Empowering the teacher – ESD the Chalmers way

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"Chalmers – for a sustainable future"
Agenda

1. ESD at Chalmers
   a) State and challenges
   b) Approach
2. ESD in UNECE
ESD at Chalmers University of Technology – some landmarks

1985
- Courses on environment and SD for all students
- Policy 1985
- Compulsory 2003-

Gothenburg Centre for Environment and Sustainability (GMV) 1989-
- Chalmers Environmental Initiative – 7 professors 2000-2008

Chalmers Learning Centre 2009-
- Chalmers Students for Sustainability 2001-
- Environmental Management System (EMS) 2004-
- Conferences and workshops on learning for SD 2001-

AGS 2001-

Vision: Chalmers for a Sustainable Future 2008-
- The ESD project - 3-year reform project 2006-2009
- UNESCO chair in education for SD 2006-

UNESCO chair in education for SD 2006-

Chalmers for a Sustainable Future 2008-

Vice President for SD 2010-
- ESD compulsory for PhD students 2012-
- Pedagogical development leaders 2012-
- ESD integrated into EMS 2012- and process organisation 2014-

ESD at Chalmers University of Technology – some landmarks

2014
The general structure of ESD in Chalmers’ educational programmes

- **Mainstreaming** – part of all educational programmes
- There is a **core SD content** that needs space in the curriculum
- It should be angled towards the **specialisation**
- Sustainability issues also need to be **integrated** into the curriculum – ideally, as the point of departure

1a Chalmers – State and challenges
Courses marked by programme directors to fulfill the local course requirement on ESD

Academic year of 2011/12

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- Full course = Green
- Part of course = Red

Full height of row = 15 hec
Are we educating engineers with the competences that industry requires?

Master theses, 2009-2010 (2 x 60 ECTS); Interviews with 16 companies and 5 organizations, alumni survey, course content analysis (70 courses), student survey.

Some conclusions:

• **Industry** demands more competences in SD amongst all engineers than what is currently provided at universities in Sweden. A stronger focus on the **business perspective** is wanted.

• 35% of **alumni** claim to encounter sustainability issues regularly in their work. Only half of them believe they possess enough competences to make decisions from a sustainability perspective.

• **Quantity, coverage and the level of integration in the educational programme** seem to be important for the **students’** perceived competence on SD and for the importance that they put on achieving SD.

"Do you regard knowledge in sustainability relevant for your education?"
A. The concept
- History
- Definitions
- Ethical incentives
- Dimensions
- Communication

B. Problems; causes and measures
- State and trends
- Critical problems
- Systemic thinking - methods, models
- Measures, strategies
- Drivers and barriers

C. The professional role
- Change in SD context
- Individual responsibility
- Opportunities

### ‘Recommended’ learning outcomes in the local course requirement on ESD
(document developed by ESD teachers in 2009)

<table>
<thead>
<tr>
<th>Knowledge and understanding</th>
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<tr>
<td>Account for the concept of SD and the political ambitions behind it</td>
<td>Account for causes behind unsustainable development, including relevant examples of states and trends in natural and societal systems</td>
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<td>Describe the profession’s interface to natural and societal systems</td>
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<th>Skills and abilities</th>
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<td>Use a systemic perspective to analyse product life cycles and cause-effect chains that reach from technical systems to natural and societal systems, and be able to interpret models of these</td>
<td>Use problem solving, critical and creative thinking, be able to communicate and cooperate, and be able to discern power issues in different decision-making processes in order to prepare for life-long learning and for becoming an effective change agent for SD</td>
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<td>Apply and shift between different perspectives in order to understand the situation of other stakeholders, and in order to be able to determine the viability of different options</td>
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<td>In a structured way reflect on his or her professional role and responsibilities as a professional and as a citizen in relation to SD</td>
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<th>Attitudes</th>
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<td>Separate facts from values, identify ethical dilemmas, and be able to apply and discuss different ethical principles</td>
<td>Accept that judgements are based on both facts and values, and that different value bases can give different outcomes</td>
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Audits by the National Agency for Higher Education

