New trends in EE: PBL and international mega projects

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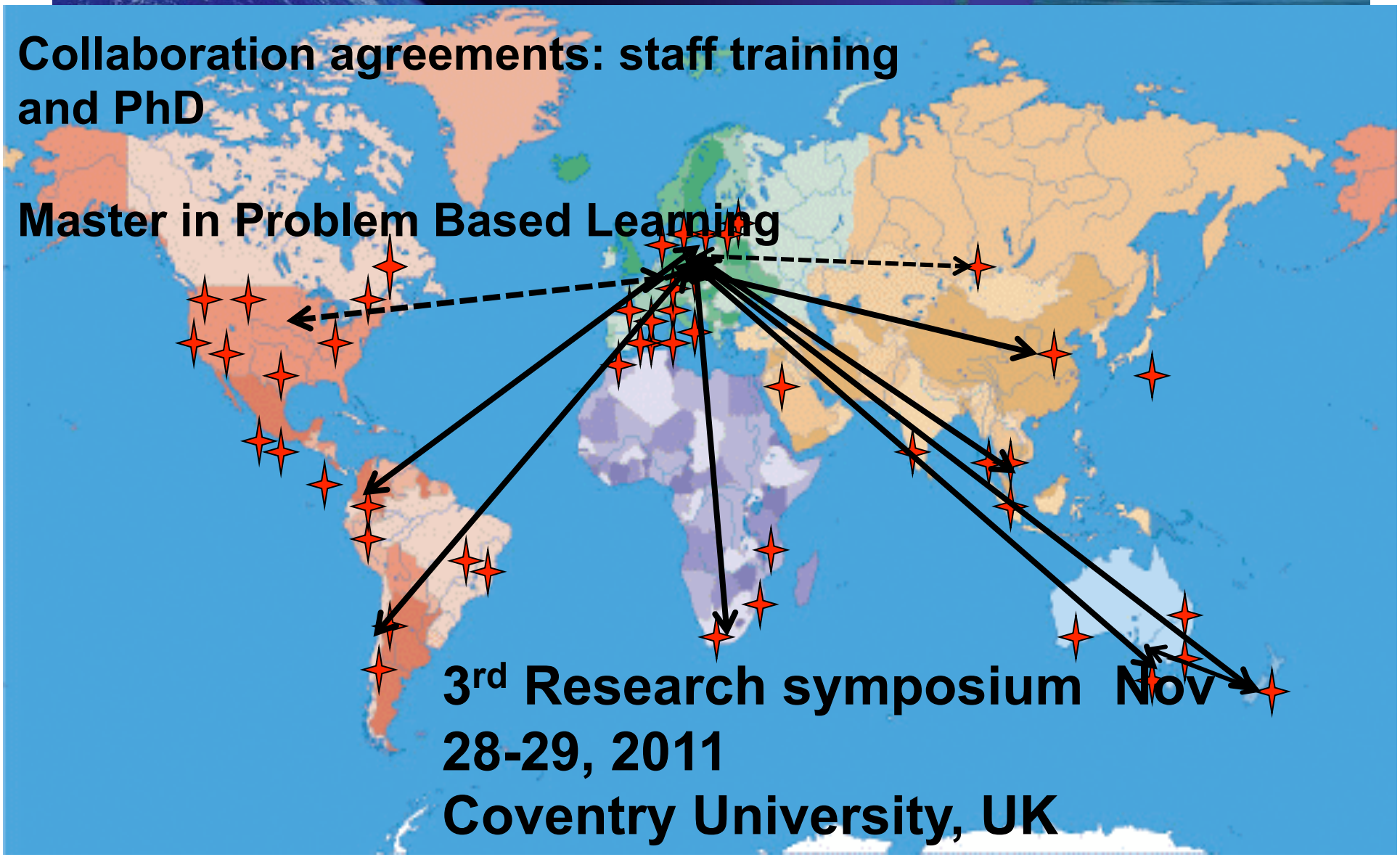
Professor at the UNESCO Chair

http://www.ucpbl.net

UNESCO CHAIR
PROBLEM BASED LEARNING
AALBORG UNIVERSITY • DENMARK

Collaboration agreements: staff training and PhD

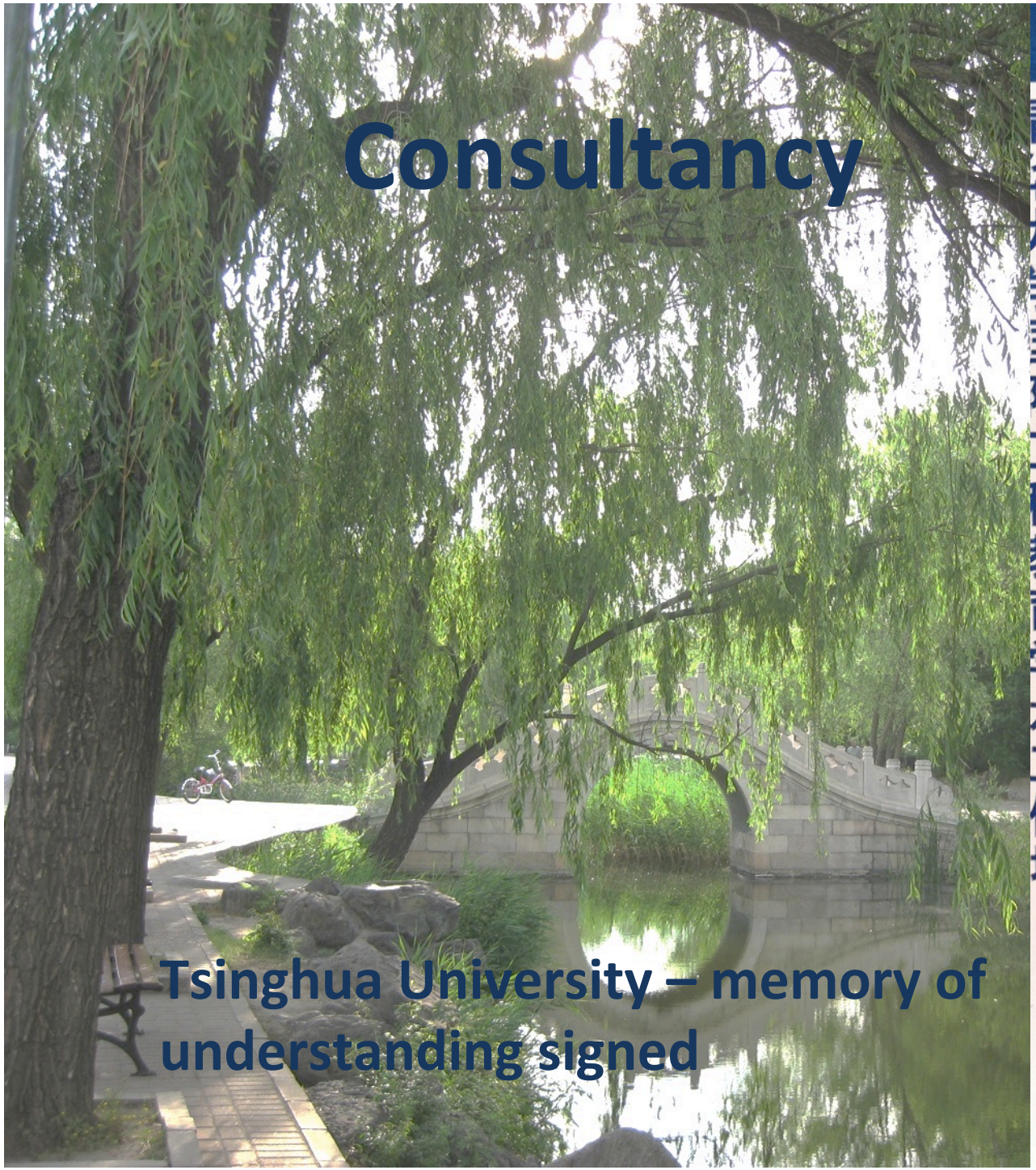
Master in Problem Based Learning



3rd Research symposium Nov 28-29, 2011
Coventry University, UK

Malaysia PhD programme

Consultancy



清华大学国际工程教育学术工作坊

清华大学百年校庆
TSINGHUA UNIVERSITY CENTENARY CELEBRATION

IIDEA WORKSHOP SESSION @ TSINGHUA UNIVERSITY

学习环境: May 30th

跨越工程教学与工程实践的鸿沟

Learning Environments:
Bridging the Gap between the Way We Teach and the Practice of Engineering

基于问题和项目的学习 May 31th

Problem and Project Based Learning

清华大学 北京

Tsinghua University, Beijing, China

May 30th-31st, 2011

主办：清华大学工程教育研究中心
Hosted by: CEE, Tsinghua University

主讲：国际工程教育发展研究院专家
Presented by: IIDEA workshop leaders

赞助：迈斯沃克公司
Sponsored by: Mathworks, Inc.

