Learning to Live Together: Reorienting Teacher Education to Strengthen School-based Initiatives

UNESCO Bangkok / APCEIU / Vietnamese National Commission for UNESCO

Environment Protection

27 October 2009
Ha Long, Vietnam

Robert Steele
Director – Systainability Asia
Senior Associate – AtKisson Groups
Education is first and foremost a holistic conversation about how to live . . .

. . . and in our time the great question now before us is how we will shall live in light of the ecological fact that we are bound together in the community of life, on one small and fragile planet, one and indivisible.
A short ‘Sense of Place’ Quiz

1. What soil type does your house sit on?
2. What natural resources are economically viable in your community?
3. Name five native edible plants in your region and their seasons of availability
4. From what direction do storms come from in your area during September to November?
5. How long is the growing season where you live?
6. Name five trees in your area by their local name. How many of them are native?
7. Name five resident and five migratory birds in your area?
8. What primary geological event or processes influenced the land where you live?
9. What species have become extinct in your area in the last 50 years and why (what reason)?
10. What are the major rivers in your region?
First Definition . . . What is the “environment”?

Environment (en·vi·ron·ment)
Pronunciation: \(\text{ɪn-}ˈvɪrə(n)-mənt, -ˈvɪ(ə)r(n)\-\)
Function: noun
Date created: 1827

1: the circumstances, objects, or conditions by which one is surrounded

2 a: the complex of physical, chemical, and biotic factors (as climate, soil, and living things) that act upon an organism or an ecological community and ultimately determine its form and survival

b: the aggregate of social and cultural conditions that influence the life of an individual or community (e.g. the built environment)

What are the important issues related to our environment and its protection?

- Global Warming and Climate Change
- Deforestation
- Solid Waste
- Coral Bleaching
- Ecosystem Degradation
- Water, Air, Soil Pollution
- Loss of Biodiversity
- Soil erosion
- Acid Rain
- Ozone depletion
- Evasive (Alien) species distribution

What Other issues?

- Poverty
- Health
- Unemployment
- Disaster preparedness
- Economic investment
- Crime & violence
- Immigration
- School drop out rate
- Status of women
- Other…. ?
Laws of Nature

The First Law: "Energy can neither be created nor destroyed. It can only change forms." In any process, the total energy of the universe remains the same.

The Second Law: The entropy of an isolated system not in equilibrium will tend to increase over time, approaching a maximum value at equilibrium.

In a simple manner, the second law states that "energy systems have a tendency to increase their entropy" rather than decrease it.
Economic Subsystem

Solar Energy

Growing Economic Dimension Faster ... Faster.

Natural Capital Source Functions

Resources

Sink Functions

Recycled Matter

High Entropy

Waste, Heat, Garbage and disorder

Source: Daly, Herman. Ecological Economics. Island Press, 2004
PHOTOSYNTHESIS

WATER + LIGHT = CHEMICAL ENERGY

1. Chloroplasts trap light energy

2. Water enters leaf

3. Carbon dioxide enters leaf through stomata

4. Sugar leaves leaf
   CHEMICAL ENERGY + CARBON DIOXIDE = SUGAR
Economic Growth and the Laws of Thermodynamics

When the GDP goes up, invariably an ecosystem somewhere has been appropriated, polluted, or otherwise degraded and, along with it, the biodiversity it holds and the services it provides.
Half is Gone . . .

The Millennium Ecosystem Assessment

<table>
<thead>
<tr>
<th>Nature converted to human use (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remaining natural systems</td>
</tr>
</tbody>
</table>

### Conversion of original biomes

- **Loss by 1950**
- **Loss between 1950 and 1990**
- **Projected loss by 2050**

<table>
<thead>
<tr>
<th>Biome</th>
<th>Loss by 1950</th>
<th>Loss between 1950 and 1990</th>
<th>Projected loss by 2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDITERRANEAN FORESTS, WOODLANDS, AND SCRUB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEMPERATE FOREST STEPPE AND WOODLAND</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEMPERATE BROADLEAF AND MIXED FORESTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROPICAL AND SUB-TROPICAL DRY BROADLEAF FORESTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FLOODED GRASSLANDS AND SAVANNAS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROPICAL AND SUB-TROPICAL GRASSLANDS, SAVANNAS, AND SHRUBLANDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROPICAL AND SUB-TROPICAL CONIFEROUS FORESTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DESERTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MONTANE GRASSLANDS AND SHRUBLANDS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TROPICAL AND SUB-TROPICAL MOIST BROADLEAF FORESTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TEMPERATE CONIFEROUS FORESTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOREAL FORESTS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TUNDRA</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The Natural Step’s Four System Conditions of Sustainability

In the sustainable society, nature is not subject to systematically increasing:

1. concentrations of substances extracted from the Earth's crust,

2. concentrations of substances produced by society,

3. degradation by physical means and, in that society...