- **2005**: Criticised all Master of Science in Engineering programmes in Sweden for *insufficient education on sustainable application of technology*. Degree ordinance states that students should be able to:
  - show the ability to develop and design products, processes and systems with consideration of conditions and needs of people as well as society’s goals for economically, socially and ecologically sustainable development
  - show insight into the possibilities and limitations of technology, its role in society, and people’s responsibility for how it is used, including social, economic and environmental aspects as well as aspects related to the work environment

- **2013**: Very good outcome for Chalmers – best in the country! But when writing the self evaluation reports, programme director’s themselves discovered a *lack in terms of ethical principles and dilemmas*
Embedding sustainability into the engineering curriculum

Overall approach:

Change will only come if **people** in the system have the **will** and the **skills** and if they are **encouraged** and even **pushed** by the system.

**Teachers are key players!**

Seek impact on two important facets of change – **individuals** as well as their **environments**.
Lessons Learned from Efforts to Integrate ESD into Educational Programmes at Chalmers

**People** and **structures** in the organisation need to be targeted; changes of attitudes, capacity building, drivers for change etc

- Try to find out **what motivates change**, e.g. academic merits, money, other, ...
- **Hitch-hike** with other processes of change, e.g. Bologna effort, audits (watch out for change fatigue!)
- Identify, respect and use existing **structures**, e.g. the annual course development cycle
- Try to get **everyone** to feel **responsible** – avoid lock-in to individuals and groups (but someone has to have the main responsibility!)
- Try to **initiate learning processes** in individuals – in many places and at many levels: “How does your area contribute to SD?” (inspired from Individual Interaction Method at Delft University of Technology)
- Showcase **champions** and **good examples** to show that change is possible and positive

Embedding of ESD in engineering education - experiences from Chalmers University of Technology; M Svanström, M Eden, T Nyström, U Palme, O Carlson and M Knutson Wedel; *Int J Sustainability in HE* 13(3), 2012
We focus on the scholarship of teaching and learning (SoTL) in pedagogical development (including ESD)

For teachers to become critically reflective practitioners, doing action research

Trigwell et al. (2000):
1. teachers **conceptualize** teaching in a student-focused way;
2. teachers **reflect** on their own practice and student learning within their own discipline: “What do I need to know and how do I find out?”;
3. teachers **inform** themselves by engaging with the literature on teaching and learning, of a general nature and within their own discipline, and conducting action research;
4. teachers formally **communicate** and disseminate their practice and conceptions of teaching and learning to their peers
Examples:

- learning centre seminar series; GMV seminar series
- annual conference on teaching and learning (KUL):

  - Dec, decision
  - Dec, new abstract
  - Nov, revision workshop
  - Nov, feedback
  - Nov, reviewer dialogue
  - Nov, abstract
  - Oct, peer coaching

Jun, First call for abstracts

Feb, publ. workshop

Jan, Conference

Publication
We make sure that research in engineering education, including ESD, is possible and legitimate

Examples:
• Engineering Education Research graduate school in May 2010
• A learning ”Milieu” at Department of Applied IT with new research groups
• Two PhD students funded by educational management
  – Tabassum Jahan: Teaching mathematical models
We review how well ESD is embedded in the university structure.

Examples:

• how well ESD is covered by the new **process descriptions** at the university

• how well ESD is promoted by the **Environmental Management System**

• how ESD can be put on the agenda in **planning and follow-up** activities (department planning dialogue, staff appraisal discussions etcetera)

• how ESD should appear in **staff development courses** (Diploma of Higher Education, 15 ECTS)

• how ESD experiences/achievements can become a **career advantage** (e.g. pedagogical portfolio)
We provide direct support to teachers and programme directors

Examples:

• 2006-2009: 'Resource group'; 6-8 ESD teachers on 10-20% of their time

• 2012-: 'Pedagogical development leaders'; one for each of the four schools, one for ESD and STS, one for project courses; on 20-30% of their time
We collaborate

