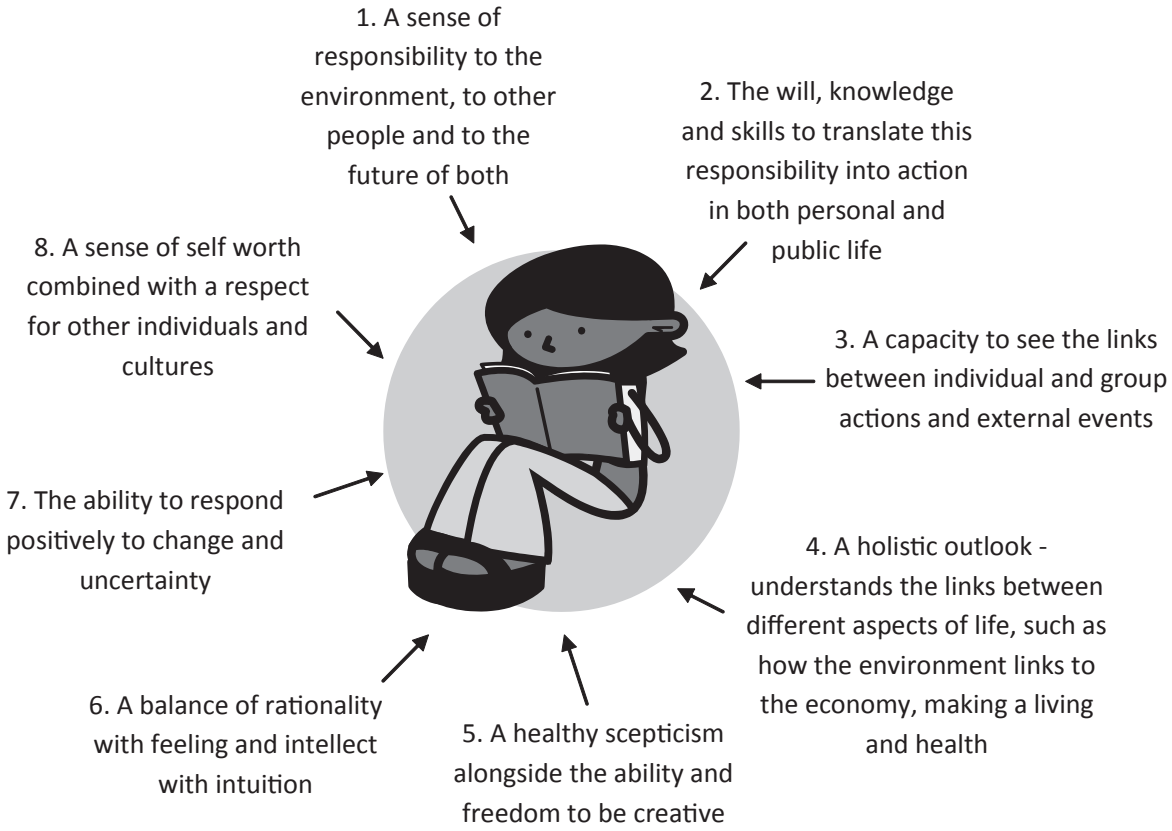
Box 2: "Sustainability Values"

Sustainability Values		Meaning
1.	Intergenerational equality	Making sure that today's generation does not deplete resources and degrade the environment that is needed by future generations
2.	Conserving bio-diversity & ecological integrity	Ensuring that human development doesn't lead to extinctions of plant and animals or degrade the natural environments that sustain them
3.	Preserving natural capital and sustainable income	Looking after natural resources that provide for our needs, such as forests that give us timber, soil and water
4.	Support the 'precautionary policy approach'	When we don't know if our actions will cause negative impacts to nature or natural resources, we should assume that they will have negative impacts and take a cautious approach
5.	Ensure social equity	Making sure that everyone benefits equally from development and use of natural resources, including both genders
6.	Limiting natural resource use	Only using the resources that we need
7.	Ensuring efficiency	Getting maximum benefit from the resources that we use (minimising waste)
8.	Ensuring resilient economy	Having a diverse economy that can be maintained and doesn't deplete the resources that support it. E.g. an economy based on logging is not resilient if it will disappear when all the trees have been harvested.
9.	Community Participation	Providing opportunities for everyone to be involved in decision making and benefiting from the use of natural resources

Adapted from: MaCleod (1992) Teaching for Ecologically Sustainable Development, Department of Education, Queensland

Box 3. Qualities of a student who is 'Educated for Sustainability'

The student has…



Adapted from: Stirling & EDET (1992) Good Earth Keeping: Education, Training and Awareness for a Sustainable Future, UNEP-UK, London

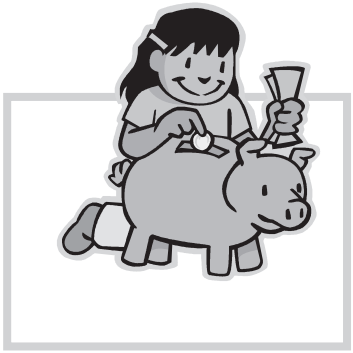
Week Two - Lecture

Links between environmental, social & economic issues

Worksheet 1

S.E.E THE LINKS!

Activity Sheet



Society	**Environment**	**Economy**
1. Conservation	1. Water	1. Food
2. Housing	2. Air	2. Business & industry
3. Poverty	3. Land-use / soil	3. Local economy
4. Customs	4. Waste	4. Global economy
5. Politics	5. Pollution	5. Jobs / livelihood
6. Medical care	6. Fish	6. Markets

Week Two - Tutorial

Strategies for teaching EFS: Critical Thinking

Critical thinking is one of the core principles of Education for Sustainability. It is a core principle because of the belief that students or citizens who can think critically are more likely to:

- Develop a deeper understanding of complicated issues
- Understand causes and effects
- Make informed decisions
- Challenge bias
- Apply knowledge to solve problems
- Develop creative solutions
- Get involved in decision-making and action

When students are thinking critically it means that they are not passively accepting everything that they read or are told. Critical thinking is an active process of thinking about information or an experience that has been provided. For example, when thinking critically, students consider new ideas and make connections between these ideas and what they already know or believe. Critical thinking also involves analysing information using processes such as classifying, comparing and critiquing. Finally, critical thinking involves applying knowledge through predicting, planning and doing.

Rote learning or learning through repetition is in contrast to critical thinking. It involves memorizing 'facts,' which are assumed by the teacher and student to be true and correct. Rote learning can be useful in establishing 'foundation knowledge' such as memorising the times tables, periodic table, or a mathematical equation. However, rote learning does not encourage a deeper understanding of concepts. In rote learning, a student may remember facts, but may not understand how to apply them in practice. Students who learn by rote often look to teachers or people of authority to provide answers to problems.

A story of two students

The fictional story of two students, presented below, is provided for students to analyse in the tutorial.

A story of two students - Part 1: Rote-Learning Richard

Richard read the chapter about waste management in the text book many times and he could remember the facts very well. The book covered topics such as land fill sites, incinerators and the definition of organic and inorganic waste. The teacher had written the main facts on the black board and Richard and all the class members had copied these down and committed them to memory. Before the examination Richard spent a long time going over the facts again, and was rewarded. When the results came back he had scored an almost perfect 9 out of 10.