支持：中国高等教育学会工程教育专业委员会
Supported by: Chinese Society for Engineering Education

Tsinghua University – memory of understanding signed

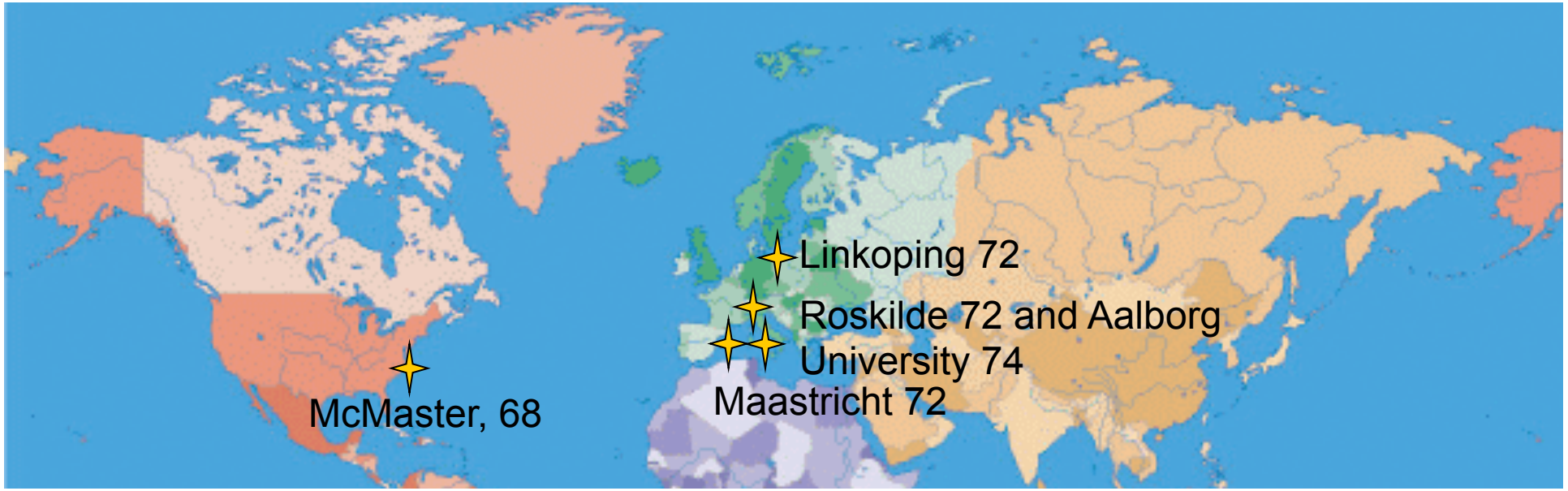
Thailand – establishment of sub center

Singhad Institute – India
PBL sub center

Victoria University/Australia

30
participants
from Victoria
university
MPBL

Reform universities - new systems: PBL



Medicine

- Problems form the focus and stimulus for learning
- Problems are the vehicle for development of problem solving skills
- New information is acquired through self directed learning
- Student-centred
- Small student groups
- Teachers are facilitators/guides

Danish models

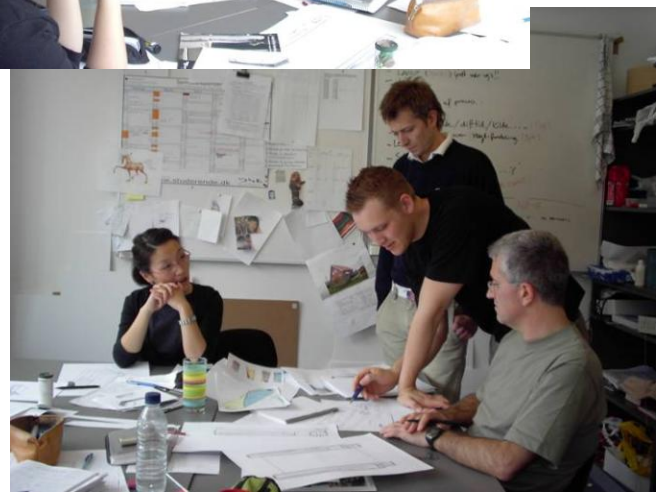
- Problem orientation
- Interdisciplinarity
- Exemplary learning
- Participant directed
- Teams or group work

PBL- learning principles

Learning
Problem based
Contextual learning
Project based / organised
Activity/experience based learning

Social
Participant directed
Team based learning

Content
Theory-practice relation
Interdisciplinary learning
Exemplary learning
Meta-learning/ Double loop learning



CASE A - model

Semester 1-4	Course 5ECTS	Course 5ECTS	Course 5ECTS	Course 5ECTS	Project 10 ECTS
Semester 5	Practicum				
Semester 6	Course 5ECTS	Course 5ECTS	Course 5ECTS	Course 5ECTS	Course and pre project 10 ECTS
Semester 7	Course 5ECTS	Course 5ECTS	Project 20 ECTS		

Total 210 ECTS:

30 ECTS for practicum,

60 ECTS for projects

120 for traditional courses

CASE B - model

Semester 1-4	Courses	Courses	Project 10 ECTS pr. semester
Semester 5	Course	Course	Project 18 ECTS
Semester 6	practicum		
Semester 7	Project normally with a company 30 ECTS		

Total 210 ECTS:

