Empowering the teacher – ESD the Chalmers way

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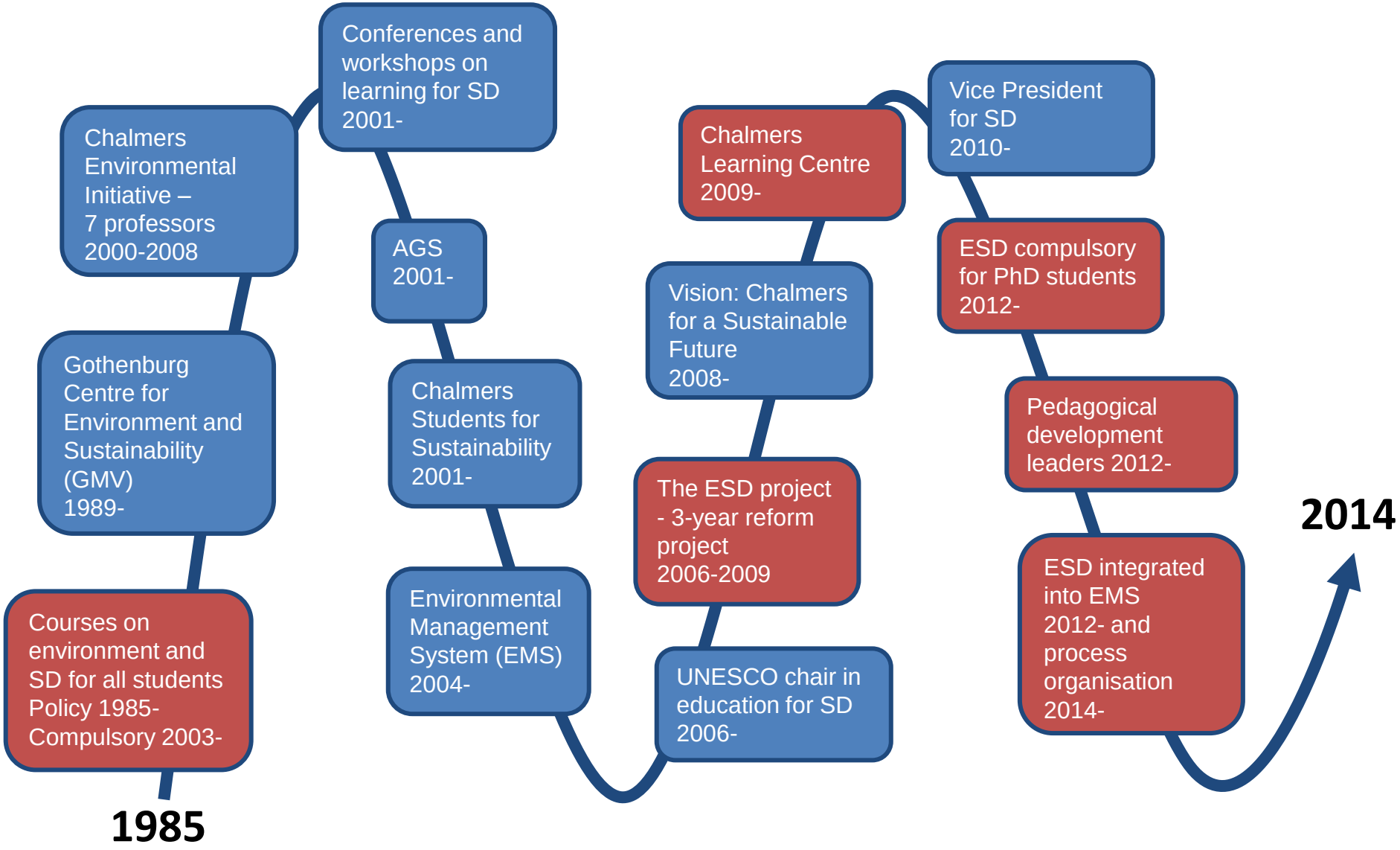
”Chalmers – for a sustainable future”

