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Sustainability Education in the Engineering and Built Environment Curriculum: The Case for Asia-Pacific

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RMIT University

19-21 November 2012
Outline of presentation

Built Environment • Impact of the built environment

The case for Asia-Pacific • ProSPER.Net Project
• Education for sustainability in the built environment
• Transforming sustainability knowledge

Integration and innovation in sustainability education • Workshop findings: Learning outcomes
• Workshop findings: Pedagogical methods
• Development and framework for the guide
• Future directions and imperatives
Overview: Impact of the built environment

*Final energy consumption by buildings in Asia*

Source: Asia / World Energy Outlook 2006  (The Institute of Energy Economics Japan, 2006)
Projected buildings related CO$_2$ emissions (IPCC)

Projections under rapid economic growth in developing nations

Major cities and centres in the Asia-Pacific Region

Ho Chi Minh, Vietnam
Melbourne, Australia
Kuala Lumpur, Malaysia
Bangkok, Thailand
Tokyo, Japan
The role of higher education

United Nations University - Institute of Advanced Studies

Promotion of Sustainability in Postgraduate Education and Research

• Alliance
• Working together
• Postgraduate and undergraduate curricula
• Strong education and research programs
• Aspiring innovators in Sustainable Development and related fields

ProSPER.Net
ProSPER.Net Project: The case for Asia-Pacific

“Integrating sustainability education into existing engineering and built environment curriculum”

Objectives

• Integrate **sustainability thinking and practice** into engineering and built environment curricula

• Identify **key priorities** for inclusion in the professional development program

• **Contextualise the priorities** within global and local policy commitments for sustainability in the built environment

ProSPER.Net Project: The case for Asia-Pacific

“Integrating sustainability education into existing engineering and built environment curriculum”

Outputs of the project

Desktop literature review
• What is currently being included/integrated and how is this taking place?

Participant involvement
• Current programs and course offerings in the built environment curricula

Core activity: workshop (Ho Chi Minh City, Vietnam)
• Bring together participants – participatory action research
ProSPER.Net Project: The case for Asia-Pacific

Universities:
Asian Institute of Technology (Thailand)
Tongji University (China)
University of the Philippines (Philippines)
National Institute of Advanced Studies in Architecture (India)
Universiti Sains Malaysia (Malaysia)
Universitas Gadjah Mada (Indonesia)
International University, Vietnam National University – HCM (Vietnam)
University of Tokyo (Japan)
RMIT University (Australia).

Industry:
World Green Building Council
Vietnam Green Building Council
Sino-Pacific Construction Consultancy Co. Ltd (Vietnam)
Vietnam Centre for Research and Planning on Urban and Rural Environment
Vietnam Institute for Architecture and Urban-Rural Planning (VIAP)
Vietnam Ministry of Construction (MOC).
ProSPER.Net Project: The case for Asia-Pacific

Highlighted issues

- Curriculum design and structure;
- Capacity building for academics in transforming sustainability knowledge;
- Sustainability pedagogies;
- Pedagogical implications in the engineering and built environment disciplines;
- Learning outcomes – student experiences;
- Industry input – students as employable graduates; and
- Challenges to professionals in the field of built environment, their institutional structures and boundaries.
# Education for sustainability in the built environment

## Learning about sustainability versus Learning for sustainability

<table>
<thead>
<tr>
<th>Traditional (‘about’ approach)</th>
<th>Critical (‘for’ approach)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Passing on knowledge and raising awareness of issues</td>
<td>- Understanding and getting to the root of issues</td>
</tr>
<tr>
<td>- Teaching attitudes and values</td>
<td>- Encouraging values clarification</td>
</tr>
<tr>
<td>- Seeing people as the problem</td>
<td>- Seeing people as agents of change</td>
</tr>
<tr>
<td>- Single actions</td>
<td>- Learning for Change</td>
</tr>
<tr>
<td>- More focus on individual and personal change</td>
<td>- More focus on structural and institutional change</td>
</tr>
<tr>
<td>- Integration</td>
<td>- Innovation</td>
</tr>
<tr>
<td>- Problem-solving</td>
<td>- Creating alternative futures</td>
</tr>
<tr>
<td>- Sending messages</td>
<td>- Creating opportunities for reflection, negotiation and participation</td>
</tr>
</tbody>
</table>

Educational responses

'**designed**' learning + ‘**attendant**’ learning

Source: Education for sustainability: the role of capabilities in guiding university curricula (Sterling & Thomas, 2006, p355)
Transforming sustainability knowledge

- **fundamental change of purpose** or, at very least, an additional key purpose of education.

- embedding, embodying and exploring the nature of sustainability as intrinsic to the **learning process** – nurturing **critical, systemic and reflective thinking; creativity; self-organisation; and adaptive management** – rather than education ‘about’ sustainability, or education ‘for’ particular sustainable development outcomes.

- not prescriptive, but **indicative and purposeful**.