30 ECTS for practicum,

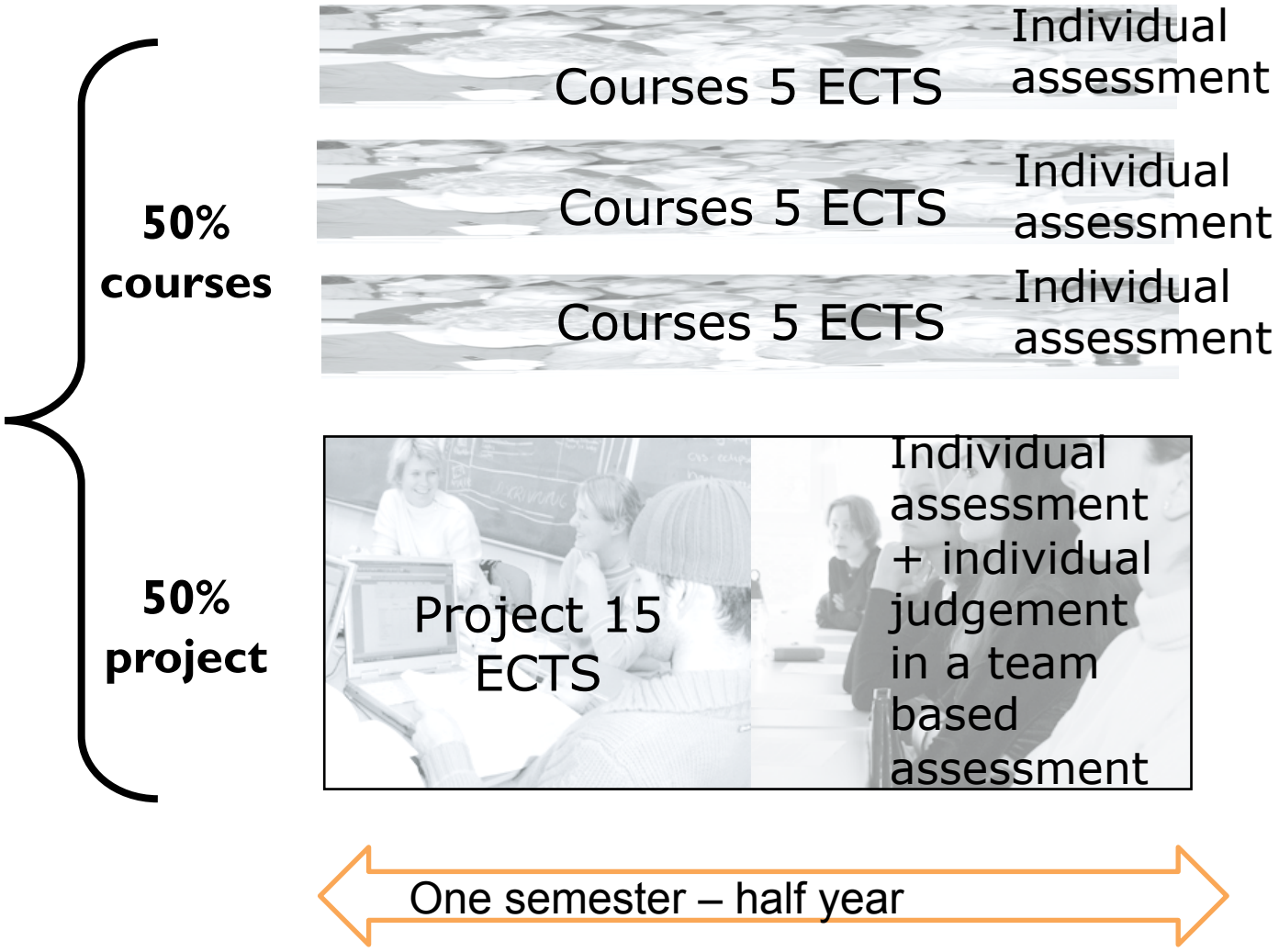
88 ECTS for projects

92 for traditional courses

Case C – Aalborg Model

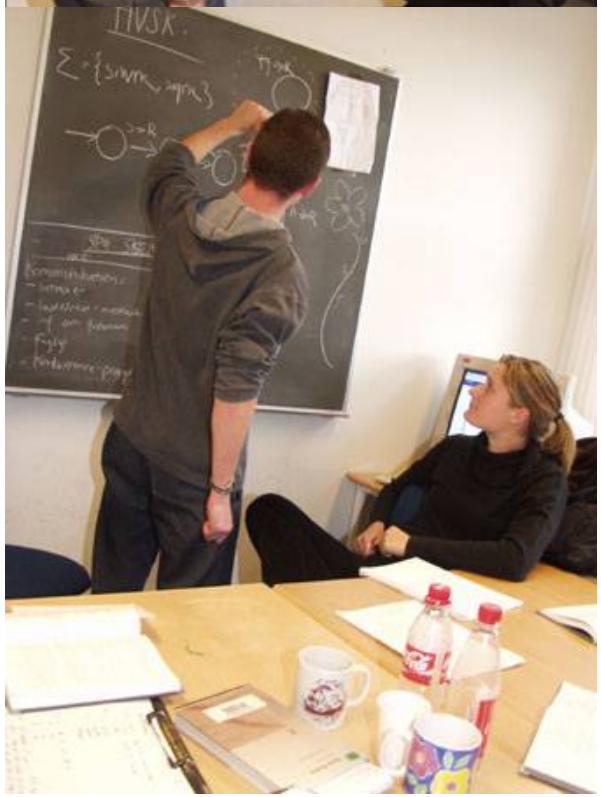
Semester	**Course** **5 ECTS**	**Course** **5 ECTS**	**Course** **5 ECTS**	**Project** **15 ECTS**
1-2				
3-7				
8-10				

