Sustainability

in Teaching

-course

Session 4

5.5.2023
12-15

A"

Aalto-yliopisto
Aalto-universitetet
Aalto University
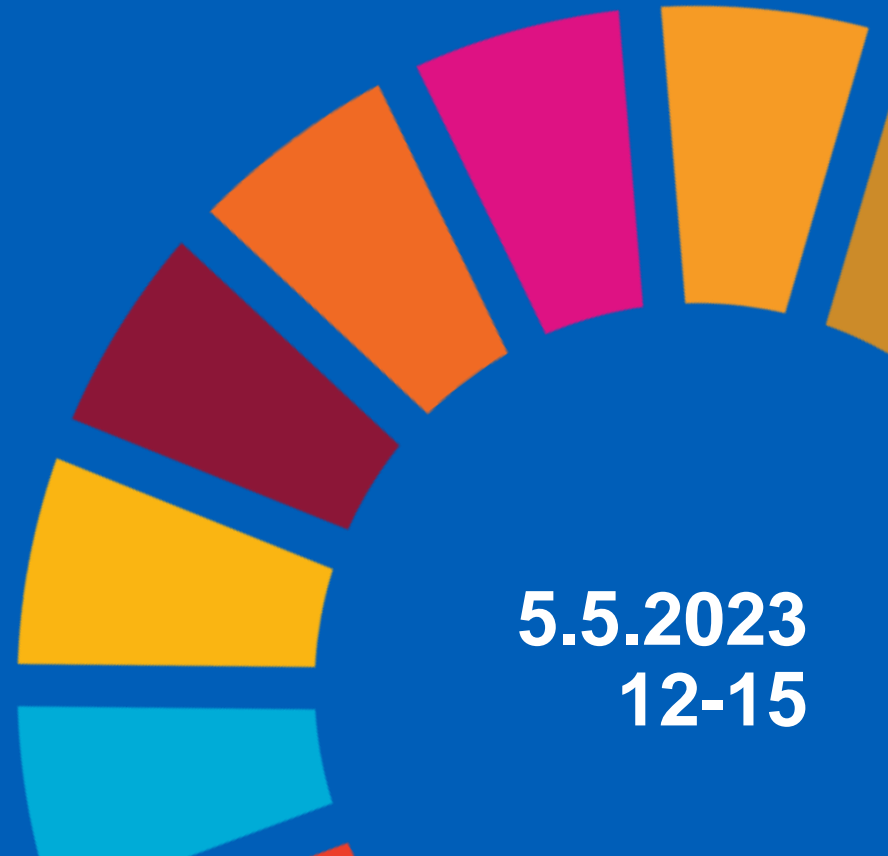
Completion of the course

3 ECTS credits

Attendance and active working during the sessions.

Attendance: 80 % (i.e. 1 session absence permitted).

Additional absences to be compensated with substitutive assignment.

All assignments completed.

Grading: Pass/fail.

A"
Aalto-yliopisto
Aalto-universitetet
Aalto University

3 credits = 81 h work
Sessions 1x1h + 6 x 3 h = 19 h
Independent work: 61 h

Photo: Zbynek Burival / Unsplash

Compensatory tasks

1. I need to be absent from one session:

→ You don't need to do any compensatory task. Inform beforehand, if possible & go through session slides & do the assignment.

2. I need to be absent for a second time:

→ Inform the teacher about your absence beforehand, if possible.

→ The tasks can be found and submitted in MyCourses subpage Compensatory tasks (see the submission box). The DL for the compensatory task is preferably before the following session.

All the course tasks should be submitted by 15th June.

A! Aalto-yliopisto
Aalto-universitetet
Aalto University

Outline and objectives

➢ Reflections

➢ Teaching methods

> *Break*

➢ Teaching method examples

> *Break*

➢ Working on your course

Intended learning outcomes of the session

After this (and next week's) session you should be able to

- Design learning activities for integration of sustainability relevant themes in courses

- Apply and evaluate teaching methods for sustainability integration in own course

A? Aalto-yliopisto
Aalto-universitetet
Aalto University

Meeting with a student - reflections

General guidelines:

Topic of discussion:

Small group discussion
- 2-3 persons, 10 min

➢ **Share your pair ONE most relevant or interesting insight from your discussion with the student.**

Reflections on student views

- Nothing on sustainability, should be something for those who are interested

- Should be more comprehensively and thoroughly integrated to all courses
  - The level often too abstract
  - Environmental aspects, technologies or materials get too much emphasis

- More hands-on and tangible examples on how to apply sustainability in own field / coming professional life
  - → Addressing sustainability in two levels: 1) understanding the role and position & possibilities of own field in relation to sustainability challenges (indirect connections and impacts); and 2) understanding the direct impact of the field in a practical level (e.g., emissions, land-use change)
  - → Connection to working life practices might help (internships, excursions, projects…)!

STUDENTS' ANONYMOUS QUESTIONS:
"What would you like to know but have never dared to ask in class?"

Fundamentals *(philosophical)*

- Is technology the key to solving our problems? Can design fields claim to be sustainable? Is green growth possible at all? Is economic growth and consumption within the planetary boundaries possible to reconcile?

Knowledge *(here energy domain)*

- What is the emissions profile of the software/IT/ICT sector? How long will the deployment of fusion energy take? How sustainable and reasonable is it to invest now in the long term in all other energy productions methods, if fusion energy will soon replace all other methods?

Skills *(here consumption domain)*

- Is it better to buy Spanish or Finnish tomatoes, if Finnish ones are grown in energy consuming greenhouses? Can we make consumption carbon neutral with taxation of externalities / carbon?