Richard left school 5 years ago and is now a respected member of his village, he goes about his daily life and doesn't interfere much with anybody else's business. But the village has developed a big problem with waste. The village is littered with plastic and used batteries, and the river is polluted because the community has no-where else to dispose of the waste. Richard thinks back to his school days, and he can recall some of the facts about waste. He remembers the definition of a landfill site, and even the temperature that waste is burned inside an incinerator. But this information doesn't help Richard or the village. Richard thinks a landfill site might help, but he doesn't know how to explain to the chief why it is needed, where it should be placed, how it works or what the alternatives might be. Richard doesn't usually voice his opinion at meetings. He decides that he doesn't have anything to contribute to solving this waste problem and he will focus on gardening and looking after his family.

What has Richard learned?

Richard has been able to remember information learned at school, however, when Richard was required to use the information to solve problems, he could not. Richard possesses some knowledge about waste management that is relevant, but he cannot transfer his knowledge to a new situation.

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A story of two students – Part 2: Critical Thinking Clarence

Clarence also read the chapter about waste management very carefully. When the class had finished the chapter the teacher asked the students whether they thought landfill sites or incinerators would be the most appropriate for the local village. Clarence had read the chapter again, asked the teacher some questions, and then found a book about waste in the library. He also listened to other students' opinions when they held a class debate on the issue. At the end of the week, the class actually made a small landfill site to bury the schools inorganic waste. The class had to make lots of decisions and solve many problems along the way, but everyone was proud of the result. Later in the term the Clarence had an exam about waste management, he did well on the multiple-choice questions, and really excelled on the short answer questions.

Clarence also left school 5 years ago and is now a respected member of his village, where he is very involved in village affairs. However, like many other villages, Clarence's village has developed a big problem with waste. Ever since Clarence's school days he has been prepared to get involved in solving village problems. At a recent public meeting someone suggested that the waste should be burned. Clarence recalled that burning was only a good solution when the incinerator could generate very high temperatures; otherwise waste such as plastic would create toxic smoke. Clarence put his argument to the meeting. Afterward Clarence was involved in a group that investigated where a landfill site could be located. Work has now started on the landfill site.

What has Clarence Learned?

Clarence, like Richard, could recall most of the important facts about waste management, this helped him to do well in the exam. Furthermore, when required to solve waste problems at school, Clarence learned more by comparing a range of possible solutions and determining which was the most appropriate. Clarence could use his knowledge to understand and solve problems. When Clarence left school, he was able to apply his knowledge to new situations, and contribute to solving problems in the real world. Clarence's school experiences have also given him the confidence and expectation to participate in decision-making, he is more likely than Richard to be involved in creating a more sustainable village.

Box 4

Box 4 contrasts the underlying properties of education involving critical thinking with rote learning (learning through repetition).

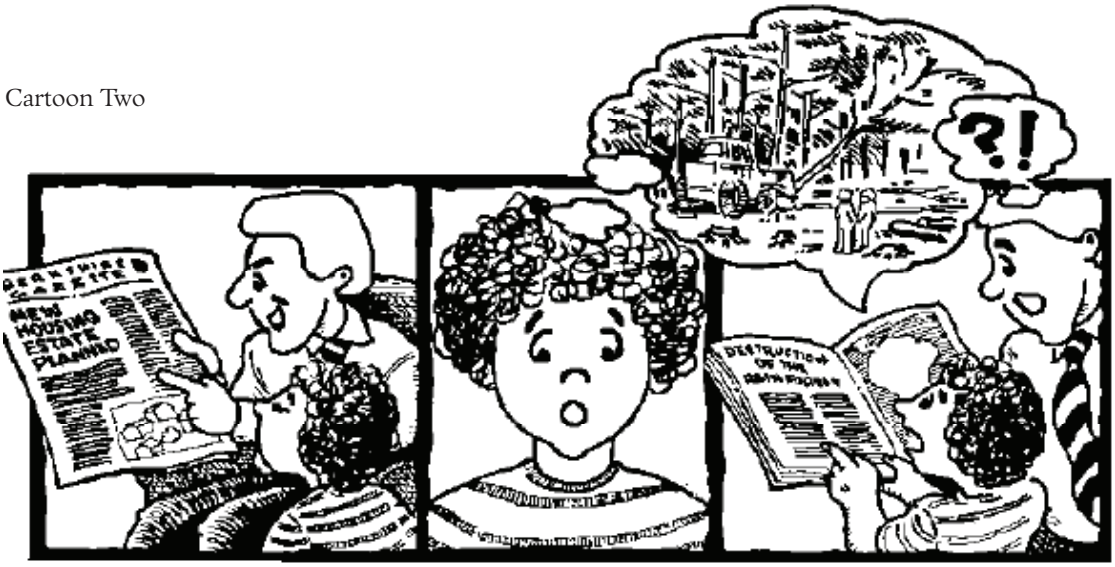
Critical Thinking	Rote Learning
Students form opinions and explain their position	Students learn through repetition
Students determine causes and effects	Students memorise information
Students evaluate ideas and make comparisons	Based on learning facts, which are assumed to be correct
Students ask questions	Useful in gaining foundation knowledge, for example the times tables, and the periodic table
Students predict outcomes	Students memorise facts, but don't necessarily understand them
Students identify problems and solutions	Does not prepare students for dealing with complex problems or issues that occur in life
Students imagine, explore and critique alternative points of view	Does not encourage creativity
Students are free to disagree if they choose	Leads to exams with right or wrong answers
Encourages students to think deeply	

The cartoons in Box 5 are provided for analysis in the week 2 tutorial.

Box 5: Cartoons on Education

Cartoon One

Cartoon Two



Cartoons From: Planning and Evaluation of Environmental Education by Chistiane Dorion, (1993)

Week Three - Lecture

Strategies for teaching EFS: Combining education in, about and for the environment

Box 6: Learning 'in, about and for' the environment

Learning in, about and for the environment are three approaches to environmental learning.

- *Education about the environment* is mainly focused on acquiring theoretical **knowledge** and provides an understanding of the environment necessary to undertake environmental management.
- *Education in the environment* provides learning through direct or 'visual' experiences in the environment; it is generally associated with developing **practical skills** and positive **values** towards the environment.
- *Education for the environment* aims to apply knowledge, skills and positive environmental values, through **actions** to benefit the environment.

Education about the environment

Education 'about' the environment is mostly concerned with acquiring knowledge about environmental processes and environmental issues. It can provide an understanding of how natural environments work and how humans impact on the environment. It also helps to develop environmental investigation and thinking skills. For example, students may learn about environmental processes such as the water cycle, food chains, or plant growth. Students may also learn about the green house effect, causes of water pollution or changes in fish stocks due to over fishing.

A good understanding of environmental processes and issues is important for anyone who is involved in environmental management, or who wants to make informed decisions about the environment. Learning about the environment usually involves a lot of theory, and to a lesser extent laboratory experiments (such as observing plant growth). It does not involve directly observing environmental processes or issues outdoors in the real situation.

Limitations

It is often assumed that people with good knowledge or 'awareness' of environmental issues will take better care of their environment. Unfortunately the evidence for this is very weak. There is a poor relationship between awareness and participation in actions to improve the environment. This means that education about the environment is important, but not sufficient to lead people to take the necessary action to achieve sustainable development.