The new Aalborg Model

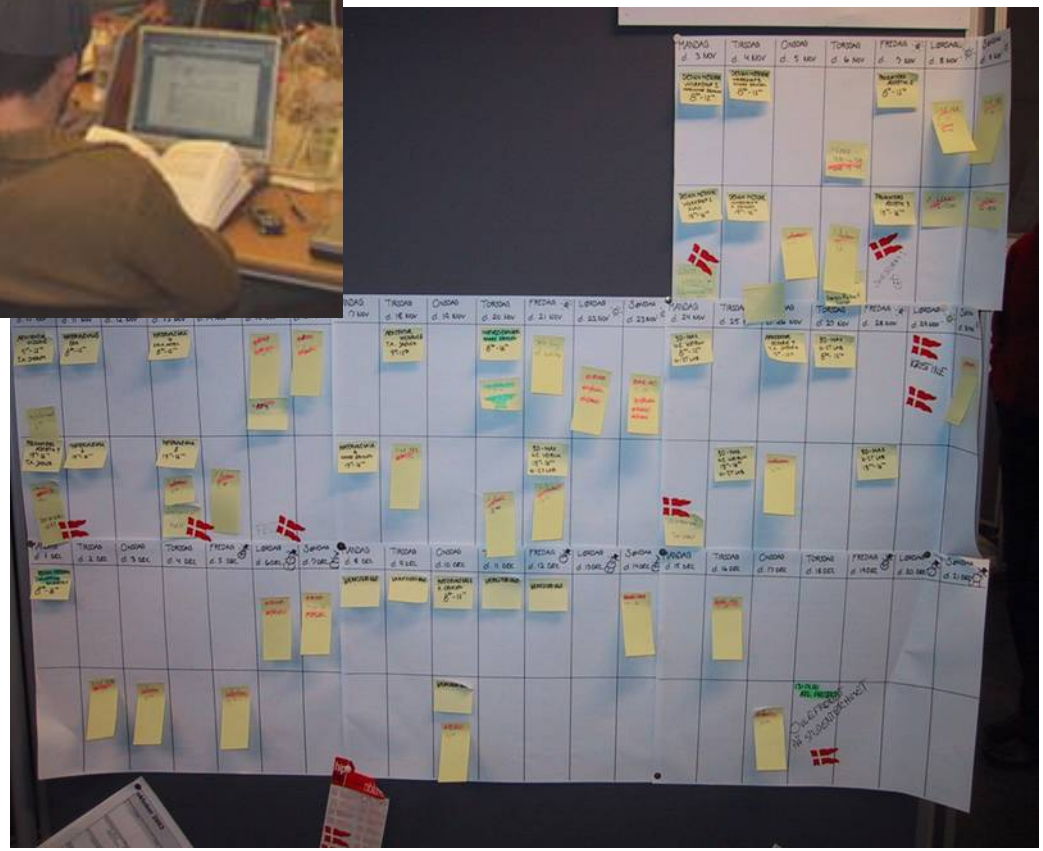


1 ECTS (European Credit Transfer System)
= 30 working hours

One project per semester



Diversity of physical facilitation
More than 1200 rooms for teams

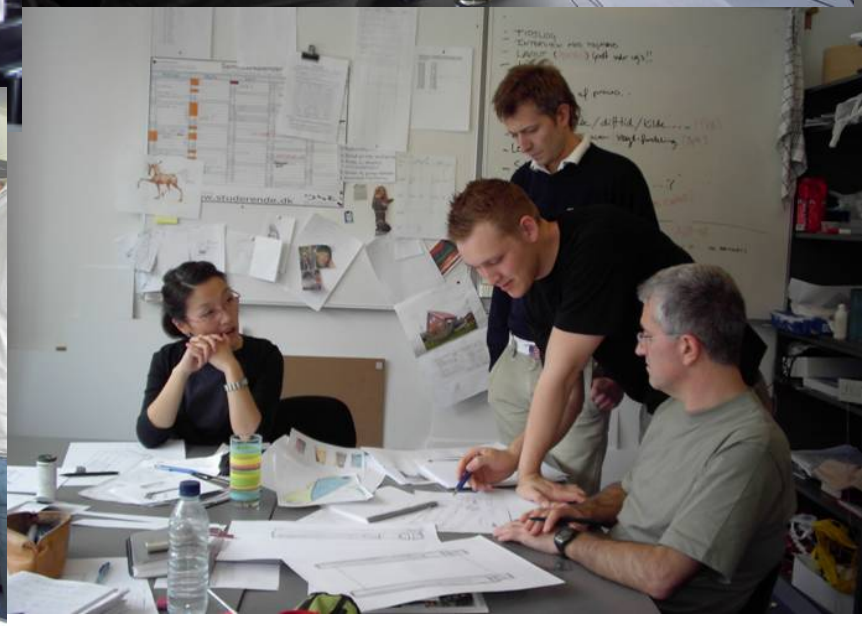


Self organised groups

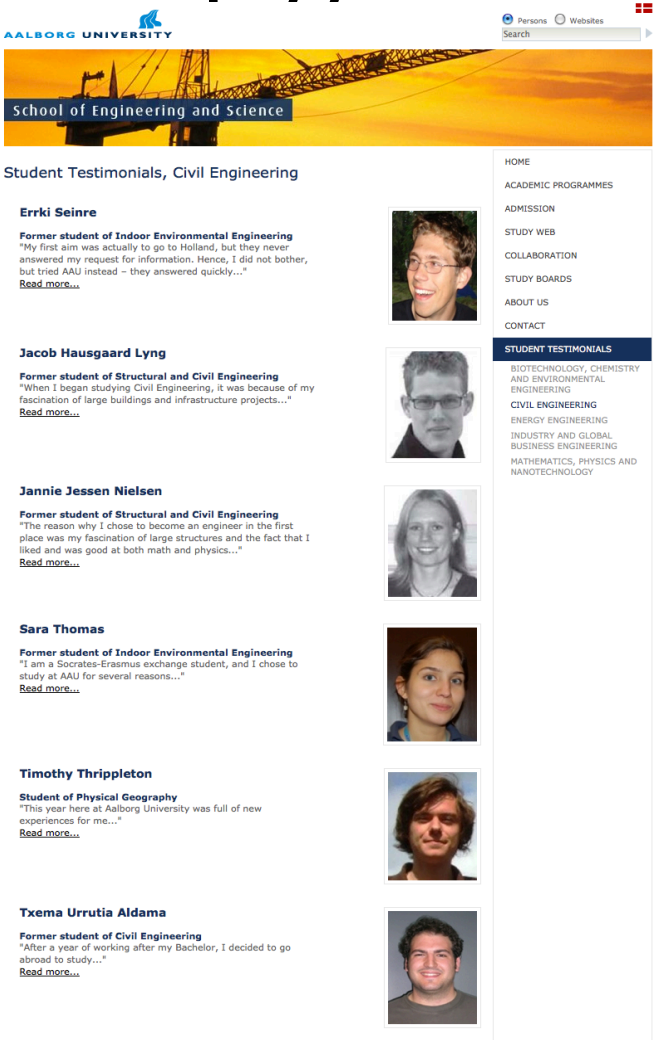
Project management

Many different types of projects

Facilitation and group dynamics



School of Engineering and Science
http://www.en.ses.aau.dk



Civil Engineering: Storey houses of wood - the pros and cons

Domicil Monjasa

- Bygningens konstruktion og energiforbrug

Kasper Fonnesbæk

Julie Trude Jensen

Kristian Kvottrup

Palle Sand Laursen

Karina Bak Pedersen

Andreas Elkjær Riis

Dimension of the roof construction made by tree and concrete
+
Energy consumption

B4 projekt

4. semester AAU

Treatment plants of Wastwater, Bachelor project, 6 students in a group

- In the present project, the focus is on Aalborg WWTP East. The project consists of an analysis of the WWTP including a mass balance of selected organic micropollutants. First, the necessary and future dimensions on the plant were calculated and it was analysed if it was fit for the future, where the load is expected to increase. The conclusion of this was that the current load is lower than what the plant is originally dimensioned for. In the future the plant is capable of handling the load that increases, because the calculated future tank volumes are lower than the actual volumes.
- The mass balance of selected organic micropollutant was investigated. The conclusion on this was that the breakthrough ranges roughly from 15-30%. This is lower than usually seen at other WWTPs which indicate a good removal. The WWTPs have different hydraulic- and sludge retention times, therefore the results are not easily comparable. Through the measurements in the process tank variations could be seen, but it was not possible to prove, if the variations was due to the alternating processes. Breakdown products were found in the sludge.

Contents

Master level 9th semester, 4 students

Wind Turbine Operating in Extreme Cold Climate

Students' Report

Structural And Civil Engineering

3rd. Semester

Aalborg University

In this report wind turbines in cold climate have been analysed. The attention has been put on the difference in the design of the blade cross-section considering the climatic characteristics of two different sites: Aalborg (Denmark) for normal conditions and Aapua (Sweden) as representatives for an extreme cold climate site.
The two materials taken into account have been compared by analysing the static tension, static compression and constant amplitude tests.
The study has been focused on fatigue analysis and it has been done by means of the characteristic SN curves. This has been possible by considering different temperatures and different wind distributions, performed by the Weibull distribution. The analysis of the wind loads has been carried out by using the Rainflow counting considering the out- of-plain bending moment. The difference in section modulus has therefore been evaluated by using the Miner's rule.

Next phase in PBL: mega projects Chunfang Zhou, 2010 and 11

- ***Across semesters - from 4th semester to10th semester***
- ***Motivation to partipate***
  - The satellite project sounds interesting
  - To learn more knowledge and skills
  - To prepare themselves for the workplace in the future

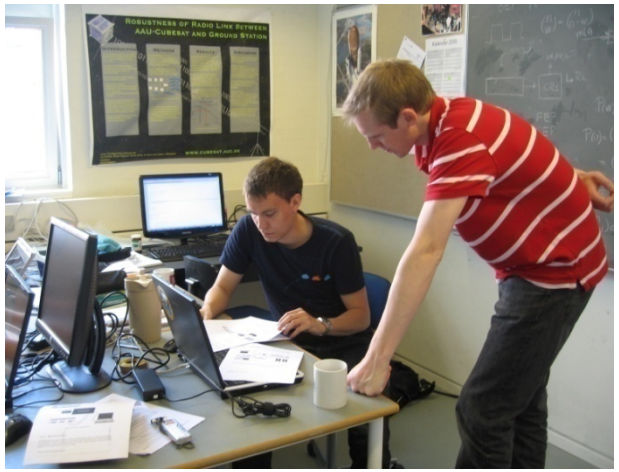
AALBORG UNIVERSITY

Group Learning in Project Work

- ***Group meeting once a week , discussion always, debate sometimes***

  - Peer Learning
  - Facilitated by reflection from practice

"We haven't got any new ideas sometimes actually, I think. However, we can test ideas from different books and put them together. It's like discussing what the opportunities are to solve the problem." - A Student



- Research projects at the UNESCO Chair
  - External: research council projects
  - Internal projects evaluation of the new PBL model – ongoing
  - Group assessment and PBL
- 15 PhD studerende
  - Creativity and mega projects (satellit)
  - Organisational change to PBL
  - PBL and the subject identity
  - Design of PBL curricula in Thailand, India og Malaysia
  - Intercultural learning in teams
  - PBL and sustainability – strategies for implementation