Example:
Empowering the teacher – ESD the Chalmers way

- Mainstreaming and embedding
- Motivate and support individuals;
- Promote SoTL
- Promote and safeguard ESD with the university structures

Whole systems approach!
Core competences for learners and criteria for ESD

Tools for policy and practice workshops
## Educator ESD competences

### 1.6 The Competences table

<table>
<thead>
<tr>
<th><strong>Learning to know</strong></th>
<th><strong>Learning to do</strong></th>
<th><strong>Learning to be</strong></th>
<th><strong>Learning to live together</strong></th>
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<tr>
<td><strong>The educator understands...</strong></td>
<td><strong>The educator is able to...</strong></td>
<td><strong>The educator is someone who...</strong></td>
<td><strong>The educator works with others in ways that...</strong></td>
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<td>- The basics of systems thinking</td>
<td>- Critically assess processes of change in society and envision sustainable futures</td>
<td>- Actively engage different groups across generations, cultures, places and disciplines</td>
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<td>- Ways in which natural, social and economic systems function and how they may be interrelated</td>
<td>- Communicate a sense of urgency for change and inspire hope</td>
<td>- Facilitate the emergence of new world-views that address sustainable development</td>
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<td>- The interdependent nature of relationships within the present generation and between generations, as well as those between rich and poor and between humans and nature</td>
<td>- Facilitate the evaluation of potential consequences of different decisions and actions</td>
<td>- Encourage negotiation of alternative futures</td>
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<td>- Their personal world-view and cultural assumptions and seek to understand those of others</td>
<td>- Use the natural, social and built environment, including their own institution, as a context and source of learning</td>
<td>- Challenge unsustainable practices across educational systems, including at the institutional level</td>
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<td>- The connection between sustainable futures and the way people think, live and work</td>
<td>- Engage in problem setting, critical reflection, visioning and creative thinking in planning the future and affecting change</td>
<td>- Help learners clarify their own and others world-views through dialogue, and recognize that alternative frameworks exist</td>
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<td>- Their own thinking and action in relation to sustainable development</td>
<td>- The importance of preparedness for the unforeseen and a precautionary approach</td>
<td>- Be willing to challenge assumptions underlying unsustainable practice</td>
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### HOLISTIC APPROACH

- **Integrative thinking and practice**

### ENVISIONING CHANGE

- **Past, present and future**

### ACHIEVING TRANSFORMATION

- **People, pedagogy and education systems**

- **Why there is a need to transform the education systems that support learning**
- **Why there is a need to transform the way we educate/learn**
- **Why it is important to prepare learners to meet new challenges**
- **The importance of building on the experience of learners as a basis for transformation**
- **How engagement in real-world issues enhances learning outcomes and helps learners to make a difference in practice**

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**UNECE**
Thank you for listening!
Model for programme workshop for teachers – ’group interaction method’

- Programme director plans the day together with resource persons
- Programme director invites teachers and asks them to prepare for the day
- Faculty workshop:
  - Program director explains the purpose of the day and gives an overview of the idea and content of the educational programme
  - Resource persons inform briefly on how embedding of ESD can be achieved and about available support at the university, e.g. the individual coaching discussions
  - Some teachers present ESD in courses in the programme and ideas on how this can be further embedded and the quality improved
  - Group discussion on possibilities to increase the quality and the embedding of ESD in the programme
  - The faculty decides on an action plan together with the programme director
- Resource persons contact the programme director to follow up on what has been achieved and to offer further assistance
We have a compulsory PhD course on research ethics and SD

- Read 1 specified text
- Read 3 texts from list
- Interview supervisor
- Interview ‘external’ person
- Student group peer review seminar
- Lecture/seminar on the SD concept
- Lectures/seminars etc on issues in ethics
- Review 4 other essays
- Generic feedback on essays
- Better ability to reflect around the own research in relation to SD