Education in the Environment

Education 'in' the environment relates to learning through experiences that arise through direct contact with the environment, usually in an outdoor setting. Experiences in the environment provide reality, relevance and practical opportunities for learning. Students may be involved in observing or gathering information, and hence learn skills for data collecting and analysis. Learning outdoors may allow students to experience the environment using all their senses, and helps to foster environmental awareness and concern for looking after the environment. Many people believe that education in the environment develops values and attitudes in students, which may motivate them to take action to protect it.

Limitations

Although students may develop various skills in data collection, observation and positive values about the environment, education in the environment does not necessarily provide students with the skills or knowledge required to take personal or group action to protect it. For example, students who study a coal reef may develop skills in coral identification, and increase their interest and enjoyment of coral reefs. However, they may not be aware of causes of coral decline or develop a willingness to play a role in solving such a problem.

Education for the Environment

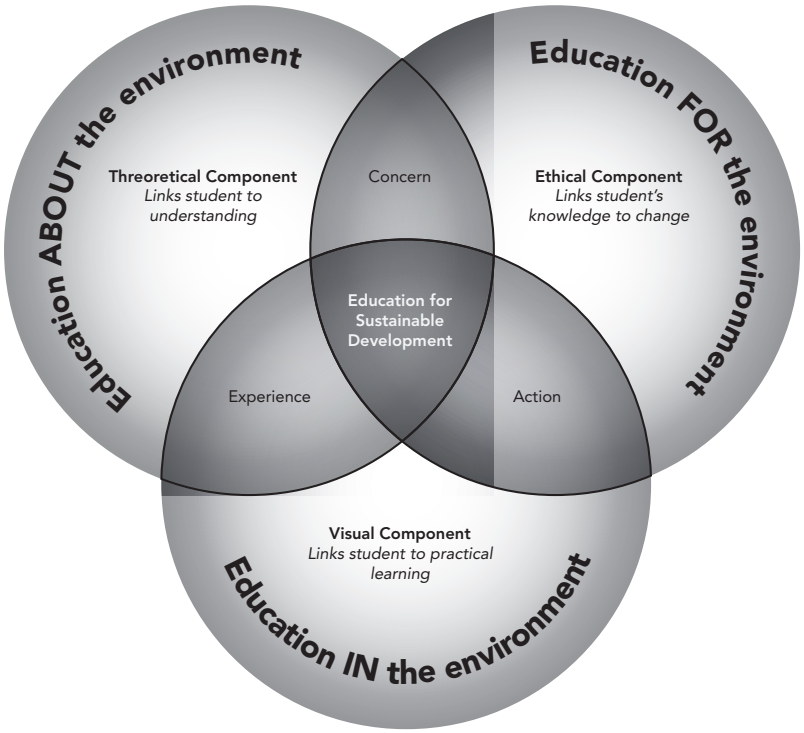
The goal of education 'for' the environment is creating positive environmental change by linking learning to actions or behaviours that students can actually apply. The distinguishing aspect of education for the environment is the notion of taking responsibility for changes that need to happen to achieve sustainable development. Students are challenged to think ethically about environmental issues and their own role in society, hence learning is not passive, but actively linked to social responsibility. In other words, when a student becomes aware and understands an environmental problem, they are challenged to respond through personal or social action.

Limitations

Environmental problems and issues can be very complex, they are often linked to a chain of causes and effects such that the root cause is not immediately obvious. Citizens with the motivation to get involved might not be effective in solving environmental problems, unless they have the necessary capacity (understanding and skills) to do so.

Combining Education in, about and for the environment for an effective approach to EFS

Education for Sustainability (EFS) is a holistic approach to environmental education. A program or series of lessons that combines education 'in,' 'about' and 'for' the environment is an effective approach to EFS. The three approaches effectively combine development of knowledge, skills, and values, with an ethic of taking responsibility to apply learning to bring about change. Those students, who have had the opportunity to undertake this learning, will have the motivation and willingness to make changes happen, supported by the knowledge and skills to make their action more effective. This approach is consistent with the goals of EFS to be a 'driver' of change within our society towards a sustainable future.



Adapted from: Environmental Education in the 21st Century - by Joy A. Palmer, (1998)

Three case studies are provided for students to analyse and contrast environmental education approaches that are 'in', 'about' and 'for' the environment.

Case Study 1: Education about rubbish in the Solomon Islands

In 2008, four Primary and Secondary schools in the Solomon Islands were involved in a School-Based Environmental Education programme supported by Live and Learn Environmental Education . Before the four schools participated in the programme, each one was asked to identify an immediate environmental problem affecting their schools that believed were important.St John School, Community High School in Honiara, was among the four schools involved. The school identified rubbish disposal / littering as a major environmental problem in their school. The state of the school environment was appalling. There was rubbish everywhere and the air pollution from rotten wastes was dreadful. The school and general public could not bear this practice.

In their effort to curb the littering problem, teachers were advised by the principal to incorporate environmental education awareness lessons for students in their school timetables. Lessons on rubbish and health related issues were taught in class. Science and agriculture lessons were also provided on the possible use and recycling of solid wastes. Each lesson focused on theory, but the students did not take excursions into the local environment to observe the waste problem. The students became aware of actions that they could take, however there was not sufficient time for students to carry out these actions during class time. The awareness activities were conducted within the two terms of the school calendar. Since the implementation of the programme, students developed a greater understanding of the environmental impacts of littering and how it could be managed.

Case study 2: Mahonia Na Dari – Marine Environment Education Program (MEEP), Papua New Guinea