Agenda

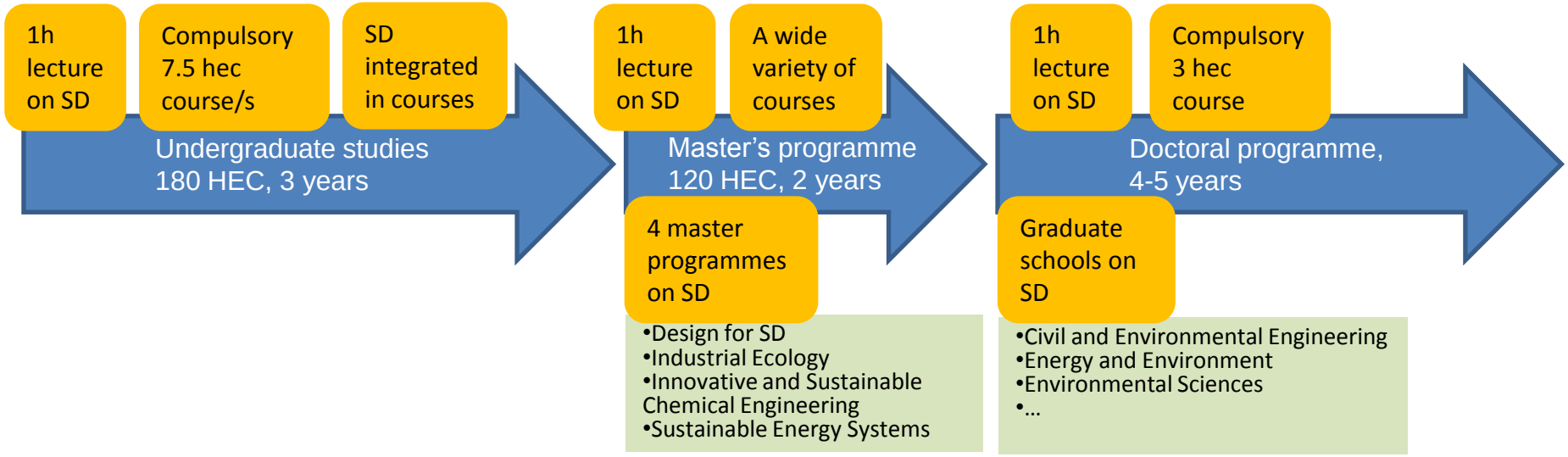
1. ESD at Chalmers
    a) State and challenges
    b) Approach
2. ESD in UNECE