4. people are not subject to conditions that systematically undermine their capacity to meet their needs.

What are the important issues related to our environment and its protection?

- Global Warming and Climate Change
- Deforestation
- Solid Waste
- Coral Bleaching
- Ecosystem Degradation
- Water, Air, Soil Pollution
- Loss of Biodiversity
- Soil erosion
- Acid Rain
- Ozone depletion
- Evasive (Alien) species distribution
Why Should We protect the environment?

- Clean Water
- Economic Foundations
- Peace
- Raw materials
- Cultural identity
- Source of Food
- Medicines
- Energy
- Therapy
- Soil Fertility
- Inspiration
- Oxygen and Clean Air
- Flood prevention
- Source of income
- Spirituality
- Knowledge & Ideas
What is the value of Nature?
What are the values inherent in protecting ‘our’ environment?

“A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise.”

- Aldo Leopold “A Sand County Almanac (1966)

- The essence of Leopold’s Land Ethic is “respect for all of the members of the community along with an equal respect for the (biotic) community

- Respect implies a sense of limits, things one does not do, not because they cannot be done, but because they should not be done.
The Earth Charter... International Shared Values

The Earth Charter is a shared global vision of ethics and principles to assist and guide society in this new period of transformation.

1. Respect and care for the community of life
2. Ecological Integrity
3. Social and Economic Justice
4. Democracy, Nonviolence, and Peace

Earth Charter’s Shared Values

I. Respect and care for the community of life

1. Respect Earth and life in all its diversity.
2. Care for the community of life with understanding, compassion, and love.
3. Build democratic societies that are just, participatory, sustainable, and peaceable.

II. Ecological Integrity

1. Protect and restore the integrity of Earth's ecological systems, with special concern for biological diversity and the natural processes that sustain life.
2. Prevent harm as the best method of environmental protection and, when knowledge is limited, apply a precautionary approach.
3. Adopt patterns of production, consumption, and reproduction that safeguard Earth's regenerative capacities, human rights, and community well-being.
4. Advance the study of ecological sustainability and promote the open exchange and wide application of the knowledge acquired.

### Existence values
Intrinsic value of resources and landscapes, irrespective of its use such as cultural, aesthetic, bequest significance, etc.

### Direct values
Outputs that can be consumed or processed directly, such as timber, fodder, fuel, non-timber forest products, meat, medicines, wild foods, etc.

### Indirect values
Ecological services, such as flood control, regulation of water flows and supplies, nutrient retention, climate regulation, etc.

### Option values
Premium placed on maintaining resources and landscapes for future possible direct and indirect uses, some of which may not be known now.

### Existence values
Intrinsic value of resources and landscapes, irrespective of its use such as cultural, aesthetic, bequest significance, etc.
Direct values
- Goods and products

Indirect values
- Ecosystem services

Option values

Existence values

Direct values
- Nature tourism

Market Prices

Productivity & cost-based approaches
- Effect on Production
- Replacement Costs
- Cost of Providing Substitutes
- Cost of Avoided Damage

Surrogate market & stated preference approaches
- Travel Costs
- Contingent Valuation
MARKET PRICES

What it costs to buy or sell a good or product

People’s actual willingness to pay

E.g. Nam Et & Phou Loei NBCA, Lao PDR:
Value of NTFP use for Viengthong District villages

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash income</td>
<td>$634,000</td>
</tr>
<tr>
<td>Plant foods</td>
<td>$45,000</td>
</tr>
<tr>
<td>Wild meats</td>
<td>$476,000</td>
</tr>
<tr>
<td>Fuel and housing</td>
<td>$480,000</td>
</tr>
<tr>
<td>Crop consumption</td>
<td>$241,000</td>
</tr>
<tr>
<td><strong>TOTAL VALUE</strong></td>
<td><strong>$1,876,000</strong></td>
</tr>
</tbody>
</table>
The economic contribution of ecosystems to other production and consumption activities

*Market value as an input*

Flood attenuation benefits from forests, Madagascar
Value of flood damage to paddy production

NPV for forest watershed protection benefits: $126,700.