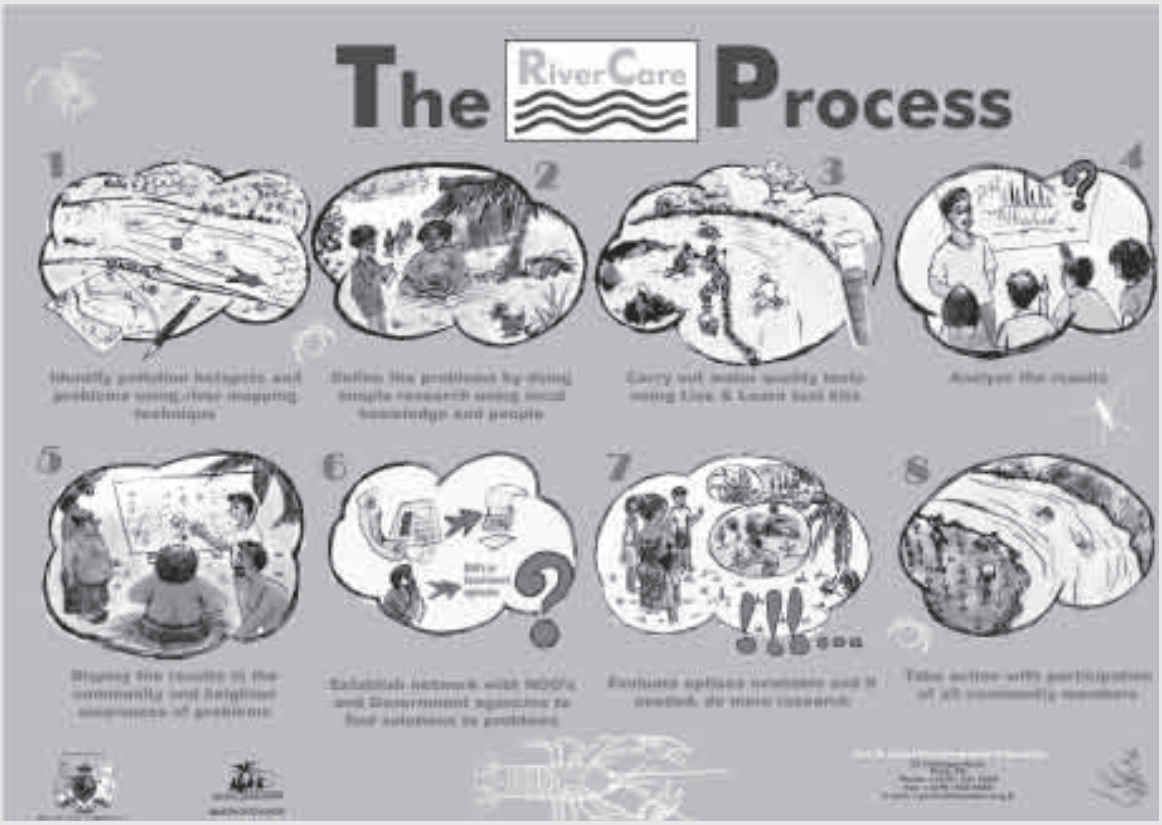
Mahonia Na Dari hosts excursions for schools from anywhere in the country, or from overseas, for up to five days at a time. Mahonia can accommodate 20 students and 2 supervising teachers in a dormitory. This allows them to participate in several days of lessons focused around the coral reef environments surrounding the centre. Participants attend classes in the main education resource centre, where they view presentations and receive lectures about coral reef biology. However, the program is designed to spend the minimum possible amount of time in the classroom and do most of the work out in the field. Many of the participants, although living locally, are from different parts of PNG and some have never seen or been in the marine environment. The program takes participants out on the water where they can see things first hand and get a clearer picture of the marine education message. Students can see how fragile the reef really is, and how conservation can play a major role.

At the end of the program the students are aware of the many different types of organisms that they may encounter on the coral reef, they also learn about how these organisms live their lives. Students also have increased awareness of impacts of developments such as Oil Palm and Deforestation on coral reef environments. Scientists regularly use the centre as a base to conduct their research. The scientists also give some time to share their knowledge about reef ecology with the students.

Case study 3: Live & Learn Environmental Education – RiverCare Program, Fiji

Over the past 5 years more than 100 schools have participated in the Fiji RiverCare program. The students follow a process of enquiry to find out if their rivers or waterways are impacted by pollution, and they are encouraged to take action in response to their findings. Students use a simple water quality test kit to take samples of water from local waterways. The tests allow students to measure oxygen levels, pH, silt levels, and nutrient pollution. The water testing is part of a seven-step process to improve the health of the river, as Illustrated in the RiverCare poster:

Many schools have followed the RiverCare process and taken on action projects to improve the health of rivers. In Suva, thirty schools have collaborated to work on a project called 'Nabukalou Creek: Our Living Heritage.' The project involves students in research, water quality monitoring and raising community awareness along Fiji's most polluted river.



Week Three - Tutorial

Linking knowledge to action and change

Box 7: Linking Knowledge to Acton & Change

Linking knowledge to action and change is an essential aspect of Education for Sustainability. Without 'action' EFS would not reach its goal of to be a 'driver' of change within our society towards a sustainable future.

Teachers are strongly encouraged to provide opportunities for their students to take practical actions that are linked with the knowledge they have gained about environmental issues.

Recall (from the week 1 tutorial) the qualities that we would like or expect to see in a student who has been 'Educated for Sustainability.' These qualities included that the student has a sense of responsibility to the environment AND the will, knowledge and skills to translate this responsibility into action.

Taking responsibility

Action can be linked with any lesson where students learn something new about the environment. To develop a sense of responsibility for environmental issues students can be challenged to think about what they or their community could do about the issue.

"Now that we know about this issue, what should we do about it?"

Considering what action to take about the issue they have learned about is an excellent way to encourage students to apply what they have learned. Applying knowledge helps students to remember and learn more about a topic. It is also encourages students to become active citizens, who will be active in shaping their future and the future of their communities.

Students may be confronted by issues that they cannot solve by themselves, however encouraging the students to take some action toward solving the issue (even if it is a small or seemingly insignificant action), establishes positive attitudes about taking responsibility. In the future (as adults) the students will have much greater capacity to take actions that can make a real difference.

Consider the different reactions that students could develop about the same issue in the picture below (reproduced in the student reader).

Box 7: Linking Knowledge to Acton & Change .. continued

Learning through doing

Some teachers may be concerned that students only need to focus on learning the facts and information that will appear in examinations. The pressure to achieve good examination results is real and is common to many education systems across the Pacific. Sometimes the pressure to focus on exam material can discourage a teacher from involving students in practical activities such as taking action or applying knowledge that has been learned.

However, it is widely accepted that applying knowledge through 'doing,' can improve students' ability to learn, recall and use information. Therefore taking action and 'doing' can also assist students to do well in exams.

The link between being involved in an activity, doing something or taking action is highlighted in this famous Chinese proverb (below). Discuss the proverb with students: to what extent do they agree or disagree with it? How could taking-action to apply knowledge assist students in an exam?

"Tell me and I'll forget;

Show me and I may remember,

Involve me and I'll understand."

Chinese Proverb

Developing skills

Taking action is a great way for students to practice and develop new skills. Examples of skills that can be learned through taking action include:

- Practical skills – such as how to use tools to build something
- Writing skills – e.g. when designing a poster, writing an article for a newspaper or a letter to a politician
- Creative thinking & problem solving skills – e.g. when solving problems that arise when trying to take an action
- Artistic skills – e.g. when designing a poster
- Organisational skills – e.g. when organising a project
- Interpersonal / team skills – through working together with other students
- Communication skills – e.g. when communicating an environmental message verbally or through a poster or sign post
- Design skills – e.g. when inventing a technical solution to a problem

Schools Action Project: Composting

Creating Compost

Organic waste comes from animal and plant material. These wastes can be broken down into soil by the action of bacteria and returned to the garden. In most Pacific Island countries, organic wastes make up about 65% of the waste we throw away.

Making compost is a great way to safely get rid of our food and garden wastes without losing the nutrients that are stored in them. Dumping or burning 'green wastes' such as vegetable peelings and off-cuts, grass clippings and leaves wastes a valuable resource and makes the overall task of waste management more difficult.

Compost is nature's way of breaking down organic material into usable pieces for plants and animals. This cycle of life is an important part of nature. Compost not only reduces what is considered waste, it is also a very useful way to recycle organic material to make an environmentally friendly alternative to artificial fertilisers. Using compost instead of having to buy artificial fertilisers can help save you money. By selling compost for use by other gardeners or by providing composting services, you may be able to raise some funds for your school.

Before you begin

- Organise a supply of household organic waste (e.g. vegetable scraps) for this activity.
- Read and discuss 'Nine simple steps to make compost' (below).
- Select an appropriate site for the compost heap. The site must be convenient, have access to water and be located where it will not attract unwanted pests to your school.