ESD at Chalmers University of Technology – some landmarks

The general structure of ESD in Chalmers' educational programmes

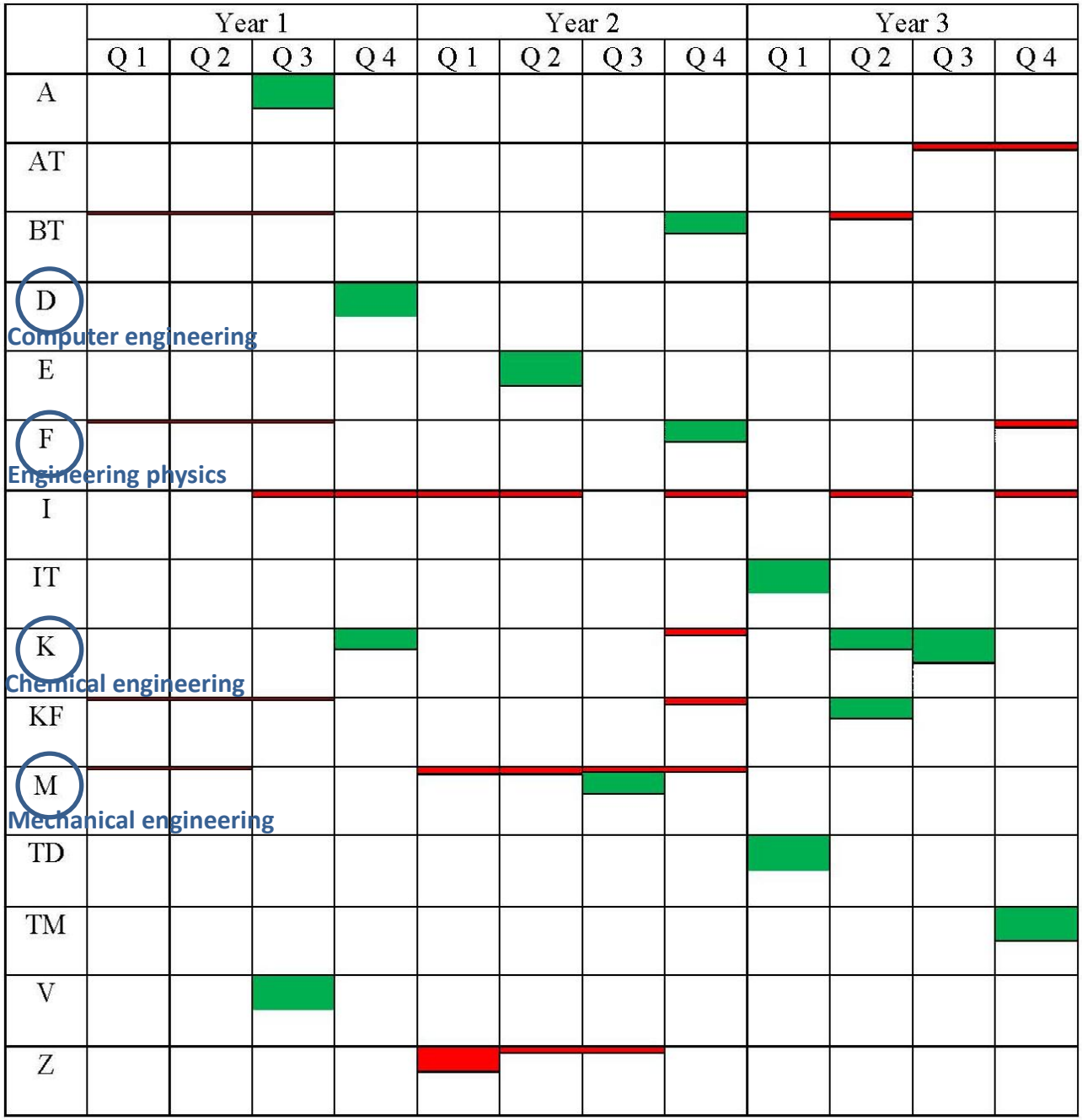
- **Mainstreaming** – part of all educational programmes
- There is a **core SD content** that needs space in the curriculum
- It should be angled towards the **specialisation**
- Sustainability issues also need to be **integrated** into the curriculum – ideally, as the point of departure



ESD in our 15 five-year engineering programmes

Courses marked by programme directors to fulfill the local course requirement on ESD

Academic year of 2011/12



= Full course

= Part of course

Full height of row = 15 hec

Are we educating engineers with the competences that industry requires?