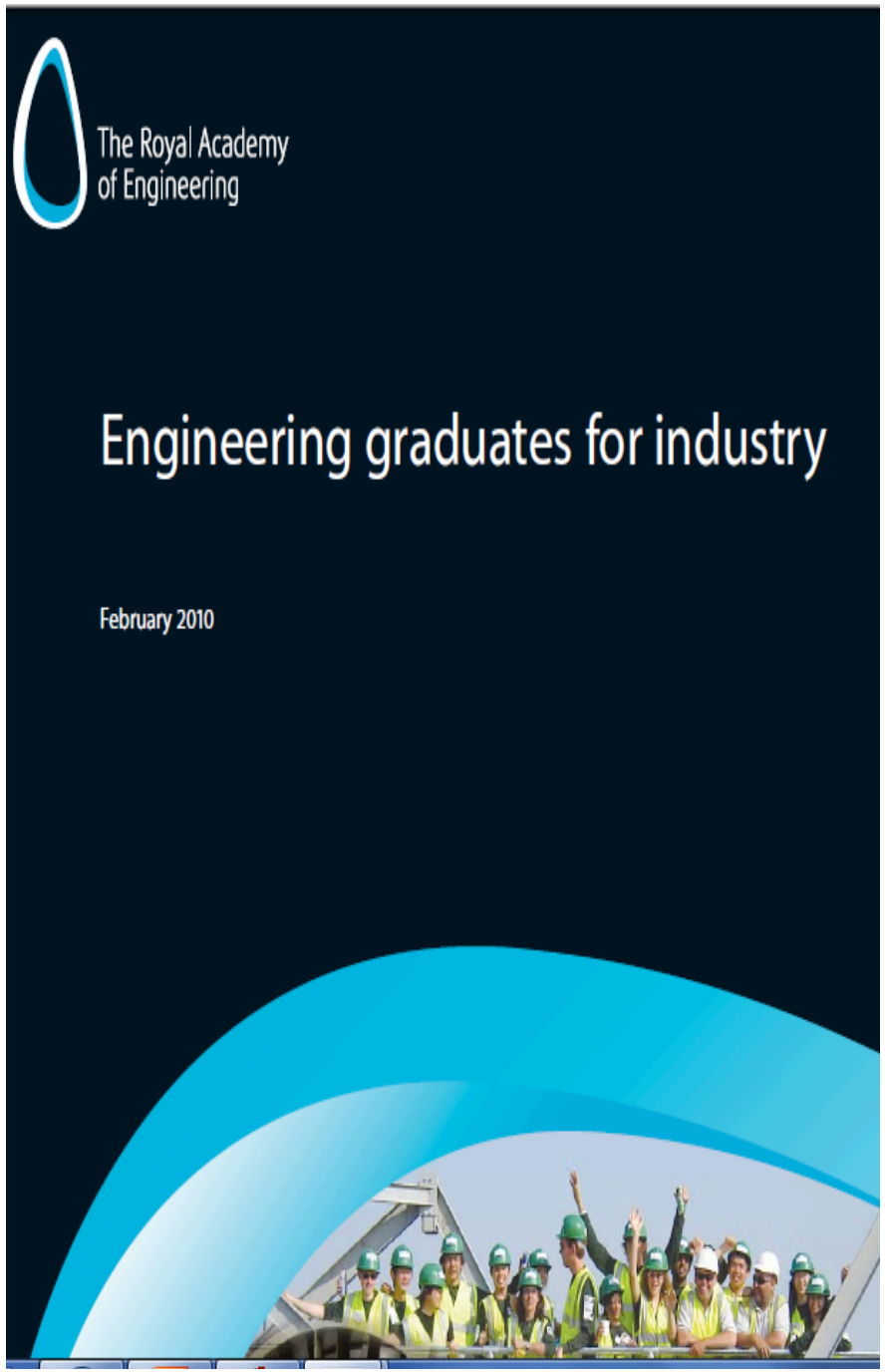
National Academy Skills and competences: engineering in 2020:

Technological (e.g., bio-tech, digital systems, computer systems/tools, sustainable technology, interdisciplinarity)

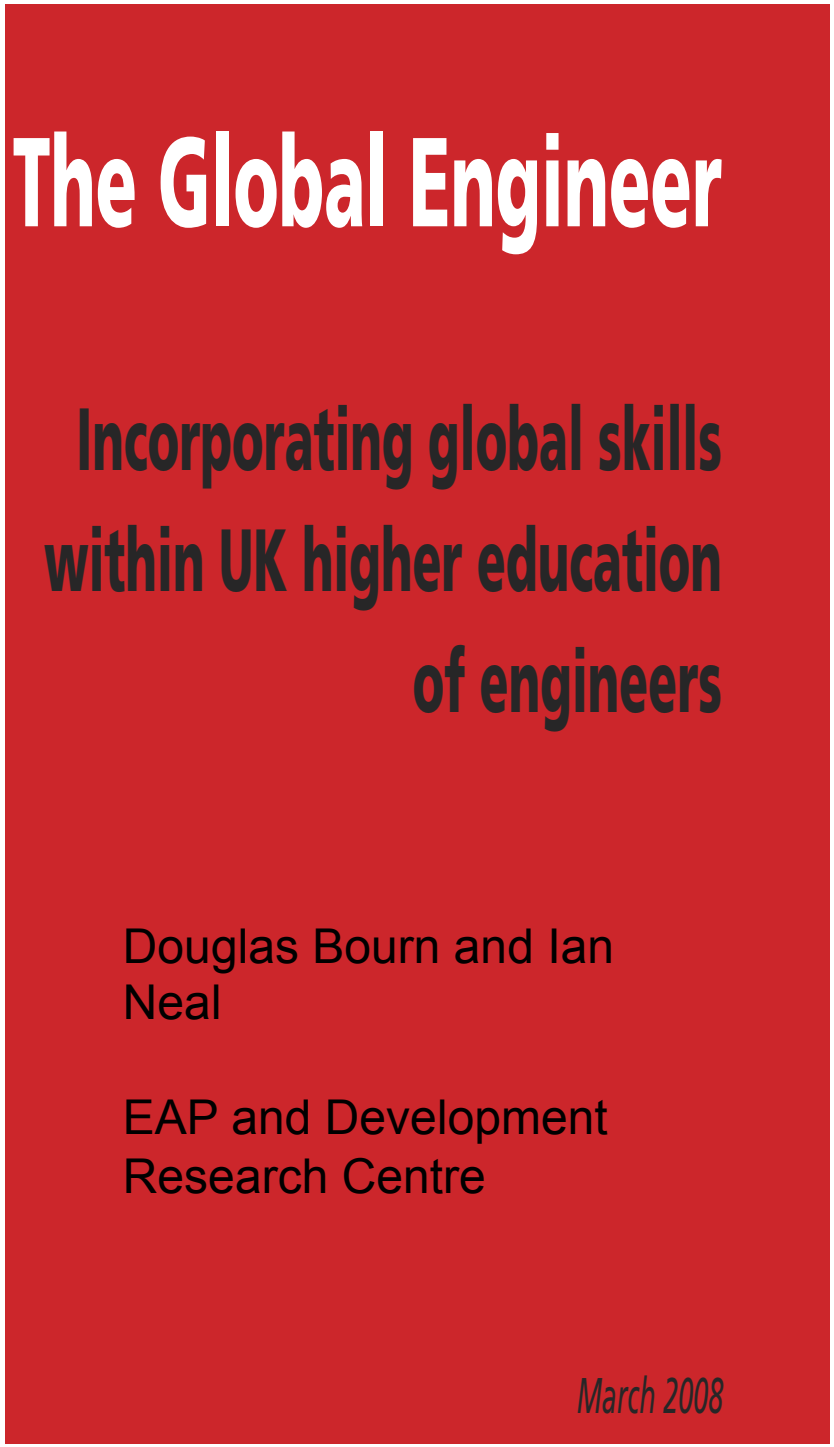
Societal, Global, and Professional (e.g., social, political & economic, diversity, multi-disciplinarity, global markets & contexts, interaction of engineering and public policy)

Attributes of the Engineer of 2020:

- Strong analytical skills
- Practical ingenuity
- Creativity
- Communication competencies (oral, written, and cultural)
- Business, management, and leadership skills
- High ethical standards and professionalism
- Agility, resilience, flexibility



- Industrial simulation such as constructionarium and pilot plants
- Sponsored programmes
- Industrial liaison boards
- Project-based and other forms of active learning
- Industrial group projects
- Lectures / seminars from engineers in industry
- Case studies from industry Influence of part-time and mature students on full-time students



- The ability to take a broader perspective - application of curriculum across countries
- An appreciation of what we do in developing countries impact upon ourselves.
- Understanding our culture doesn't have all the answers and there is more than one perspective and approach.
- Understanding the local context of development
- Coping with uncertainty