The job

Involve the students in each of the tasks listed below:

- Lay out the materials that have been collected for the heap and ensure that there are also sufficient leaves or dry yard wastes. Examine each material and decide if it is dry yard waste or green vegetable waste. Place these into two piles. Dispose of any item that should not be placed in a compost heap.
- Use a bush knife or spade to chop up the coarse leaves and yard waste into small pieces.
- Lay cardboard boxes underneath the heap. Explain that this will help to protect the groundwater from any liquid that drains or 'leaches' through the compost. Sometimes this can include substances that are not good for the soil.
- Create a 'frame' to contain the compost heap. This could be made with cardboard boxes or wire, old tyres or wood.
- Make the compost heap in layers as described in the nine steps on the next page.
- The compost is ready when the soil looks dark, has a clean smell and doesn't contain any identifiable vegetable scraps

Follow up

** Follow up does not need to happen for the demonstration activity for teacher training. However, the students can be made aware of how follow up should proceed.*

- Every two to three weeks you will need to remove the cover and mix the remaining compost. Adding water if the mix is too dry, replace the cover.

Create a 'frame' to contain the compost heap

- It is important to monitor the moisture in the compost heap. If it is too dry it will compost very slowly, and if it is too wet it will get smelly.
- Now that you have the knowledge and skills required to make a compost heap, what will you do with this knowledge and skills? Make a commitment to start compost heaps at home, or conduct a training workshop to show other people in your community how to compost.

Nine simple steps to make compost

1. Firstly make a base 30 cm high and 2 m wide with coarse plant material such as small stems or coconut husks. This will ensure good air circulation and drainage.
2. Add a 10 cm layer of material that is difficult to decompose, such as dry grass or coarse leaves.
3. Add a 10 cm layer of material that is easily decomposed, such as fruit and vegetable scraps.
4. Add 2 cm of animal manure or old compost.
5. Add a sprinkling of top soil (soil collected from within 10 cm of the ground surface)
6. Very small amounts of ash can be lightly sprinkled onto these layers to accelerate the process of decomposition.
7. Repeat all these layers except for the first layer of coarse material, until the heap reaches 1 to 1.5 m high. This can be done over time and may take several weeks.
8. Monitor the moisture level of the compost. It should be damp but not wet. If it is too dry, add water. If it is too wet, remove the cover when it is sunny and replace the cover to protect it from getting water-logged in the rain.
9. The heap should be covered to protect it against evaporation and heavy rain as this will wash away all the nutrients. Plastic sheets, thatch or banana leaves are suitable for this.

Source: Steps modified from 'Composting in the Tropics', HDRA - the organic organisation

Use banana leaves to cover your compost

Week Four - Lecture

Valuing traditional practices in EFS

Box 8: The Value of Traditional Knowledge

Solomon Island communities have a long history of living and working with the natural environment, and have a great depth of knowledge about how to use its plentiful resources to meet their everyday needs. This knowledge includes an understanding of what can be collected and eaten, what is poisonous, what can be used as medicines and what can be used for building.

Solomon Islanders also have knowledge about how the environment changes from season to season, for example, at what time of year a certain fruit may be collected. This knowledge, which has been gathered over thousands of years through experiences in the environment and passed down from generation to generation, is called traditional knowledge.

Traditional knowledge is extremely important and should be recognised for its value, even if you can't find it written in any textbook. Some traditional knowledge is very localised; it may be held by one village, one clan, a family or even an individual person. For example, some people have a detailed knowledge of where and when certain types of fish are found on a local reef.

People may also know the specific tree that bats will visit at a certain time of year, and when yams may be ready for harvest in a hard-to-reach place in the bush.

Traditional knowledge may take the form of hunting, fishing, food collecting and gardening techniques, stories, songs, legends, cultural values, beliefs, rituals or community laws, and is often expressed uniquely through local language. For example, songs and legends can be an important way to pass on traditional knowledge. Community laws may be made to protect resources, such as the breeding grounds for turtles at important times of the year.

Traditional knowledge is very practical, particularly in the areas of collecting or growing food, fishing, hunting, and health and environmental management. For instance, in some villages in Vanuatu, people know the right time for yam harvesting is when a narara tree is in flower. So, to the people of that community, the knowledge of that tree blooming will tell them that it's the right time to start harvesting yam. In some countries, natural signs warn people that breeding seasons have started for birds or crabs and, in turn, it tells the communities when it is best to go hunting or fishing.

Why we should teach traditional knowledge

There is concern that traditional knowledge is being lost in the rapidly changing and modernized world. Traditionally, all food and medicine needed for survival was taken from nature and local gardens. With the introduction of trade and the cash economy, people now rely less on collecting and growing food and medicine. Many things can now be purchased. Diets are now changing with the introduction of food from other places.

Many people now purchase tinned fish instead of catching fish or buying fresh fish at a local market. Medicinal knowledge is being lost because we are relying more on Western/modern medicine. Similar changes are happening with building materials; people are building with steel, iron and brick rather than with wood, thatch and stone. Hand woven baskets have been replaced by plastic bags in stores.

The change from traditional to modern practices provides some advantages and disadvantages. This is very important to recognise because many people think that modern ways are always better than traditional or old ways, but this is

Box 8: The Value of Traditional Knowledge .....continued

not true. Some modern practices provide very useful services, for example, modern drugs used to treat malaria are much more effective than traditional methods and have saved thousands of lives. However, some modern ways also cause many problems. Plastic bags, for example, take hundreds of years to decompose (break down) in the environment. They pollute our waterways and threaten our marine life, such as turtles. If they are burned, they release toxic chemicals. They also require energy and resources to manufacture and transport.

Woven baskets made from local plant material have none of these disadvantages. Traditional food, medicine and building materials can be obtained 'free' as long as they are still available in your area and managed properly. Many areas and people in the Pacific still use the resources provided by nature, much the same as they did traditionally. It takes a lot of work to make a fish trap, however, all the materials are available from local plants. Synthetic fishing line or nets, by contrast, can be very expensive to purchase. A tin roof may be very good at keeping out the rain, but it also costs money and this may put pressure on families to obtain the money.

Therefore, we see that traditional knowledge and use of resources from nature can provide people with the essentials for life (foods, building materials, etc.) that can be relied upon when money is not available. This traditional knowledge allows people to be 'self-reliant'. If traditional knowledge is lost, people must rely on being able to earn enough money to purchase what they need. There is currently a growing appreciation of the value of traditional knowledge, not only to those communities using it in their daily lives, but to modern industry and agriculture as well. Many widely used modern products, such as plant-based medicines and cosmetics, are developed using traditional knowledge.

Traditional knowledge can also be used for managing the environment so that it is kept healthy for future generations. A good example is when a village chief decides to place a ban on taking fish for a period of time or in a specific place using his powers under customary law. This is often called a tabu. This practice is a way that traditional knowledge can be used to conserve biodiversity, and may be more accepted by communities and hence more effective than modern systems of conservation, such as declaring a protected area using the laws made by the national government.

Traditional knowledge: a missing link in schools?

