

PBL AND SUSTAINABILITY IN ENGINEERING AND SCIENCE EDUCATION AT AALBORG UNIVERSITY

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THE RESEARCH PROJECT

- An research project conducted by
- Kirsten Krogh Hansen, Mona Lisa Dahms, Kathrin Otrel-Cass and Aida Guerra
- See the final report
- Krogh Hansen, K., Dahms, M-L., Otrel-Cass, K., & Guerra, A. (2014). *Problem Based Learning and Sustainability: Practice and Potential*. Faculty of Engineering and Science, Aalborg University.

COPERNICUS CHARTER/ECIU

- Commitment of AAU to support adoption and implementation of the COPERNICUS/ECIU guidelines for Sustainable Development in the European Higher Education Area
- How can the conception of sustainability be integrated?
- To what extent is this already the case?

AIMS OF STUDY/INVENTORY

Phase 1

- The way the concept of sustainability is integrated, interpreted and delimited in relation to the different educational programmes and contexts
- The role of PBL in designing and carrying out engineering and science activities that integrate key concepts of sustainability

Phase 2

- Identification and sharing of existing strategies for integrating sustainability in the educational programmes at both strategic and staff level
- Potential for further integration of sustainability in PBL and courses in engineering and science education.

PHASE 1 OUTCOME

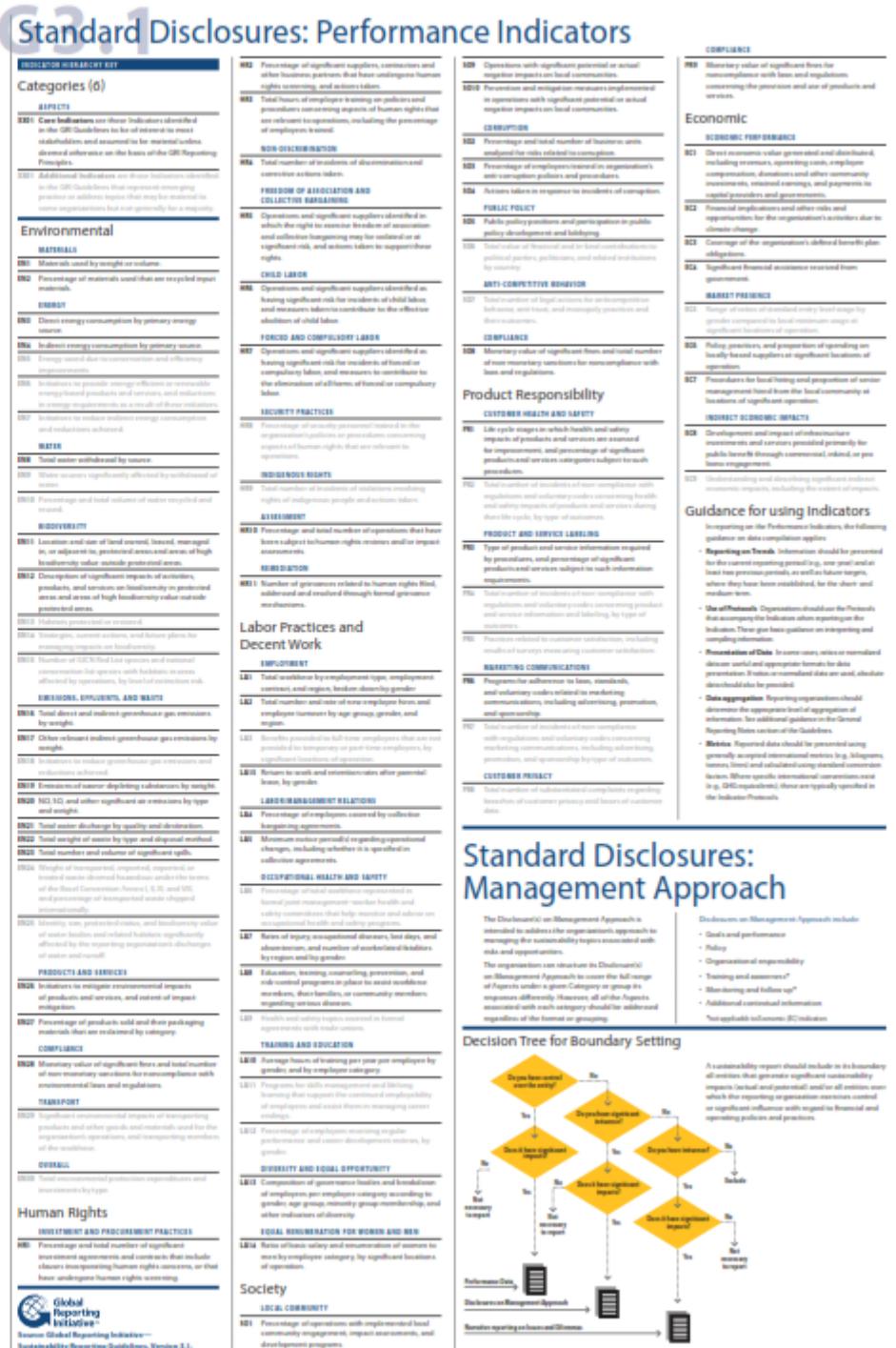
Document
analysis
Interviews

DOCUMENT ANALYSIS

- Analysis of 104 programmes from TN-AAU, Aalborg, Esbjerg and Copenhagen

GLOBAL REPORTING INITIATIVE

- Global Reporting Initiative: Sustainability Reporting Guidelines G3.1 – Reference Sheet
- <https://www.globalreporting.org/reporting/latest-guidelines/g3-1-guidelines/Pages/default.aspx>



DOCUMENT ANALYSIS

- Competence profile of the program and the Overview of the program
 - Apparent extent of sustainability in curriculum?
- Quantitative search for key words and their context

Environmental	
Categories	In connection with...
Environment	