Resulted in the establishment of Mantadia NP
The costs of mitigating or averting the effects of the loss of an environmental good or service

A minimum estimate of money saved

E.g. Thua Thien Hue, Vietnam:
Value of watershed catchment protection for urban and rural water supplies (Infrastructure to mitigate erosion, seasonal low water supplies and flooding)

<table>
<thead>
<tr>
<th>Investment costs</th>
<th>$27 million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recurrent costs</td>
<td>$1.8 million</td>
</tr>
<tr>
<td>ANNUAL COST</td>
<td>$2.88 million</td>
</tr>
</tbody>
</table>
DAMAGE COSTS AVOIDED

The costs avoided from the destruction of ecosystem

*A minimum estimate of money saved*

E.g. Value of Phnom Bokor NP for watershed protection and hydropower generation

Failure to invest in watershed management as a component of dam maintenance could incur NPC of over $2million in terms of power revenues foregone.
We Need to Reorganize Society for Ecological Sustainability
We need Ecological literacy

- Ecological Literacy means having the “ability to distinguish between health and disease in natural systems and their relation to health and disease in human ones.”

Ecological Literacy

The foundation of ecological literacy as having three components:

1. the knowledge necessary to comprehend interrelatedness,
2. an attitude of care or stewardship, and
3. the practical competence required to act on the basis of knowledge and feeling”.

What do we need to know, understand, do and feel in order to protect ‘our’ environment?

“People who do not know the ground on which they stand miss one of the elements of good thinking, which is the capacity to distinguish between health and disease in natural systems and their relation to health and disease in human ones.

- David Orr, Ecological Literacy, 1992

What we need is Ecological competence, or ‘literacy’

- Understanding of the Laws of Thermodynamics
- Understanding of the interconnection of ecological systems & human systems
- Recognition of interrelatedness (symbiosis)
- Understanding of exponential growth and limits
- Indigenous or Traditional knowledge
- Understanding of Natural design (i.e. the structure and function of natural systems)
- Understanding of one’s place, or ‘sense of place’
Enduring Questions for Teachers

- What are the **most pressing** environmental, societal and economic **issues** facing our community?
- How are the **environmental issues**, **linked** to the social, economic and wellbeing? (Systems approach)
- What **basic knowledge** is necessary to guarantee a healthy and sustainable environment for our community?
- What **skills** are necessary for students and others to possess in order to guarantee a healthy and sustainable environment for our community?
- What **perspectives** are necessary to understand in order to come to an agreement on protecting the environment in our community?
- What **values** are necessary to live sustainably in our community?

*Source: adapted from McKeown, *ESD Toolkit*. Version 2, July 2002*
Reorienting Curriculum towards Environmental Protection

To effectively incorporate environmentally centered . . .

- Issues
- knowledge,
- skills,
- perspectives,
- values,

... into the formal school curriculum, several key questions must be answered as a whole school by the teachers and administrators.
Understanding Stakeholder Perspectives about the Environment

Understanding the views and values of different stakeholders is essential to the sustainable development process.

Answers to the following questions will help us in working together . . .

- What do they think about this particular topic or issue?
- Why do they think this way? What or who may have influence on their thinking?
- How do they see themselves in relation to cause, effect and solution to the issue / problem?
Identifying and understanding Multiple Perspectives

- ESD emphasizes the need for understanding multiple perspectives in solving problems .... Which will require cooperation between and across sectors.

- How do the following people/groups possibly perceive this picture of a forest?
  - Farmer
  - Local politician
  - Environmental NGO
  - Timber company manager
  - Fisherman
  - Teacher
  - Artist
  - Religious Leader
What are Systems?

Systems are...

...groups of discrete elements that work together to make a whole.

Systems are bound together by the laws of cause and effect, and governed by flows of information, energy and materials.
What does a Systems approach give us?

- **Insight**: “Understand components and their links in the system, you will understand its behavior.”

- **Leverage**: “Change a component or link in the system, and you will change the system behavior.”

- **Solution**: “Solving problems almost always involves changing systems *(identify and change the limiting factor)*.”
Step 1: Brainstorm the variables involved

**Drivers / Causes**

- Discharge from Industry sources
- Factories complying with the law
- Enforcement of the law
- Revenue Profits (Income – Expenses)
- Government Policy Regulations and laws
- Outside Investment
- Cost of raw water for use in manufacturing

**Responses / Effects**

- Climate Change
- Riverine aquatic and terrestrial biodiversity
- Ability to catch fish and other commercial species in the river
- Effects on Human health
- Economic Growth
- Public perception of the problem
- Reputation of the company
- Education

**Drivers / Causes**

- Corruption

**Responses / Effects**

- Outdoor recreation on or near river

**Drivers / Causes**

- Factories complying with the law
- Enforcement of the law
- Revenue Profits (Income – Expenses)
- Government Policy Regulations and laws
- Outside Investment