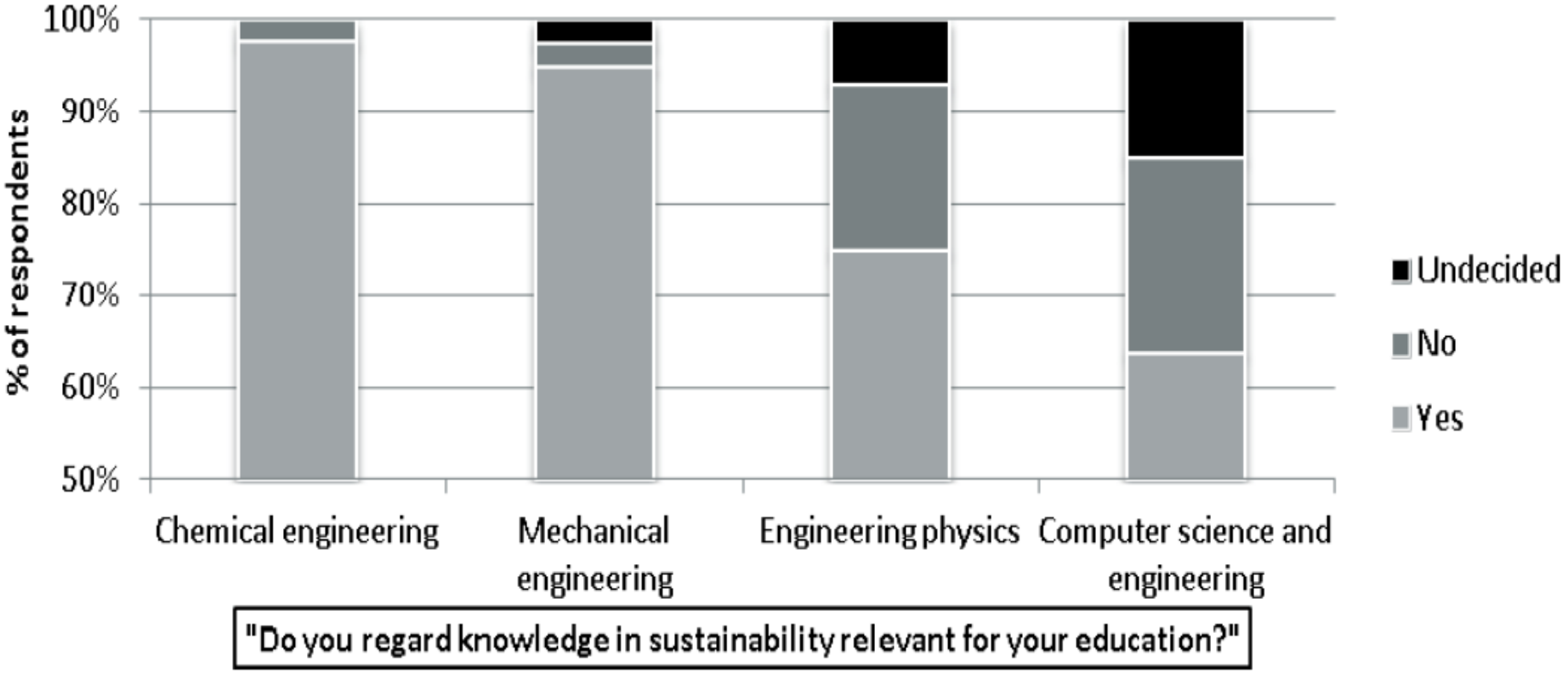
Master theses, 2009-2010 (2 x 60 ECTS); Interviews with 16 companies and 5 organizations, alumni survey, course content analysis (70 courses), student survey.

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.

"Are we educating engineers for sustainability? Comparison between obtained competences and Swedish industry's needs" (2012). Andreas Hanning, Anna Priem Abelsson, Ulrika Lundqvist, and Magdalena Svanström. *Int. J of Sustainability in Higher Ed.* 13 (3) s. 305-320.

1a Chalmers – State and challenges



Content of compulsory ESD courses at Chalmers – comparison to 'desired content'

(document developed by ESD teachers in 2005)

A.The concept

History
Definitions
Ethical incentives
Dimensions
Communication

Concept too briefly introduced;
Ethical perspective is missing

B. Problems; causes and measures

State and trends
Critical problems
Systemic thinking - methods, models
Measures, strategies
Drivers and barriers

Too narrow systems studied

C. The professional role

Change in SD context
Individual responsibility
Opportunities

Individual reflection often missing

"**Inventory of content in basic courses in environment and sustainable development at Chalmers University of Technology in Sweden**", U Lundqvist and M Svanström, *European J Engineering Education* 33(3), 355-364, 2008

'Recommended' learning outcomes in the local course requirement on ESD

(document developed by ESD teachers in 2009)

After the bachelor studies, a Chalmers student should be able to:	
Knowledge and understanding	Account for the concept of SD and the political ambitions behind it
	Account for causes behind unsustainable development, including relevant examples of states and trends in natural and societal systems
	Describe the profession's interface to natural and societal systems
Skills and abilities	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
	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
	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
	In a structured way reflect on his or her professional role and responsibilities as a professional and as a citizen in relation to SD
Attitudes	Separate facts from values, identify ethical dilemmas, and be able to apply and discuss different ethical principles
	Accept that judgements are based on both facts and values, and that different value bases can give different outcomes