Some people now recognise that traditional knowledge has not been given enough attention in many Pacific Island schools and school curricula. Many schools have been teaching curricula inherited from Western countries prior to independence. Therefore, many of the topics learned by students involve concepts, situations, events or places from foreign countries. Providing students with opportunities to learn traditional knowledge and skills is extremely important in allowing students to develop traditional knowledge and skills. In this way, students will be better prepared to participate in their own culture, society and environment.

Modified from: Live & Learn Environmental Education (2008) Discovering Biodiversity: An Educators Guide to Exploring Natures Variety, pp 205-207

Worksheet 2 - Part 1

Comparison of traditional and contemporary (modern) ways

		Traditional	Contemporary (modern)
a)	Type of food people eat		
b)	How food is prepared		
c)	Medicines		
d)	Building materials		
e)	Clothes people wear		
f)	Way of catching fish		
g)	Way of hunting		

Worksheet 2 - Part 2

Comparison of traditional and contemporary (modern) ways

		Traditional	Contemporary (modern)
h}	Way of protecting a sensitive environment		
i}	Way of avoiding over harvesting (e.g. taking too many fish, shells, birds or trees etc)		
j)	Weapons		
k)	Ceremonies		
l)	Decorations		
m)	Types of money		

Week Four - Tutorial

Strategies for including traditional knowledge in formal education

Box 9: Formal Education and Indigenous Education

Formal education taught in institutions such as schools, technical and vocational training and university were only introduced very recently in the Solomon Islands. These institutions came with colonization and have become the standard way that children and young people receive their education. A similar situation can be observed in other countries that were colonized throughout the World. When the Solomon Islands became Independent in 1978, schools continued to be the main institutions of education.

However, education in the Solomon Islands did not start when the British colonized in the 1890s. Prior to this time young people learned traditional knowledge, which was past on verbally from generation to generation. Learning of traditional knowledge is referred to here as indigenous education. Indigenous education still continues today, however it has been largely separate from school education. Societies emphasis on school education as the place where children learn poses a risk to traditional knowledge because it does not encourage interaction between children and their parents or elders in the community. It also focuses more on 'abstract knowledge' that can be tested in an exam. Traditional knowledge cannot usually be tested in an exam, but is tested in practical life situations.

The importance of traditional knowledge, particularly in Education for Sustainability, is now more widely accepted. The United Nations recognises the important contribution that traditional knowledge can have, and encourages teachers and educators to increase opportunities for traditional knowledge to be taught in schools. There are significant differences between formal school education and indigenous education, as demonstrated in the table (below). Education for Sustainability can be significantly enhanced if teachers can find ways to integrate indigenous education into their lessons in schools.

Aspects of Education	Indigenous Education	Formal Education
View of Knowledge	Includes religious or spiritual and non spiritual knowledge	Usually does not include spiritual knowledge
	"Holistic and integrated" based on knowing about how things relate to each other	"Analytical or reductionist" based on understanding things by breaking them down and learning about their components in detail
	Stored orally and in cultural practices	Stored in books and computers
	Capable of predicting and describing conditions in local areas based on local ecology	Capable of predicting and describing conditions locally and in distant places based on natural principles
	Less valued in distant areas	Weak in local use of knowledge
Objectives	Long-term wisdom	Short term recall
	Cultural and ecological sustainability	Economic sustainability
	Practical; for use in everyday life	Abstract; to pass examinations
	Integration of cultural values in decision making	Use of logical and critical thinking in making decisions
Methods of Teaching and Learning	Acquired over a long period	Acquired over shorter periods
	Learning through experience	Learning by formal education
	Teaching through example, modeling, ritual and storytelling	Teaching through abstract concepts and methods such as lectures and books
	Tested in practical life situations	Tested artificially in examinations

Adapted from: Teaching and Learning for a Sustainable Future, UNESCO, 2002

Worksheet 3

Analysis of formal (school education) and indigenous education

Aspect of education		Formal (school education)	Indigenous education
a)	The place where learning happens		
b)	Teaching techniques		
c)	Resources used to teach		
d)	The objectives		
e)	How is it tested?		
f)	Relevance in rural life		
g)	Relevance in urban life		
h)	Value to the environment		
i)	Value to community life		
j)	Value to the economy		

Example Lesson – Using Traditional Knowledge

a) Present the information provided (in the boxed text) to the students. If possible provide copies of the case study for the students to read. If you cannot provide copies, select one student to read the case study aloud to the class.

b) Initiate discussion about the case study by asking questions

- How can local (customary) laws protect the environment?
- What do you think was happening to the shellfish, land crabs and flying foxes in the Lakavik Tak area before the tabu was declared?
- How could the Lakavik Tak tabu area benefit the animals? How could it benefit the people of Kumreut?

c) Organise for the students to work in groups of three. Ask each group to prepare a short survey that they can use to gather information about local tabus that are currently in place or may have been in place in the past. Set the students the task of interviewing a chief, elder or family member who may know about tabus. The survey can be undertaken as home work. (Alternatively, a chief or elder could be invited to the school to be interviewed by the class).

Example survey questions:

- Where is the tabu?
- What activities were forbidden by the tabu? What activities where still allowed?
- When did it exist?
- Who put it in place?
- What were the benefits of the tabu?
- What were the disadvantages?
- Was the tabu respected? Why or why not?
- Is the tabu still respected today? Why or why not?

d) After students have conducted their interviews and gathered the information about tabus, ask each group to present their findings to the class. Encourage the class to ask questions.

e) Ask each student to write a short report, or create a poster with pictures, which explains about the tabu that they researched.

A sign that an area has been declared tabu

Local (customary) laws

To protect the local environment, the chiefs and elders of a community may put laws in place. Laws dealing with the protection of the environment in a local area may be put in place as part of the chiefs' duty to care for the community and their land. These laws are not passed by the government but may be put in place through a process of discussion at a community meeting. A Council of Chiefs in an area may be responsible for agreeing on laws that each individual chief will be responsible for overseeing in their own community.

Examples of local laws

1. Declaring a tabu area where fishing is not permitted.
2. Declaring a 'No Fishing' period after someone of a high rank from the community dies.
3. A local ban on the use of destructive fishing methods such as using explosives.
4. Establishing bans on the cutting of mangroves.
5. Adhering to custom tabus including those related to not eating or killing the special spirit animals of your tribe.

Case Study: Lakavik Tak Tabu Area – Central Pentacost (Vanuatu)

The Lekavik Tak area is a tabu site, which lies between Bwarnapne and Sadar and is part of Kumreut land. The boundaries are the Mbule River to the north, the outer reef to the west, and specific landmark features in the south and east. It includes a reef flat, a mainly rocky shoreline and a steep rocky hill covered in a typical coastal thicket.

Villagers from throughout Kumreut were forbidden from gathering shellfish, land crabs and flying foxes from within the Lekavik tabu area. Both line and spear fishing were still undertaken on the outer reef slope, outside the tabu area. Use of a small freshwater soak by the people from Elislis was not affected by the tabu, which only applied to living resources. The area was one of many such sections of coast from which people from Kumreut and nearby areas could gather coastal resources. People from nearby villages used the soak for washing but soap and dirt from the washing entered the tabu area.