**Responses / Effects**

- Climate Change
- Riverine aquatic and terrestrial biodiversity
- Ability to catch fish and other commercial species in the river
- Effects on Human health
- Economic Growth
- Public perception of the problem
- Reputation of the company
- Education
Step 2: Link the variable by cause & effect

- Climate Change
- Illegal Discharge from Industry sources
- Water quality and quantity
  - Riverine aquatic and terrestrial biodiversity
  - Effects on Human health
    - Ability to catch fish and other commercial species in the river
    - Outdoor recreation on or near river
  - Public perception of the problem
  - Economic Growth
    - Revenue Profits (Income – Expenses)
    - Cost of raw water for use in manufacturing

- Enforcement of the law
- Factories complying with the law
- Education
- Outside Investment
- Reputation of the company
- Economic Growth
- Revenue Profits (Income – Expenses)
- Cost of raw water for use in manufacturing

- Corruption
- Government Policy Regulations and laws
- Revenue Profits (Income – Expenses)
- Cost of raw water for use in manufacturing

- Outside Investment
- Education
- Enforcement of the law
- Factories complying with the law
Step 3 – Look for feedback and Leverage Points

- Discharge from Industry sources
- Overall Water quality and quantity
- Riverine aquatic and terrestrial biodiversity
- Effects on Human health
- Ability to catch fish and other commercial species in the river
- Outdoor recreation on or near river
- Cost of raw water for use in manufacturing
- Economic Growth
- Public perception of the problem
- Reputation of the company
- Outside Investment
- Revenue Profits (Income – Expenses)
- Enforcement of the law
- Factories complying with the law
- Technology
- Education
- Government Policy Regulations and laws
- Policy
- Corruption
- Enforcement of the law
- Program

Climate Change

- Outside Investment
- Program
Systems thinking ... Linking to personal relevance and behaviour change

(an example)

Climate change can cause...
- Changing weather patterns
- Melting Glaciers
- Rising Sea Levels
- Floods
- Droughts
- Desertification
- Loss of Biodiversity
- Spreading Disease
- and more global challenges

Fossil fuels such as coal and natural gas are burned to make electricity

More heat is trapped in the atmosphere

The rate of climate change increases

CO₂ is released into the atmosphere

Electricity consumption

Decision making

Education for Sustainable Development

‘feedback’?
Environmental Protection = Action
Action Competence (UNESCO 2002)

Avoid the belief that awareness leads to understanding, understanding leads to concern, and concern motivates the development of skills and action.

Start from the questions, issues and problems that concern young people themselves, and help them develop action competence through community based learning.
REAL Education Project

By ...Thai Education Foundation
What is the REAL Project??

REAL stands for …

Rural Ecology and Agricultural Livelihoods

REAL education is an integrated learning process in which school children …

- explore what is happening in local farms
- gain an understanding of ecology and develop critical thinking skills with respect to environmental, health and social problems.
REAL Education - Thailand

- REAL stands for Rural Ecology and Agricultural Livelihoods. REAL education is an integrated learning process in which school children explore what is happening in local farms. They gain an understanding of ecology and develop critical thinking skills with respect to environmental, health and social problems.

- This movement has a close association with the Integrated Pest Management (IPM) programmes supported by the UN Food and Agriculture Organisation (FAO).

Delivering REAL education

- For students, **REAL education** involves weekly sessions in the field and classroom where they discover how to grow their own crops, conduct simple experiments and make detailed observations of the agro-ecosystem.

- The role of REAL teachers is to facilitate the learning process, not to deliver information. Teachers arrange resources, demonstrate study techniques, set problems, ask questions and provide encouragement.

- Parents have an important role through participating in surveys and discussions organised by students, and as resource persons who provide plots of land, implements and specialised knowledge.

Delivering **REAL education**

- By exploring what is happening in a rice field, students can be introduced to a wide range of environmental issues such as food chains and life cycles, water pollution and soil erosion, biodiversity and GMOs.

- The information and materials which students collect in the field are used as a basis for science projects, math exercises, art activities, and essay writing assignments.

- Students are encouraged to keep portfolios of the work they produce, and exhibitions are organised to share this work with the community.

Students together with farmers, religion leaders, and local agencies identified locations of habitats, conducted survey to collect species.

Together, they analyze the benefits, hazards, treats, status and documented all species found as the community farmland biodiversity information that can be used for sharing and learning.

They then prioritized and selected species that they want to conserve and develop habitat action plan.

The selected species are those that are nearly extinct or had disappeared and must have value to their livelihood such foods, medicine, income and etc.
Reorienting Education for Ecological Sustainability
“All Education is Environmental Education”

Source: David Or (Earth in Mind, 1994)
One of the essential aspects in creating an ecologically sustainable society is the knowledge of how to live in balance with the Earth’s living systems; meaning how to balance our social and economic activities in accordance with natural laws, energy flows and a finite limit of resources.