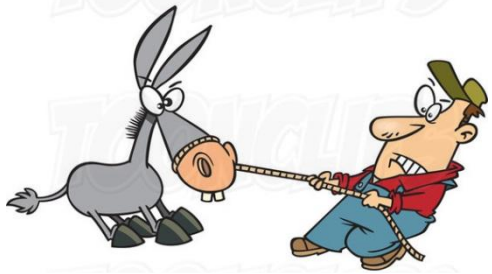
Audits by the National Agency for Higher Education

- **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)

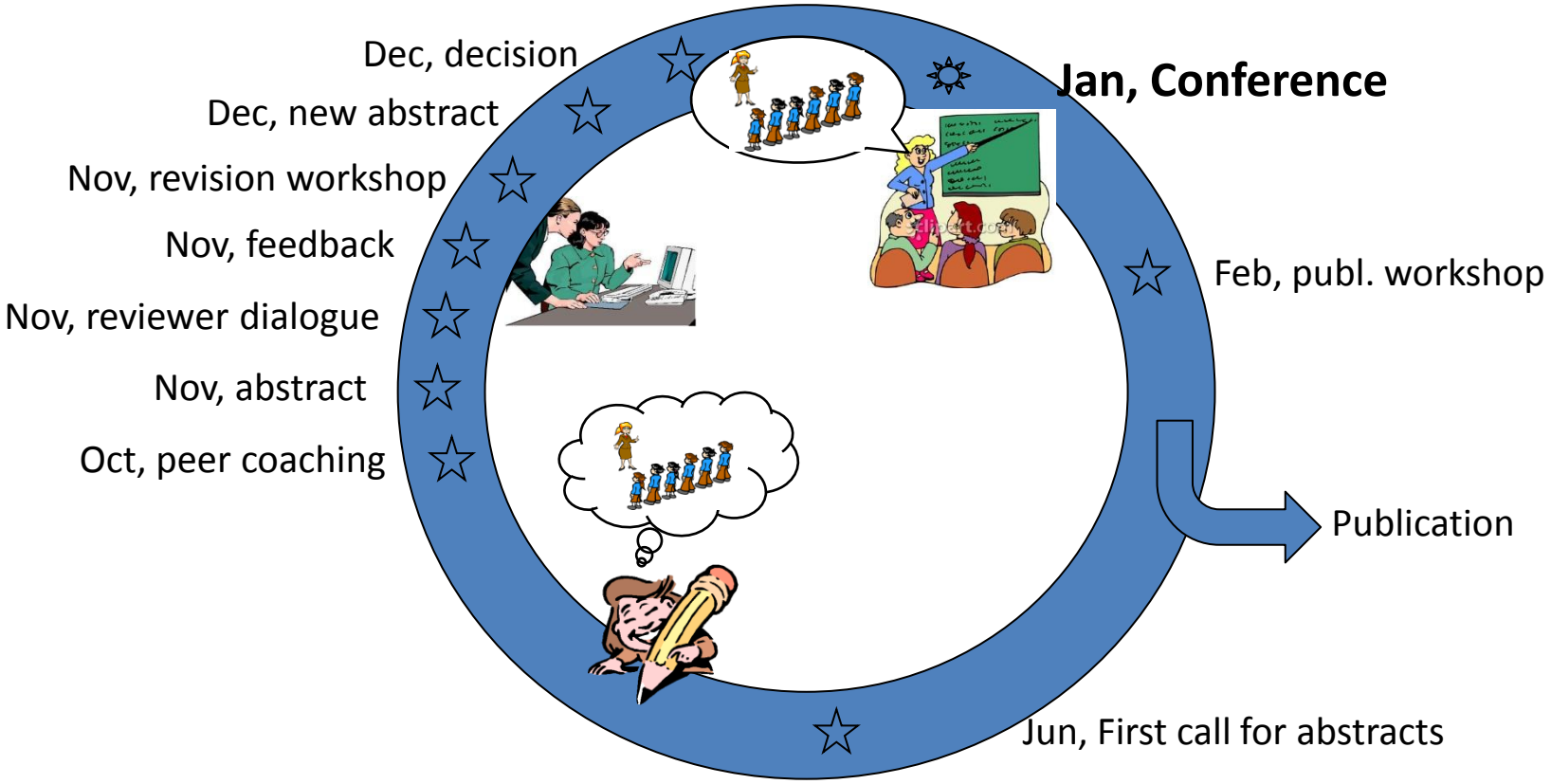
For teachers to become critically reflective practitioners, doing action research

