Getting from *Why* to *How* in Sustainability Education

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Agenda

- ▶ Introduction (10 min)
- ▶ Hands-on activity (60 min)
- ▶ Wrap up (20 min)

Introduction

▶ Sustainability is an increasingly important topic all over the world and engineers have an important role.

▶ Engineering education has achieved some milestones regarding sustainability with regards to awareness of the sustainability crisis/challenges

▶ To reach further, engineering education needs to change sustainability education from a strategic *why* focus towards an action-oriented *how* focus.

Previous study

Purpose:

How is sustainability transferred into learning objectives used in innovation courses for engineering students?

Reference:

Løje, H. & Lindahl Thomassen, M., (2020). The influence of the sustainability agenda on learning objectives in innovation courses for engineering students? Proceedings of the 48th SEFI Annual Conference 2020, pages: 1346-1353. Presented at 48th Annual Conference, Enschede, the Netherlands 20 – 24 September 2020

Methods

▶ Collection of learning objectives (105) from courses at three universities in Denmark

▶ The learning objectives were collected based on an online search in the course databases using the search word "sustainable innovation". The inclusion criteria was only courses for engineering students.

▶ The learning objectives not specifically focusing on sustainability were labeled "General learning objectives" (56).

▶ The remaining learning objectives (49) with a sustainability were sorted by learning *about*, *for* or *through* sustainable innovation.

Results

Table 2. Sustainability learning objectives divided into learning about, for or through

Category	Examples of learning objectives
Learning About	• Demonstrate knowledge on different theories learned throughout the classes such as: Depletion of natural resources, Eco-design, Life-cycle assessment, Sustainable Development Goals, Circular Economy, Cradle to cradle, scares ressources, overexploitation • **Explain the broad meaning of sustainability (environmental, social and economic**
Learning For	• **Evaluate environmental performance using the life cycle assessment framework** • Model and interpret multi-criteria decision-making problems in sustainable design • Criticize and assess the strengths and weaknesses of approaches for sustainable design • Must have the competencies to apply principles of agile and sustainable production to company cases and design intelligent production and service systems • Perform an analysis of "governance" and development of regulation and legislation within the field, and discuss social and environmental advantages and risks of the new technology, and relate to examples of these aspects
Learning Through	• **Apply entrepreneurial methods and processes to develop a sustainable business opportunity based on the defined problem.**

Reference: Løje, H. & Lindahl Thomassen, M., (2020)

Hands on session- part A

▶ Share your current practice in relation to sustainability education.

▶ Identify current challenges, opportunities and context specific considerations and note them on your handout (1).

Please sum up in Padlet: https://padlet.com/melt/u6gsvhsuaytr9bct

(You will be asked to share your considerations in plenum)

Summary in plenum

- Challenges
- Opportunities
- Context specific considerations

Formulating good learning objectives

1: Identify the level of knowledge necessary to achieve your learning objective, consider progression in education and time frame to create realistic and achievable objectives.
**2: Select** action verb
3: Formulate learning objectives that includes

•**Audience:** It's important that your objective identifies the people that will be doing the learning. Typically this will involve the word, "learner" or "participant."
•**Behavior:** You'll need to identify what the participants are going to do differently. This component will contain your action verb.
•**Condition:** This part of the objective will describe the situation of the participants.
•**Degree of Mastery:** This part of the objective is closely tied to the change in behavior, as it stipulates the degree of the change.

•**Example**

The SOLO taxonomy

The SOLO Taxonomy With Sample Verbs Indicating Levels of Understanding
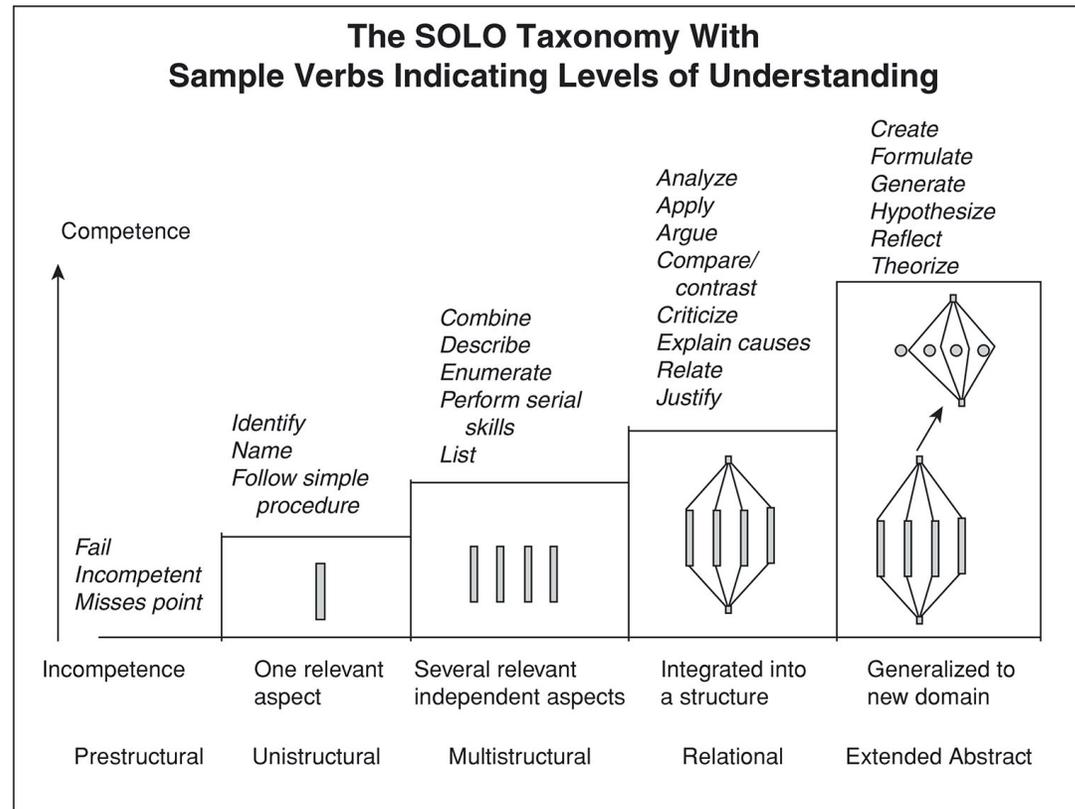
Examples