Materials	
Energy	
Water	
Biodiversity	
Emissions, effluents, and waste	

DOCUMENT ANALYSIS

Environmental (B.Sc. BEM – Urban, energy and environment planning)

Categories	In connection with...		
Environment	Planning		
	Assessment	Climate change	
	Consequences		
	Impact		
	Resources		
	Legislation		
Materials	Source material		
	Maps (product...?)		
	Cycles		
Energy	City & environment	Planning	
	Sustainable solutions		
	Renewable		
	Issues	solutions	
	Planning	Climate change	
	Water and biodiversity		
	Energy balance of earth	Atmosphere, weather systems and climate	
	Cycle		
	stakeholder analysis		

DOCUMENT ANALYSIS - FINDINGS

Faculty of Science and Engineering	Sustainability			Comment
	Environment	Social	Economy	
School of Engineering and Science	23/61	17/61	14/61	<p>The social and economic aspects of sustainability are not necessarily found in connection with environmental sustainability.</p> <p>Two programmes only have elements of economic, one programme only have social aspects of sustainability.</p> <p>Nine of 61 programmes cover all three aspects of sustainability</p>
School of Information and Communication Technology	1/29	5/29	2/29	<p>Three programmes only cover social aspects of sustainability.</p> <p>No programme does only have economy – it is in connection with social or social and environmental aspects.</p> <p>One of 29 programme covers all three aspects of sustainability.</p>
School of Architecture, Design and Planning	12/14	12/14	9/14	<p>Apart from two programmes all programmes cover minimum environmental and social aspects of sustainability.</p> <p>Two programmes cover no aspects of sustainability.</p> <p>Three programmes only cover environmental and social aspects of sustainability, but no economic aspects of it.</p> <p>Nine of the 14 programmes cover all three aspects of sustainability.</p>
Total	36/104	34/104	25/104	

Dean **Eskild Holm Nielsen**

- Vice-dean **Lars Døvling**

- Interviews with study boards
- 16 out of 18 possible respondents were interviewed.