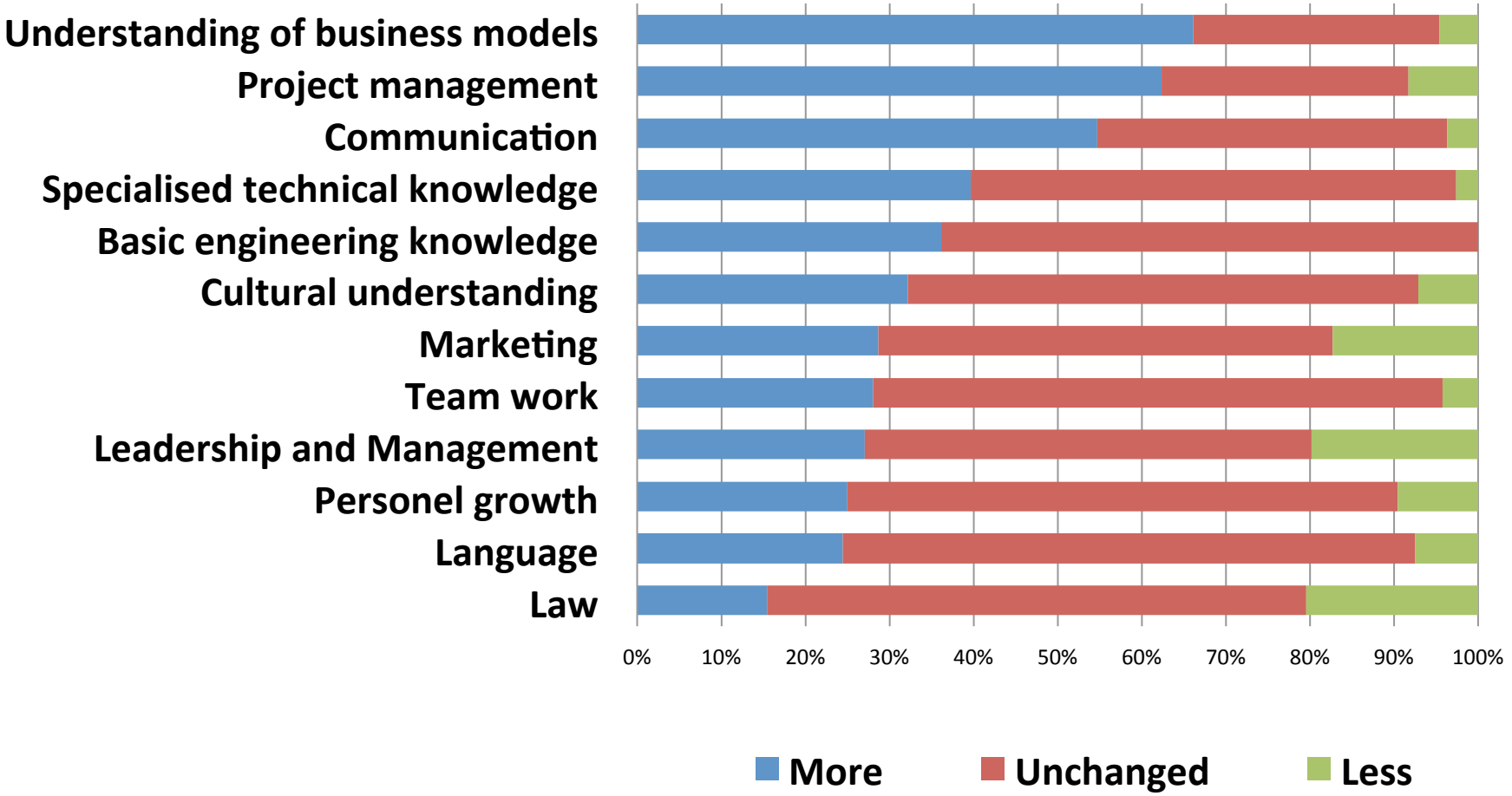
Educating engineers

- Add on strategy for the curriculum – one more block

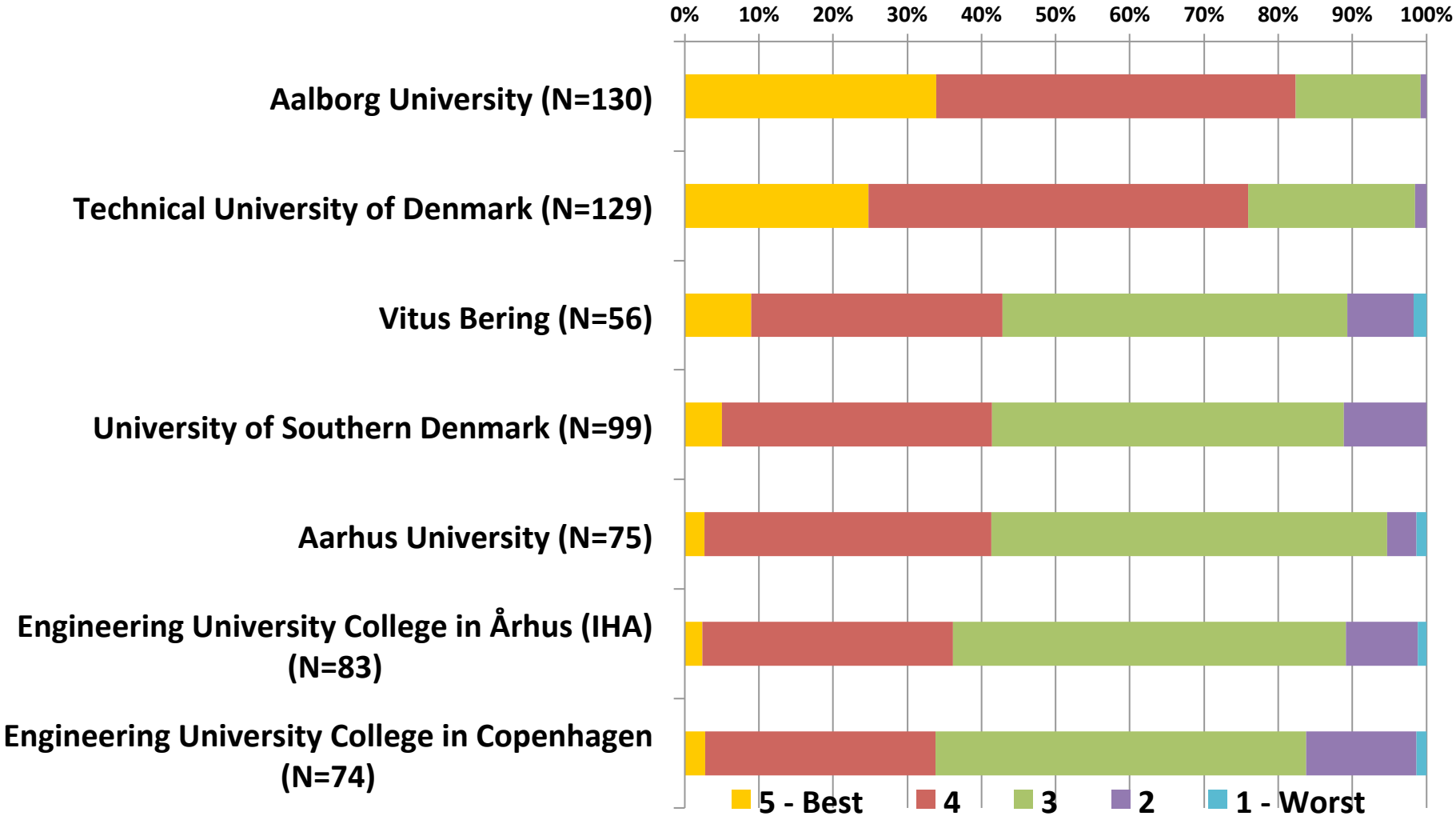
- Criticism of linear block system
- Arguing for design capabilities and a more problem based and project based system
- Complexity and technological integration