▶ By the end of this course students should be able to list the 6 quality elements used to evaluate sustainability in construction in the DGNB-system. (SOLO 2 multi strcutural)

▶ After completing this course students will be able reflect on environmental impact of alternative solutions for cloth drying using system thinking. (Solo 4 extended abstract)

Hands on session- part B

▶ Each group formulate sustainable learning objectives relevant to their courses or domain expertise on post-its

▶ Place post-its on the wall

These learning objectives should be contextualized and practise oriented.

Please sum up in Padlet: https://padlet.com/melt/u6gsvhsuaytr9bct

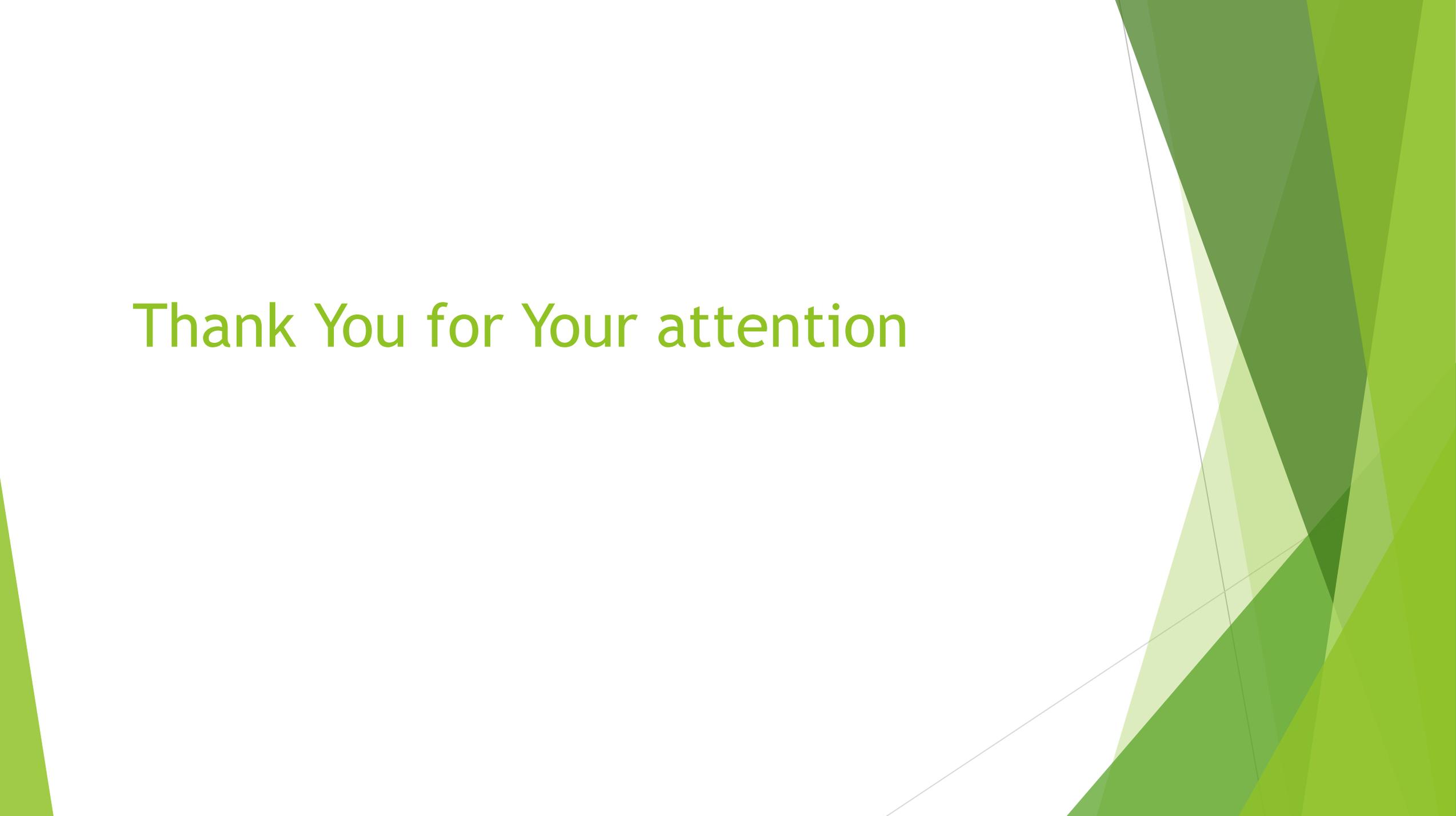(You will be asked to share one learning goal + considerations in the formulation process in plenary)

Wrap up

- Please share examples of learning objectives and you considerations in the development
- What is your most important take away from todays session?

Reflection questions:

- Are we currently educating about, for and/or through sustainable innovation?
- Would we like to do it differently in the future?
- How can we create learning designs and learning objectives to support sustainable action competence ?
- Are we missing good action verbs to get from why to how in sustainability education?

- **What could be next-gen in sustainable education and how can a progression be build?**

Thank You for Your attention