Chief Ignatus Viresang of Kumreut consulted with his neighbours and peers. Chief Michel of Elislis and Chief James of Vereprep, to stop the washing at Lekavik. The decision was the Chief's to make, and it is likely the consultation was a custom to show respect to neighbouring senior chiefs. All local residents knew a tabu would be declared after the chief's ceremony, and Namale leaves clearly marked the area for them. Washing and pollution of the freshwater soak was stopped in the area.

Told by Olivier T, Port Vila, 2005

Worksheet 4

Read the "Example Lesson – Using Traditional Knowledge" and answer the following questions.

a) What would you expect the students to learn from participating in this lesson? (Knowledge, values & skills)

_____

_____

_____

b) What techniques were used to access information about tabus (traditional knowledge)? *Hint: There were three

_____

_____

_____

c) What was the purpose of including a case study? (The Lakavik Tak Tabu Area)

_____

_____

_____

d) What are the advantages and disadvantages of using local knowledge as a source of information?

_____

_____

_____

e) Why were books not used in this lesson?

_____

_____

_____

f) What are the advantages of asking students to work together?

_____

_____

_____

g) Which part of the lesson could be used for assessment?

_____

_____

_____

h) This lesson was about custom tabus. What other aspects of traditional knowledge could this lesson be adapted to be used for?

_____

_____

_____

Week Five - Lecture

Education for Sustainability across the curriculum (1 hour)

Box 10. Why should EFS be taught across the curriculum?

We have seen that one of the key goals of Education for Sustainability is to develop students who have a 'holistic outlook' on the world around them. Holistic comes from the word 'whole,' and means that students can understand the connection between different aspects of life, such as how the environment links to the economy, making a living and our health. We hope that as adults, whether they become farmers, business people or government officers, the students will be able to make good decisions based on their understanding of how different matters are connected.

Environmental problems and unsustainable activities arise when people make decisions that do not consider that we live in a world where the environment, the economy and society are closely connected. For example, if a landowner based all his decisions on maximising short-term profit from selling timber, he might not realise that the supply of timber for the future is diminishing. Meanwhile his profit making may be destroying his supplies of water, building materials, medicines and hunting opportunities. The short-term financial gain may turn into long-term poverty for his family and community.

Helping students to understand the world around them as an interconnected system is a major challenge, and is not made easier by the structure of our education systems. Worldwide, the majority of secondary education systems separate learning into different subjects, which don't strongly connect with each other. For example students attend different subjects such as science, english, social studies, mathematics, economics, health and home economics. Each subject is taught using a different curriculum and textbook guide. In many cases different teachers teach these subjects, and in larger schools the teachers may be from different faculties or departments. Some of these teachers don't even share the same staff room! Therefore there are many barriers that make it difficult to make links between the different teaching disciplines. This presents a challenge to EFS. How are we going to develop students into adults who appreciate the complex connections between the environment and the society around them? What will happen if an economics student learns about models of business, trade and economic growth, but does not learn about the connection between resource use and the environment?

It is often easier for primary school teachers to make links between the different subjects that they teach. This is because it is more common for the same teacher to be teaching different subjects. If a teacher is focusing on the issue of pollution in social studies, they are more able to see opportunities to follow the theme of pollution into science, english (e.g. writing about pollution) and art.

Some educators have called for fundamental restructuring of secondary education so it is more favourable to holistic learning. Suggestions include more thematic teaching, where students follow a relevant theme (e.g. forests) and examine economics, science, conservation and even art connected with this theme. These changes may take place sometime in the future, but at the present time teachers need to find other ways of making connections between teaching disciplines.

The approach of teaching EFS 'across the curriculum' is designed to give all students an understanding of environmental, economic and social connections, regardless of which subjects they take in school. This requires that all subjects include some EFS content, including economics, mathematics, art, english and home economics. Teachers need to be creative and resourceful when looking for opportunities to include EFS in 'non-environmental subjects.' The teacher is required to follow the curriculum learning outcomes, however there are opportunities to incorporate EFS within this framework. In 2006, Live & Learn Environmental Education examined the Solomon Islands curriculum. The researchers looked at direct and potential links to EFS in each subject from year six to ten. A direct link was recorded when a learning outcome specifically included an environmental or sustainability theme, a potential link was recorded when the theme was flexible and could be used to link to the environment or sustainability. For example learning outcome *10.5.1 recognize the relationship between a consumer and resources supply in Home*

Box 10: continued ...

Economics, could potentially be used to teach about population growth, over consumption or resource depletion. Mathematics learning *outcome 3.1 Reading, understanding and making graphs using objects,* could focus on graphing the different types of rubbish that litter the environment around the school.

Overall, Live & Learn recorded forty-five learning outcomes with direct links and twenty-eight outcomes with potential links to EFS across all subjects from year six to ten in the Solomon Islands curriculum.

The fictional story of 'Blake the businessman' is provided for students to consider the importance of teaching EFS across the curriculum. The story will be analysed using Worksheet 5 (below) during the week 5 lecture.

Blake the businessman

Blake learned to count at a very young age, and everyone knew that he had a talent with numbers. At school Blake excelled in mathematics and economics, and so he decided to focus on these subjects. He also studied English, but dropped science and social studies subjects in his senior years. When he finished school, Blake was lucky enough to receive a scholarship to study at a prominent university in New Zealand. Here, in the school of economics, Blake studied business and accounting.

Blake now runs his own business, where he quarries gravel to sell for making roads and building construction. Blake is very proud of his huge yellow excavator. This great machine, with its enormous bucket, digs the gravel out of the river and deposits it into the waiting truck. The machine can almost move a tone of gravel in a single scoop. Business has been good, and lately his trucks have been working day and night.

Unfortunately Blake is not aware of the problems that he is causing for his village. His village lies on the coast downstream from the river where he collects his gravel. Fishing was once very good in the river, and also along the coral fringed headland beyond where the river meets the sea. Recently, the river has become shallow and the fish have disappeared. The coral also seems to be dying, and large areas of dead white 'bleached' coral can now be seen. Blake is very generous, and provides employment and money for his family and friends in the village. However there never seems to be enough money. In the past the people could catch all the fish they need, nowadays they need to go to the store to buy tin fish and corned beef.

No one has yet suspected the link between Blake's gravel business and the decline in the fishing and reef. But each day, Blake's digging sends a plume of dirty water down the river. Some of the mud and silt, that Blake has disturbed, settles in the river, especially in the deep holes. Over time these holes gradually filled up with silt and the river became shallower. Unfortunately these same deep holes were the places where fish and eels liked to live. The silt that reached the reef also caused problems. The mud contained nutrients, which caused algae (green slime) to grow over the coral, suffocating it. The fish that depend on the coral had either died or moved to live elsewhere.

It seemed that life would continue to be hard in the village, unless Blake and his people came to understand and manage the impact that his gravel business had on the environment and on the local economy. But how could they see this link?

Worksheet 5

Read and analyse "Blake the Businessman" and answer the following questions

a) What are the economic advantages and disadvantages of Blake's gravel business?

_____

_____

_____

b) Why is Blake unaware of the environmental impacts to the river that supports his village?

_____

_____

_____

c) What role did Blake's education play in his ignorance of the environmental problem that he has caused?

_____

_____

_____

d) Why did Blake focus his study on mathematics, economics and English?

_____

_____

_____

e) How could a teacher ensure that Blake's education enables him to understand links between business, economics and the environment?