The Carnegie Foundation for the Advancement of Teaching

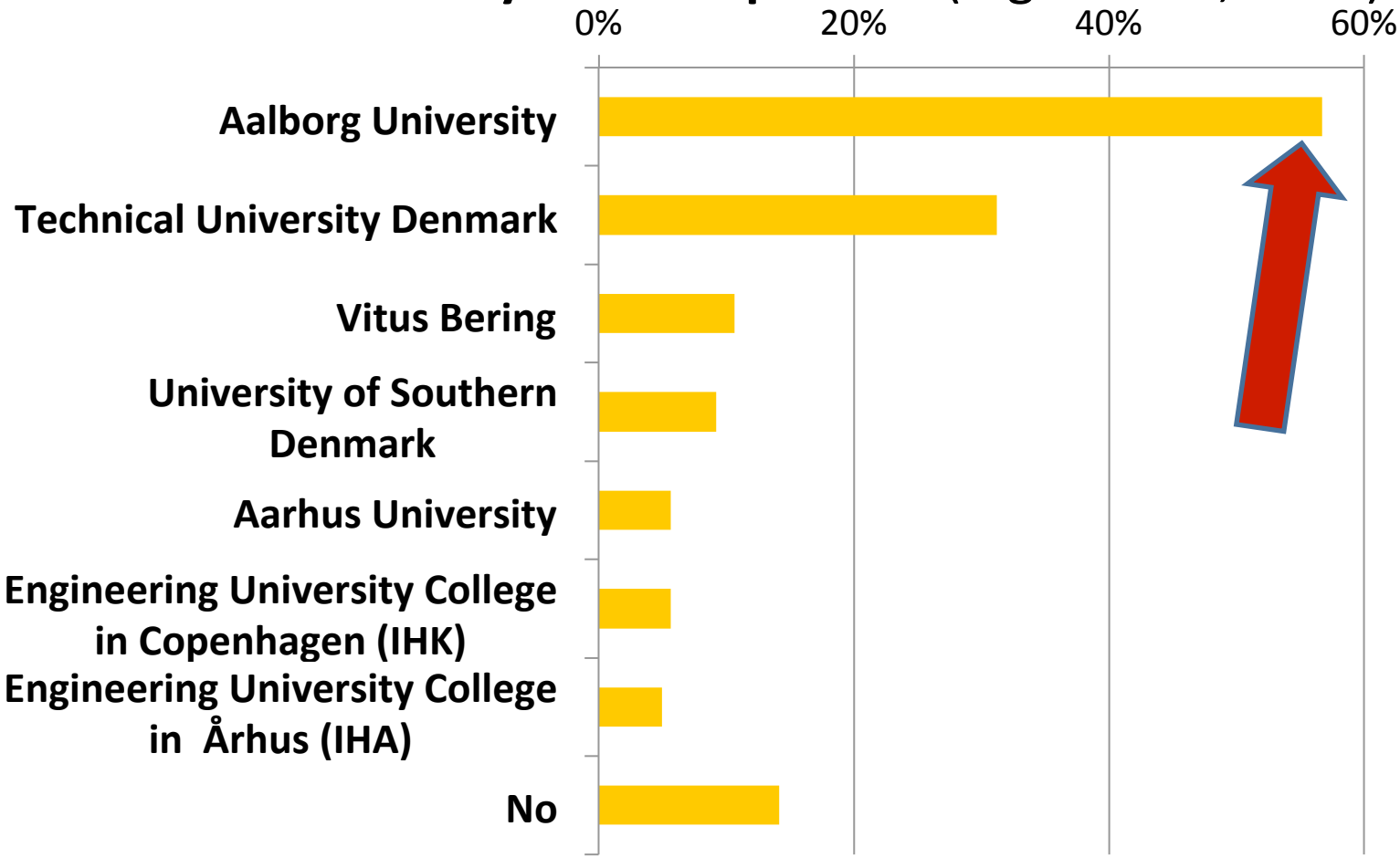
Is there a need for change of the existing engineering educations to match companies' need and challenges? (N=183) (Ingeniøren, 2008)



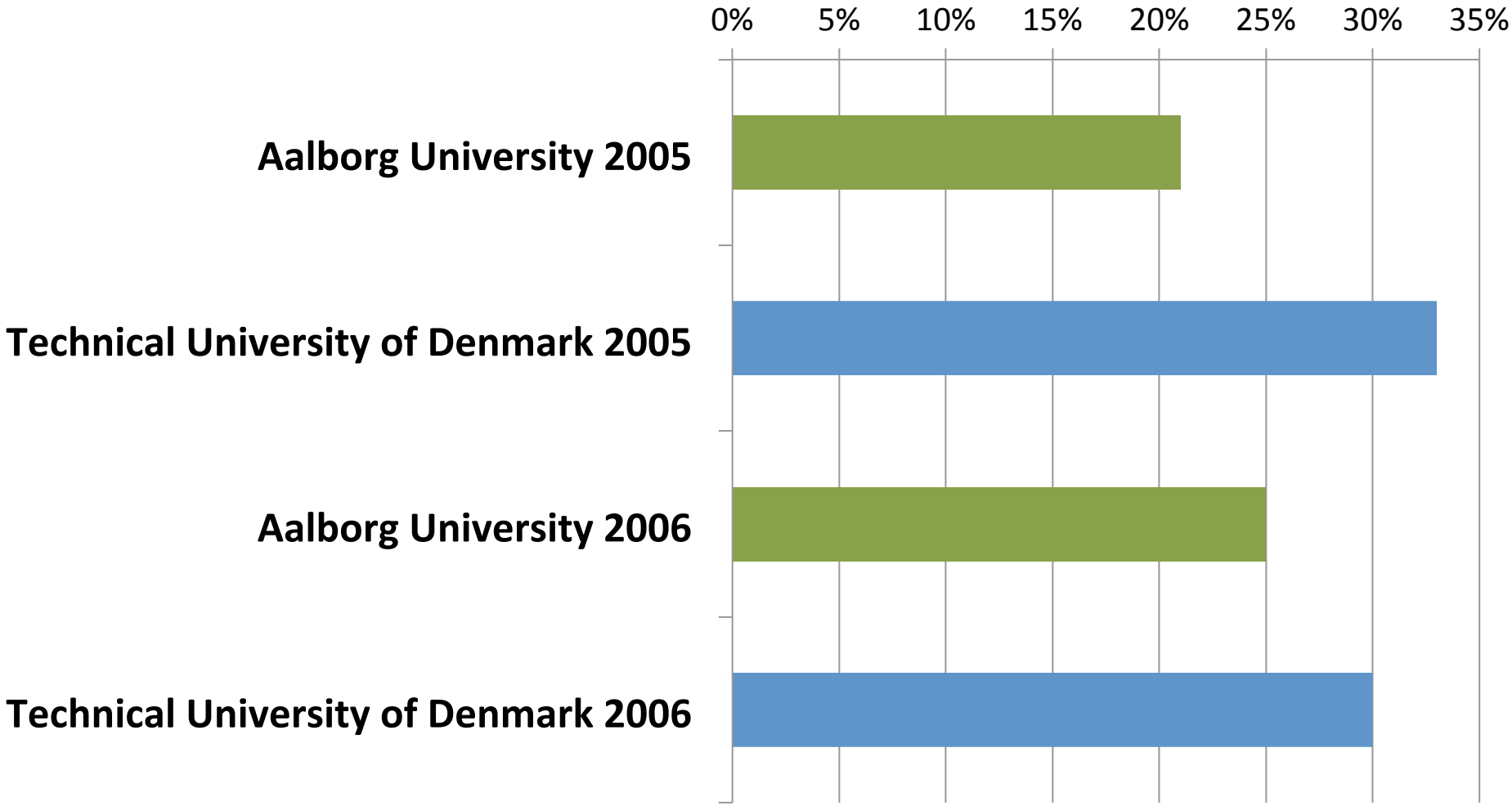
Overall assessment of Danish Engineering Institutions by companies (Ingeniøren, 2008)