Head of SES **Henrik Brohus**

- Head of Civil Engineering **Christian Frier** and **Rasmus Lund Jensen** from Indoor Environment and Energy
- Head of Energy **Birgitte Bak Jensen**
- Head of Industry and Global Business Development **Jens Henrik Andreasen**
- Head of Chemistry, Environmental engineering and Biotechnology **Niels T. Eriksen**
- Head of Mathematics, Physics and Nanotechnology **Eva Maria Petersen**
- Head of Techno-anthropology **Tom Børlsen**

Head of SICT **Uffe Bro Kjærulff**

- Head of Computer Science **Hans Hüttel** (stand in for Lone Leth Thomsen)
- Head of Electronics and Information Technology **Ove Andersen**
- Head of Media Technology **Claus B. Madsen** (Stand in for Rolf Nordahl)

Head of SADP **Michael Tophøj Sørensen**

- Head of Architecture and Design **Henrik Harder**
- Head of Planning and Geography **Martin Lehmann** (stand in for Claus Lassen)

INTERVIEW - FINDINGS

- Status quo:
- PBL
- Future perspectives:
- Relevance:
- Leadership:

INTERVIEW – FINDINGS: STATUS QUO

- The interviews show more sustainability than apparent in written curricula
- Sustainability is explicit in some projects, but also implicit in a lot of projects
 - Implicit – within e.g. Nanotechnology where the students/supervisors might not be aware that it is sustainability they are writing about
- There are existing resources (human capital, existing research)
- Sustainability in the title of programmes is problematic – it implies other programmes are not sustainable.
 - Instead it needs to be in the learning outcomes
- Background of heads of study boards is influencing programmes – to some extent

INTERVIEWS – FINDINGS: PBL

- PBL is a natural way of implementing sustainability
 - Due to the interdisciplinary of sustainability
 - Only one respondent was vague about this point in regards to PBL
- Even when the concept of sustainability was only implied most agreed that the nature of PBL supports teaching and learning about sustainability

INTERVIEWS – FINDINGS: FUTURE PERSPECTIVES

- The programmes that already have sustainability integrated have no current plans of doing more
 - They do follow regular updates of programmes
- Programmes with no trace of sustainability (in written curricula or in interviews with Heads) have no plans of including aspects of sustainability
 - Not because they are against it, but because they have not given sustainability any thought at all
- One respondent was updating the curricula at the time and was prompted through this investigation to add a couple of points with regards to sustainability

INTERVIEWS – FINDINGS: RELEVANCE

- Respondents are all agreeing on sustainability as relevant
 - Not all aspects of sustainability are relevant for all programmes, but some aspects can be included in all programmes
 - University as a whole should cover all aspects of sustainability
 - Not all graduates from TN-AAU should be generalists, there is also a need for specialists

Eco-economic

- Resource economy
- Energy efficiency
- Global energy issues
- Product and service labelling

Sustainability

An integrated approach to Environmental, Social and economic impact issues (both internal and external) leads to long term, sustainable profit growth

Economic

- Consistent, profitable growth
- Risk management
- Total shareholder return
- Market presence
- Indirect economic impacts

Socio-economic

- Employment
- Training & development
- Local economies & enterprise

Social

- Respect for the individual
- Equal opportunities
- Diversity
- Outreach programmes
- Human rights
- Child/forced labour
- Corruption
- Public policy

Environmental

- Permit & license compliance
- Biodiversity management
- Emissions to air
- Water/chemical usage and discharges

Socio-environmental

- Health & safety
- Legislation and regulation
- Climate change
- Crisis management

INTERVIEWS – FINDINGS: LEADERSHIP

- Heads of Study Boards support initiatives from staff
- Very few are willing to "tell people what to do"
- Heads of Study Boards welcome top-down – including financial resources, in order to work bottom-up

CURRENT SUGGESTIONS FOR "IMPROVEMENT"

- There are existing resources (human capital, existing research)
 - Develop an information bank collecting knowledge from AAU and other places so people have a place to turn for knowledge regarding sustainability
- AAU as a role model – walking the talk: University should be on the forefront of technological development. Green solutions might not all be financial sustainable yet, but the University Campus is a place to show the world...
- When to implement/where to implement
 - Quick solution: first year, then it's over and done with and can be forgotten!
 - Or later on it will be a tool for reflection and will be part of a professional profile
- Sustainability needs to be made explicit/visible in study programmes