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):

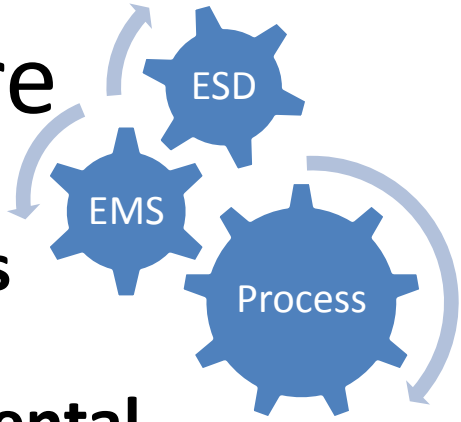


We make sure that research in engineering education, including ESD, is possible and legitimate

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
  - Johanna Lönngren: ”Engineering students’ ways of relating to wicked sustainability problems”, Licentiate thesis, Feb 2014
  - 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

INTERNATIONAL CONFERENCE
ENGINEERING EDUCATION IN SUSTAINABLE DEVELOPMENT
EESD'10
Göteborg, Sweden
19-22 September 2010

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

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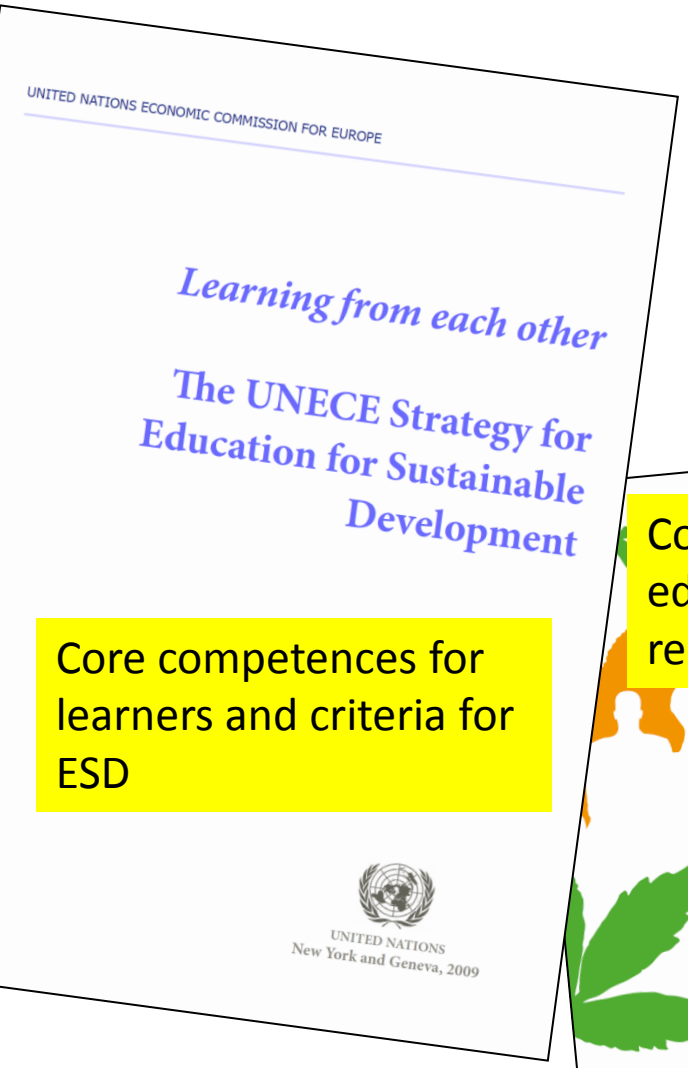
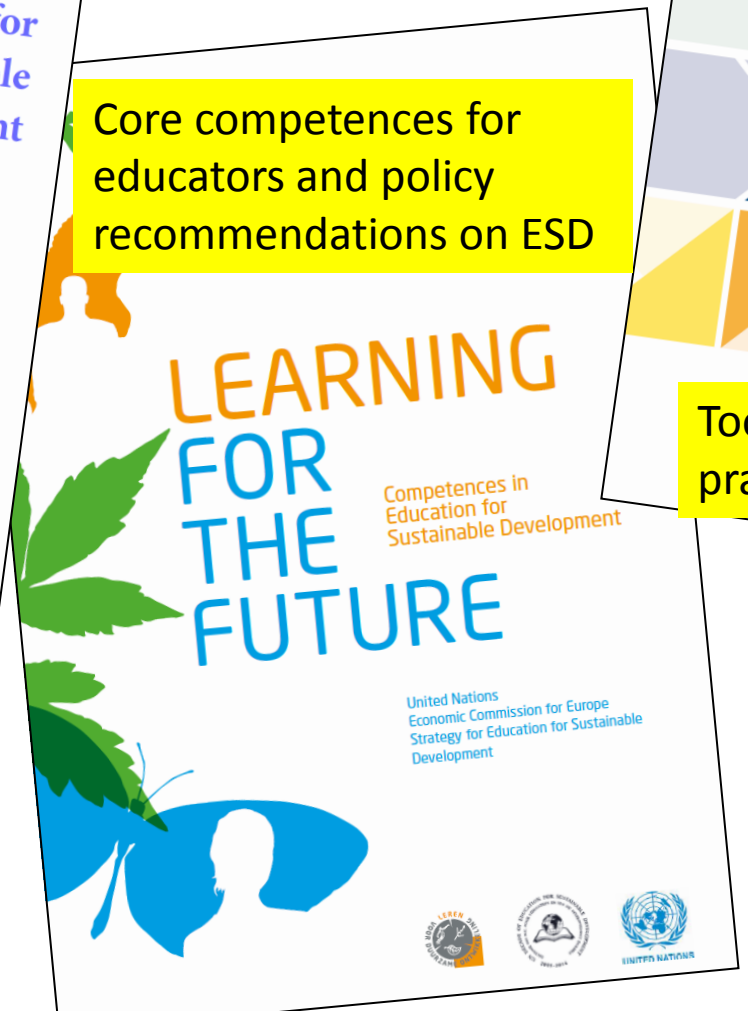
Whole systems approach!