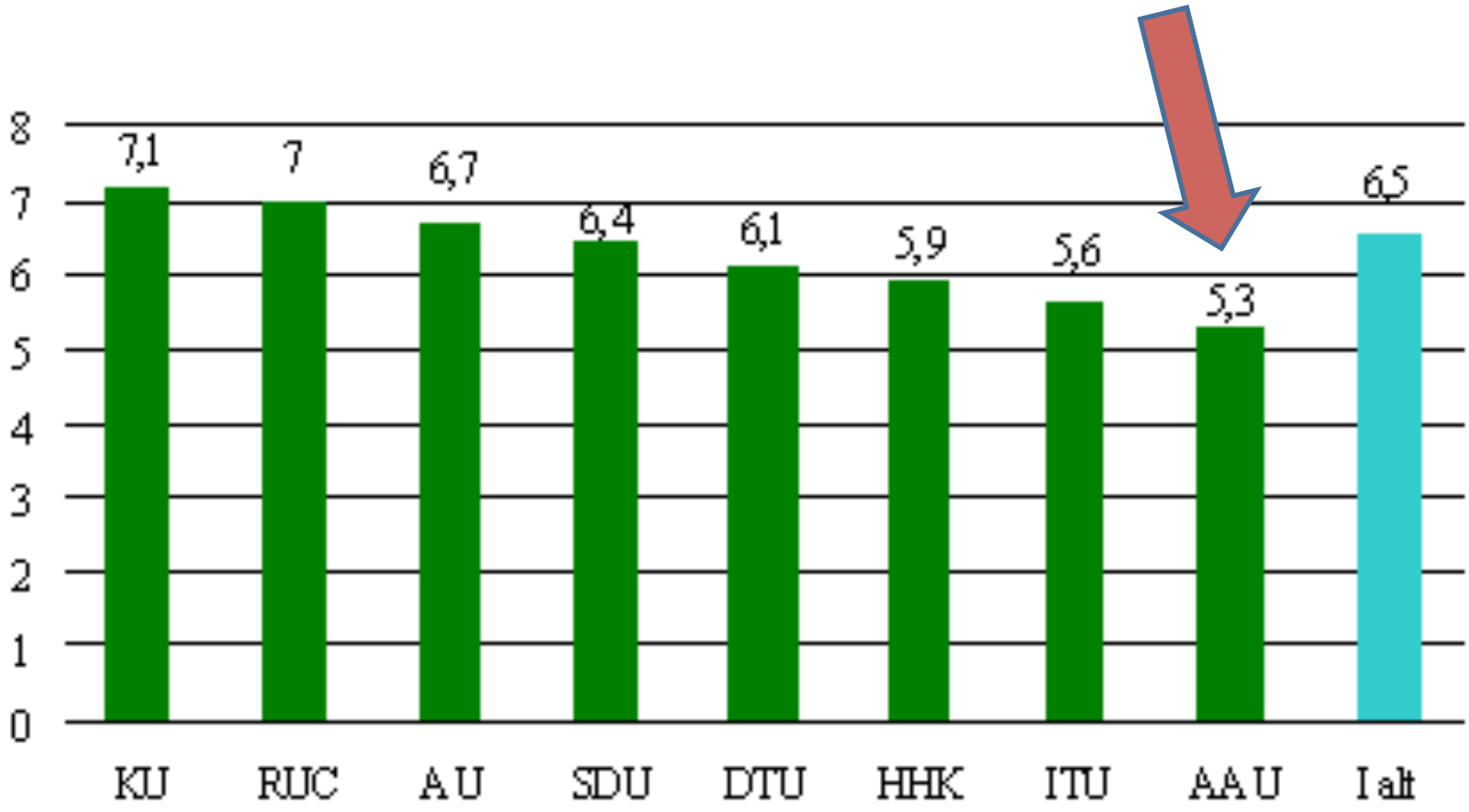
Are there one or more institutions which you find particular good at developing engineering education according to the needs of society and companies? (Ingeniøren, 2008)



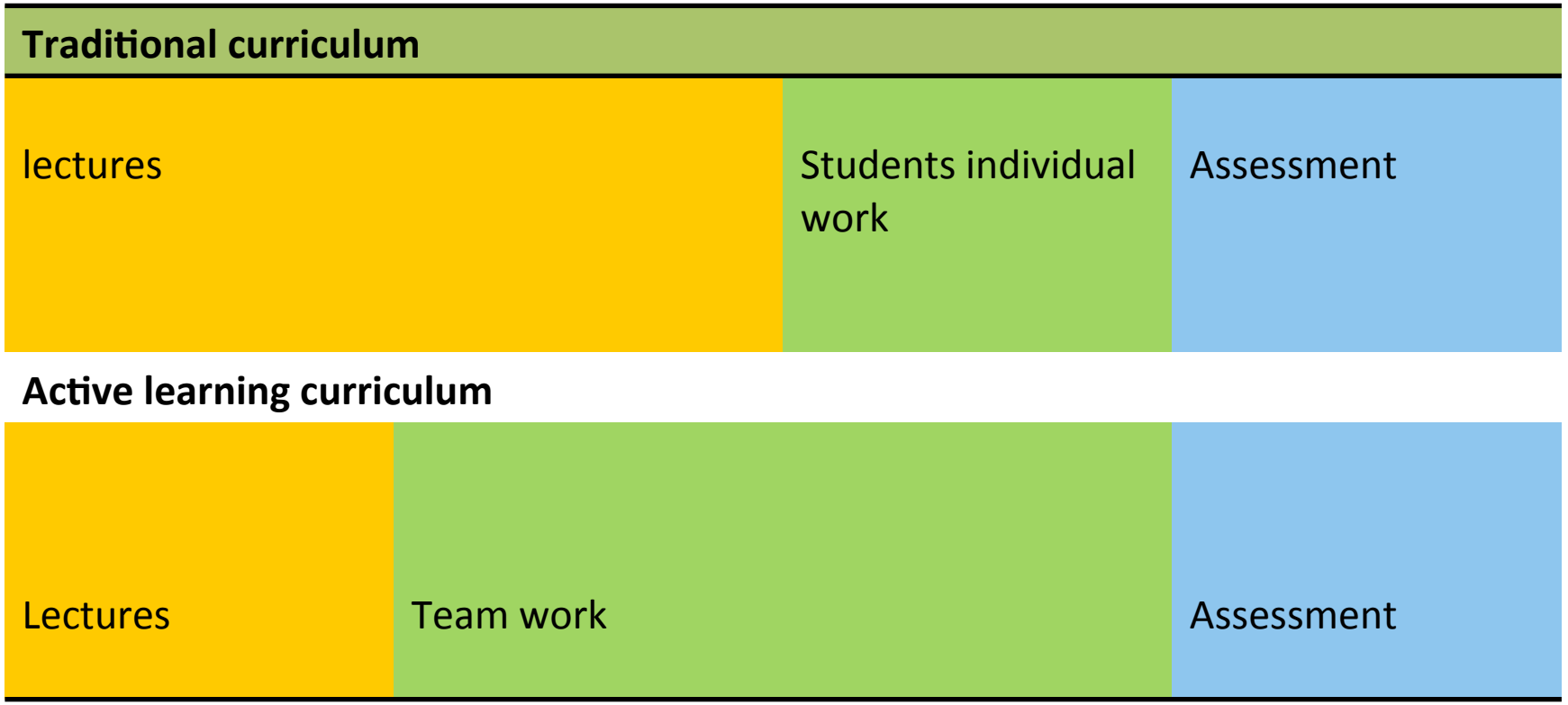
Official statistics: Drop out rate



Duration rates for Danish universities, 2007, Official statistics



Active learning



Vision +	**Consensus +**	**Skills +**	**Incentives +**	**Resources +**	**Action Plan +**	**= Change**
	Consensus +	Skills +	Incentives +	Resources +	Action Plan +	**= Confusion**
Vision +		Skills +	Incentives +	Resources +	Action Plan +	**= Sabotage**
Vision +	Consensus +		Incentives +	Resources +	Action Plan +	**= Anxiety**
Vision +	Consensus +	Skills +		Resources +	Action Plan +	**= Resistance**
Vision +	Consensus +	Skills +	Incentives +		Action Plan +	**= Frustration**
Vision +	Consensus +	Skills +	Incentives +	Resources +		**= Treadmill**

Knoster/Moesby

Master in PBL in EE - Curricula

Program Module	Modules	ECTS	Assessment	
1. semester	Course: Teaching and Learning in Engineering , Science and Health	5	P/NP	Internal
	Project: Teaching portfolio	5	7 step scale	Internal
2. semester	Course: PBL models and change strategies	5	P/NP	Internal
	Course: Process competences and facilitation	5	P/NP	Internal
	Project: PBL experiments	10	7 step scale	External
3. semester	Course: Theory and methods	5	7 step scale	Internal
	Optional course: PBL and sustainability PBL and intercultural learning PBL and management	5	P/NP	Internal
	Project: Master project	20	7 step scale	External
In total		60		

Thank you very much