Environment education will be central to achieving sustainability
Environmental issues are complex and cannot be understood through any single discipline, subject or department.

Source: David Or (Earth in Mind, 1994)
The goal of education is not mastery of subject matter but mastery of one's person. Subject matter is simply the tool.

Source: David Or (Earth in Mind, 1994)
Knowledge carries with it the responsibility to see that it is well used in the world.

Source: David Or (Earth in Mind, 1994)
We cannot say that we know something until we understand the effects of this knowledge on real people and their communities.

Source: David Or (Earth in Mind, 1994)
For the inhabitants of a place, education occurs in part as a dialogue with a place and has the characteristics of a good conversation.

Source: David Or (Earth in Mind, 1994)
The way education occurs is as important as its content

Source: David Or (Earth in Mind, 1994)
Experience in the natural world is both an essential part of understanding the environment, and conducive to good thinking.

Source: David Or (Earth in Mind, 1994)
At its foundation, Educational reorientation requires . . .

. . . “rethinking the conduct of childhood and the need to connect the psyche with the earth in the earliest years of our development as humans. Contact with earth, soil, wildlife, trees and animals is the substrate that orients adult thought and behavior to life.

Without this contact with nature, maturity is spurious, resulting in ‘childish adults’ with the ‘world’s flimsiest identity structures.’

Source: Paul Shepard, Nature and Madness, 1982
Incorporating Ecological Protection into the Formal School Curricula

Some thoughts and an examples.
Understanding is the ability to transfer learning to new, different and unique experiences.”

Wiggins
Understanding is . . .

- Understanding is different than knowledge
- Understanding is fluid, transferable to new contexts and transformable into new theory
- Mere knowledge can be rote, understanding provides insight
Start with a Big Idea . . . Enduring & Essential Understanding

- Provides a ‘lens for prioritizing’
- Serves as an organizer for knowledge, skills, values, perspectives and actions … focusing on big ideas, helps students see purpose and relevance of the various pieces
- Support Transference … creates coherence
- Manifest itself in many ways and in many content areas
- Requires Uncovering - its meaning is abstract, so it must be discovered, constructed or inferred by learners
Begin with Understandings to get to Essential Questions

Remember understanding should be:

- Knowledge that is enduring
- Has value beyond the classroom
- Understanding is not obvious to students
  - Most be “uncovered” – inferred, revealed, come to be seen, constructed
- Can often be applied to other situations
- Should be written as a full sentence statement
Enduring Understandings: Format

- No: “Students **will understand** principles of persuasive speaking”
- No: “Students **will know** how to speak persuasively”
- No: “Speak persuasively in public”
- **YES:** “Students **will understand that** persuasion often involves an emotional appeal to the particular wishes, needs, hopes, and fears of an audience, irrespective of how logical and rational the argument”
“To question means to lay open, to place in the open. Only a person who has questions can have real understanding.”

Gadamer, 1994
Essential Questions ...

- Have no simple ‘right answer; they are meant to be argued and discussed (discovered, uncovered)
- Designed to provoke and sustain inquiry
- Often address the foundational or historical issues of a subject
- Lead to more questions
- Naturally come back again when learning
- Encourage ongoing re-thinking of big ideas, assumptions, prior learning (transference…)
- Could be overarching or topical
Brainstorming Essential Questions Based On the Facets

Interpretation
- critique
- illustrate
- judge
- translate
- provide metaphors

Explanation
- describe
- express
- justify
- predict
- synthesize

Application
- build
- create
- design
- perform
- solve

Empathy
- assume role of
- consider
- imagine
- relate
- role-play

Self-Knowledge
- be aware of
- realize
- recognize
- reflect
- self-assess

Perspective
- analyze
- argue
- compare
- contrast
- infer
Desired Outcomes

- Determine the Learning Goal (standard)
- Clarify specifically what the student will know, understand, and be able to do (unpack the standards)
Evidence of Learning

What evidence could be used to document and validate the learning that has been achieved?

Note: Assessment should be done throughout the learning time, and should include formative and not only summative assessments.
Plan the Learning Experience and Instruction

- What specific content and skills must be ‘taught’ to achieve desired results?
- What is the best way to ‘teach’ the content and skills?
- What resources will we need?
- How much time might be required for learning?
Thank you for your attention

Robert Steele, Director / Senior Associate
Tel: +662 246 7036
Mob: +6681 920 2215
robert@atkisson.com
www.AtKisson.com