_____

_____

_____

f) To what degree is Blake's example realistic in your school or community?

_____

_____

_____

Week Five - Tutorial

Opportunities for integrating EFS into school programs

Case Study 1: Sustainable Schools – Australia

The Australian Sustainable Schools Initiative (AuSSI) involves a whole-of-school approach to education for sustainability with measurable environmental, financial, educational and social outcomes.

It implements improvements in a school's management of resources and facilities and integrates this approach into the existing curriculum and daily running of the school.

Students participate in an action learning – or learning by doing – process. AuSSI also involves a school's local community through parents, local government and local industry.

More than 2000 schools and 570,000 students across Australia are now participating in AuSSI. Some participating schools have reported reductions in waste collection of up to 80%, reductions in water consumption of up to 60%, and savings on energy consumption of 20% with commensurate reductions in greenhouse gas emissions. Schools are also achieving financial savings and broader social and educational benefits from increased school pride and interest in learning.

The 'whole of school' approach' of AuSSI means that all aspects of the school community are involved, including the administrators, teachers, students, parents and local community. The goals of the program include:

- Including learning and teaching for sustainability in the school curricula
- Schools actively involved in a continuous cycle of planning, implementing and reviewing their approach to sustainability as part of their everyday work
- Schools using natural resources, including energy, water, waste and biodiversity in more sustainable ways
- Schools and school authorities reporting on changes towards sustainability
- Young people sharing ownership of sustainability actions and decision making
- Schools working towards sustainability in partnership with their local communities

An example of a 'Sustainable School'

Howard Springs Primary School began sustainable schools in term 2005. We are located 30km from Darwin in a rural area. Many students, although living in a rural area, do not have knowledge of their local environment.

Issues identified by the school:

- Need to reduce energy use
- Need to increase recycling
- High consumption of resources
- Need to establish outdoor learning environments

School aims:

- To begin identifying issues that our school needs to address to become a more sustainable school.
- To improve the participation of the whole school community in the existing initiatives and in the creation of new initiatives

What we did:

Learning:

- Professional learning for staff to introduce Sustainable Schools
- Sustainability was incorporated into a curriculum map so that it would be taught in class
- Seven out of thirteen classes have already implemented programs specifically focused on sustainability

Case Study 1: Sustainable Schools – Australia ...continued

- Upper primary students were involved in planning and creating a cane toad free frog pond. (Cane toads are introduced pests).
- All classes have taken part in rubbish free lunch day and associated learning about recycling, packaging and reducing packaging.
- All classes taking part in fortnightly energy audits
- Ongoing student involvement in vegetable garden/nursery
- Students caring for a number of worm farms. After initial set backs these have now been incorporated into the garden.
- Participation in national threatened species day exhibition

Resources

Management/School Grounds

- Energy audits
- School Environmental Management Plan drafted
- Plans to implement irrigation to reduce water usage
- Shredded paper being recycled within school, stuffing toys, mulching
- Recycling of cans and bottles in staffroom
- Governance
- School council has formed a Sustainable Schools committee
- The committee is working on a Sustainable Schools policy

Community Links

- Parent group working on recycling for the Howard Springs area.

Case Study 2: Eco-clubs in Cambodia

A number of schools the Tonle Sap region of Cambodia have established 'Eco-Clubs' as a way of providing students with opportunities to be involved in Education for Sustainability. The schools established the Eco-clubs with the assistance of the Cambodian Ministry of Education and NGOs. The Tonle Sap is the area surrounding the biggest lake in South East Asia. The lake provides water and fish for millions of people, but is rapidly being polluted and overfished. It is critical that the people of Cambodia undertake more sustainable development around the lake.

Eco-clubs are extra curricular clubs, which meet once a week after school hours. Each school has their own rules for who can be a member. Some schools select students from a certain class, others allow any student who wants to join to be a member, and some schools selected students who they thought were most 'talented.' Eco-clubs typically had between 20 -30 members.

A teacher was selected from each school to be in-charge of the Eco-Club. The teachers use a range of resources provided by NGOs and the Government to run activities for the kids. For example, in 2008, many Eco-clubs worked through the Live & Learn 'Sustainable Livelihoods Flipchart.' The flipchart guides the club through activities about water, pollution, hygiene and sanitation, rubbish, energy, deforestation and sustainable fishing.

Eco-clubs also get involved in environmental action projects such as making gardens, cleaning up rubbish, maintaining clean water supplies, making compost and raising community awareness about environmental issues and action. When doing action projects the students are usually given a lot of responsibility for planning and deciding what and how actions will be taken. One advantage of the Eco-club is that they can run a project for many weeks or even a whole year. For example many schools started compost heaps and then provided ongoing maintenance. This works well as an extra-curricular activity, because they don't have to follow a formal curriculum. In contrast, students who study composting in class time, following the Cambodian curriculum, can only spend one week on the topic before they must move on to the next topic.

However, the Eco-clubs also have a disadvantage because they are extra curricular. There are too many students in the schools for everyone to be a member of the Eco-clubs, this means that many

students miss out on Education for Sustainability. Some schools are trying to address this by making the Eco-club for a specific grade, so each year new students get to join. Another disadvantage of after school eco-clubs is teacher commitment. Cambodia teachers are not well paid, and receive only around $US 40 per month. Some Eco-club teachers would regularly cancel club activities so that they could do other work that could earn them money.

Case study 3: "Learn-scaping" your school

Learn-scapes are specially designed outdoor spaces in the school grounds that are stimulating and engaging places for student learning and interaction with the environment. The word 'learn-scape' comes from the word landscape, but it is a special landscape created to help students to learn.

The Learn-scape allows a range of teaching strategies to be used that cannot be undertaken in a regular classroom.

Many Australian schools have 'Learn-scaped' their school grounds. Usually many people work together to plan and create a Learn-scape. It may involve teachers, students, school administrators and community. For example, students, teachers and parents can be involved in planing and creating the Learn-scape that the students will use for an outdoor classroom.

Common features of a Learn-scape include food gardens, frog ponds, worm farms or outdoor 'classrooms'. Composting is a common feature of a Learn-scape. A school can create a compost area that is available for students to study. The compost heap can be used to teach many subjects, including environmental studies within social science, or to study the biology of decomposing organisms.

An example Learn-scape

Alice Springs is a town in the dry desert interior of Australia. One of the local schools developed a Learn-scape based on a water efficient vegetable garden. The teachers and students worked together to plan the Learn-scape, which was built with support of parents and the community. One of the community members used a small tractor to help move the soil. A local nursery donated plants. The landscape was designed so that in would naturally 'harvest' any rain and direct the flow to the garden. The students used the garden to learn about many aspects of sustainability including:

- Learning about water efficiency and water conservation
- Growing fruit and vegetables
- Composting
- Health and nutrition
- Business and economics (students sold fruit and vegetables to the school canteen)
- Planning, teamwork and project management skills

The school also created a miniature habitat, which imitated the habitat of the surrounding bushland. This included plantings of local native desert trees, shrubs and grasses. Many insects and birds were attracted to the habitat, which allowed the students to study the local ecology outside of the classroom, but without leaving the school grounds.

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We cannot live only for ourselves.
A thousand fibers connect us
with our fellow men.

Herman Melville