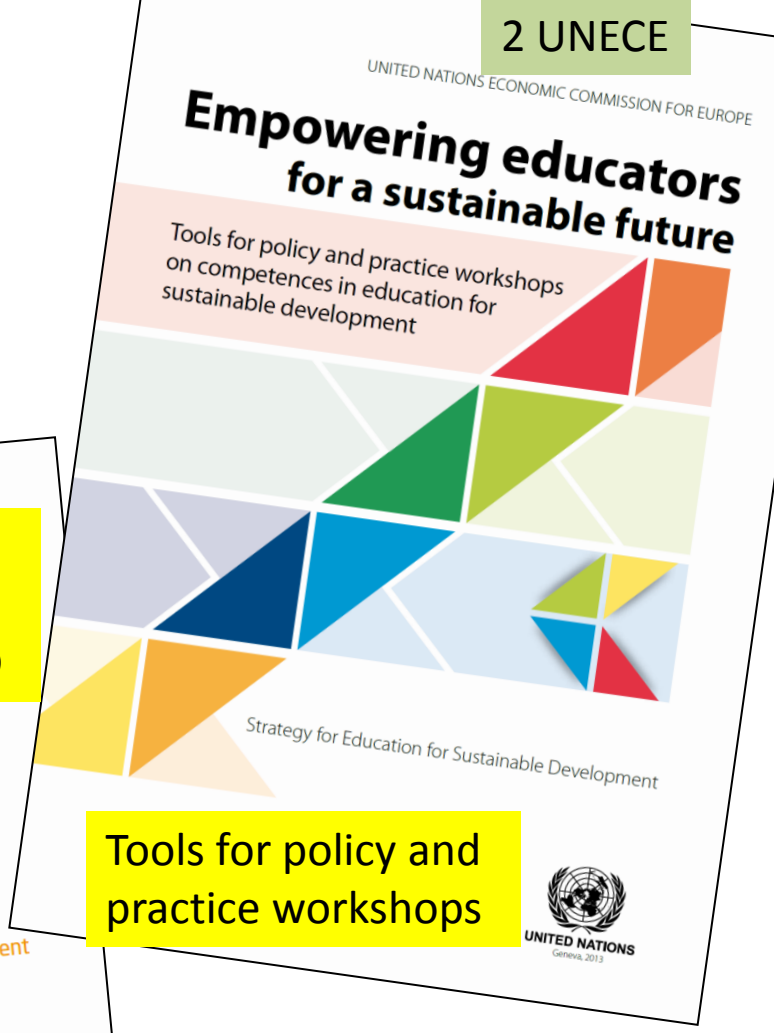
2 UNECE



Core competences for learners and criteria for ESD



Core competences for educators and policy recommendations on ESD



Tools for policy and practice workshops

Educator ESD competences

2 UNECE

1.6 The Competences table

	HOLISTIC APPROACH *Integrative thinking and practice*	ENVISIONING CHANGE *Past, present and future*	ACHIEVING TRANSFORMATION *People, pedagogy and education systems*
Learning to know *The educator understands…*	◣ The basics of systems thinking ◣ Ways in which natural, social and economic systems function and how they may be interrelated ◣ 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 ◣ Their personal world-view and cultural assumptions and seek to understand those of others ◣ The connection between sustainable futures and the way people think, live and work ◣ Their own thinking and action in relation to sustainable development	◣ The root causes of unsustainable development ◣ That sustainable development is an evolving concept ◣ The urgent need for change from unsustainable practices towards an advancing quality of life, equity, solidarity and environmental sustainability ◣ The importance of problem setting, critical reflection, visioning and creative thinking in planning the future and effecting change ◣ The importance of preparedness for the unforeseen and a precautionary approach ◣ The importance of scientific evidence in supporting sustainable development	◣ 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
Learning to do *The educator is able to…*	◣ Create opportunities for sharing ideas and experiences from different disciplines/places/ cultures/generations without prejudice and preconceptions ◣ Work with different perspectives on dilemmas, issues, tensions and conflicts ◣ Connect the learner to their local and global spheres of influence	◣ Critically assess processes of change in society and envision sustainable futures ◣ Communicate a sense of urgency for change and inspire hope ◣ Facilitate the evaluation of potential consequences of different decisions and actions ◣ Use the natural, social and built environment, including their own institution, as a context and source of learning	◣ Facilitate participatory and learner-centred education that develops critical thinking and active citizenship ◣ Assess learning outcomes in terms of changes and achievements in relation to sustainable development
Learning to be *The educator is someone who…*	◣ Is inclusive of different disciplines, cultures and perspectives, including indigenous knowledge and world-views	◣ Is motivated to make a positive contribution to other people and their social and natural environment, locally and globally ◣ Is willing to take considered action even in situations of uncertainty	◣ Is willing to challenge assumptions underlying unsustainable practice ◣ Is a facilitator and participant in the learning process ◣ Is a critically reflective practitioner ◣ Inspires creativity and innovation ◣ Engages with learners in ways that build positive relationships
Learning to live together *The educator works with others in ways that…*	◣ Actively engage different groups across generations, cultures, places and disciplines	◣ Facilitate the emergence of new world-views that address sustainable development ◣ Encourage negotiation of alternative futures	◣ Challenge unsustainable practices across educational systems, including at the institutional level ◣ Help learners clarify their own and others world-views through dialogue, and recognize that alternative frameworks exist

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