- goes beyond liberal humanist traditions in education through **synergy with systemic and sustainability core values, concepts and methodologies**.

- Challenges the limiting effects of characteristics of the dominant mechanistic paradigm, such as top-down control, centralisation, managerialism, instrumentalism and the devaluing of humanities and arts.

- based on ‘systemics’ rather than ‘systematics’ – **emphasis is on systemic learning as change**, rather than **systematic control** in response to change.

Source: An analysis of the development of sustainability education internationally: evolution, interpretation and transformative potential. (Sterling, S., 2004, p57-58)
Integration of sustainability in higher education

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmissive learning</td>
<td>Learning through discover</td>
</tr>
<tr>
<td>Teacher-centred approach</td>
<td>Learner-centred approach</td>
</tr>
<tr>
<td>Individual learning</td>
<td>Collaborative learning</td>
</tr>
<tr>
<td>Learning dominated by theory</td>
<td>Praxis-oriented linking theory and experience</td>
</tr>
<tr>
<td>Focus on accumulating knowledge and a content orientation</td>
<td>Focus on self-regulative learning and a real issues orientation</td>
</tr>
<tr>
<td>Emphasis on cognitive objectives only</td>
<td>Cognitive, affective, and skills-related objectives</td>
</tr>
<tr>
<td>Institutional, staff-based teaching/learning</td>
<td>Learning with staff but also with and from outsiders</td>
</tr>
<tr>
<td>Low-level cognitive learning</td>
<td>Higher-level cognitive learning</td>
</tr>
</tbody>
</table>

Source: An analysis of the development of sustainability education internationally: evolution, interpretation and transformative potential. (Sterling, S., 2004, p58)
ProSPER.Net Workshop: Findings

Learning outcomes and anticipated attributes

<table>
<thead>
<tr>
<th>From academics</th>
<th>From industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Genuine concern</td>
<td>1. Motivation to make change</td>
</tr>
<tr>
<td>2. Discipline / competence /</td>
<td>2. Life-cycle thinking</td>
</tr>
<tr>
<td>sustainability</td>
<td></td>
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<tr>
<td>3. Good team player</td>
<td>3. Open to other disciplines</td>
</tr>
<tr>
<td>4. Right attitude</td>
<td>4. Environmental / social / economic implications of their</td>
</tr>
<tr>
<td></td>
<td>work</td>
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</tbody>
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ProSPER.Net Workshop: Pedagogical Methods

Development and changes to built environment curriculum

<table>
<thead>
<tr>
<th>How educators will make the change</th>
<th>How to engage industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change teaching content</td>
<td>Continuing professional education</td>
</tr>
<tr>
<td>Research collaboration</td>
<td>Open lectures / seminars open to all in the university rather than just within the program</td>
</tr>
<tr>
<td>Sharing / networking lessons learned</td>
<td>Research collaboration</td>
</tr>
<tr>
<td>Best practice examples / case studies used where possible</td>
<td>Form partnerships: students and industry through conferences such as with Green Building Councils, etc.</td>
</tr>
<tr>
<td>Dialogue / discussions with industry</td>
<td>Getting industry speakers</td>
</tr>
<tr>
<td>Invite industry to: student presentations, faculty presentations</td>
<td>Accreditation considerations</td>
</tr>
<tr>
<td>Dialogue / discussions with other university staff / officials</td>
<td>Organise activities with industry (e.g. conferences, seminars, etc.)</td>
</tr>
<tr>
<td>Keep looking for funding</td>
<td>Send graduates to individual companies</td>
</tr>
<tr>
<td>Lobbying politicians</td>
<td>Mentoring</td>
</tr>
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<td></td>
<td>Alumni tracking – surveys</td>
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<tr>
<td></td>
<td>Advisory boards</td>
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<td></td>
<td>Adjunct professors</td>
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<tr>
<td></td>
<td>Feel good stories / testaments</td>
</tr>
</tbody>
</table>
Curriculum guide

Development and framework for a curriculum guide:

• focus primarily on the built environment and construction sector

• point to sustainability education in the built environment

• emphasise integration of sustainability thinking and practice

• nurture key role of related professions in sustainable developments.

Adapted from: Strategies and Actions for Sustainable Construction (CIB, 1999, p21)
Curriculum guide

Structure:

- **Section 1:** outlining priorities; contextualising priorities and strategies for capacity building
- **Section 2:** guiding principles for teaching and learning issues; learning aims and outcomes; transformative approaches monitoring and feedback loops
- **Section 3:** Curriculum dissemination and distribution

Adapted from: Strategies and Actions for Sustainable Construction (CIB, 1999, p21)
Future directions and imperatives

Sustainability as knowledge, process, practice, paradigm

Key to professional education
- pedagogical implications
- learning outcomes
- industry input
- challenges to professionals in the engineering and built environment field

Architecture

Engineering
Thank you.

Further information:

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