Critical thinking, ways of thinking *(here economy domain)*

- How can we distinguish green washing and true sustainable development? How can we make businesses invest in all dimensions of sustainability (environment, society, economy)? How can we show the ROI of sustainability?

# Learning objectives in sustainability education

Sustainability education:
Head, hands, heart OR knowing, doing, being

Sustainability competencies are:
- Interplay of knowledge, capacities and skills, motives and affective dispositions
- Developed by the learners themselves during action, on the basis of experience and reflection.

UNESCO 2017: Learning objectives for the SDGs

"Knowledge"
"Knowing"

What

"Skills"
"Doing"

How

"Attitudes/Mindset"
"Being"

Why
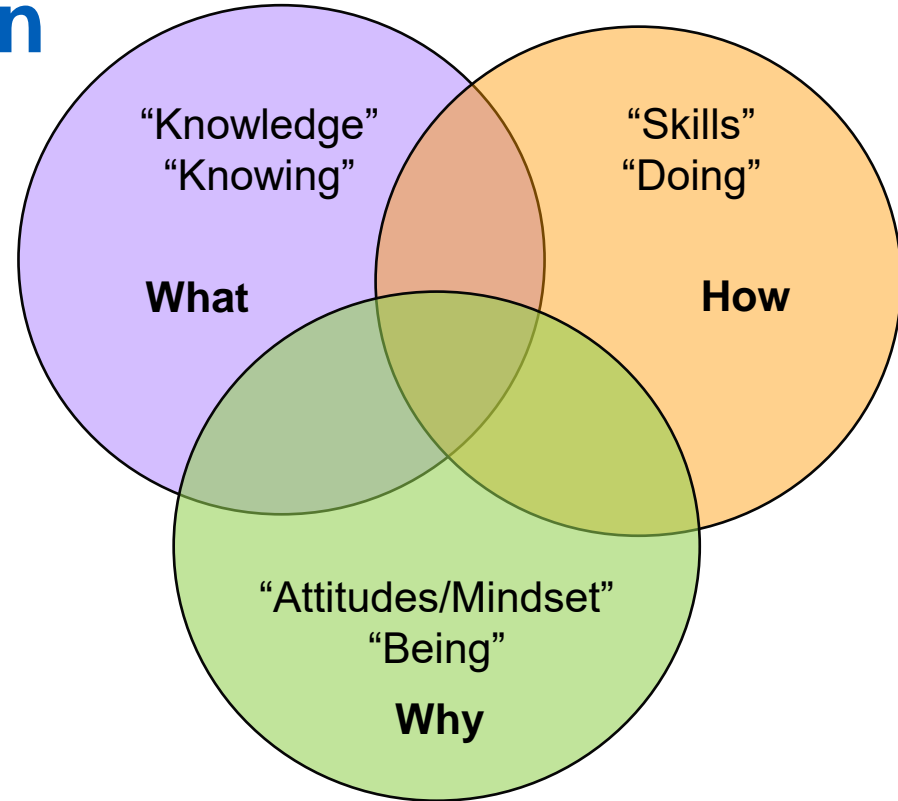
→ Teaching methods ought to develop students' thinking and recognition of own capabilities; A "linear continuum of development tasks" insufficient

(Savickas 2007; Sipos et al. 2008)

Teaching and learning activities (TLAs)

→ Combining different types of learning activities (methods) essential, if aiming at improving all the spheres, the "what, how and why". This includes:

- Basic sustainability literacy; knowledge of "world current situation"

- Learning about disciplinary connections, solutions and impact assessment, and connection of own discipline to sustainability

- Active learning, participatory methods and situated learning

- Group and individual reflection (on context, tools and self)

- Research approach (critical evaluation of sources and knowledge, data analysis, drawing conclusions, argumentation)

(Segalas et al. 2009; Tejedor et al. 2019)

Developing a learning activity

"The choice of pedagogical approach depends on the pedagogical and educational goals and the specifics of the situation (regarding students, teachers, or the learning environment)"

(Lozano et al. 2019)

What are the course learning outcomes?	What are your "degrees of freedom"?	What is the learning goal of the activity?	What methods would be possible?
⬇	⬇	⬇	⬇
• Linkage to one or several? • No linkage	• Time available • Collaborators • Feedback to students • Assessment • Own resources	• What / Knowledge (Sustainability literacy, disciplinary) • How / Skills (disciplinary methods and tools) • How and Why (Key competencies)	1. Passive With some activating elements 2. Active: Research, PBL, Simulation (games, roleplays), Community-connected, Inter-/transdisciplinary …

Common feature of engaging sustainability education: teacher has a tutor / facilitator role!

Your turn: collecting learning experiences / teaching methods

Step 1: In Flinga (5 min)

→ Write down any good learning/teaching experiences for sustainability related competencies or content, that you have had (either as learner or teacher): **What teaching method was used, what was the more detailed learning activity? Describe briefly.**

Step 2: In the same Flinga (5 min)

→ Let's organize our notes according to learning objective categories ("knowing, doing, being")

→ Drag your note to appropriate field

https://edu.flinga.fi/s/ECXWE2E

Break

10 minutes

From your home assignments:
thoughts on methods and learning activities, e.g.

- **Methods addressing value-related, transdisciplinary topics in student groups**

- **Infographics, particularly relating to the SDGs in teaching**

- **Co-teaching practices**

- **Project-based and real-life approaches in teaching sustainability**

- **Roleplaying, learning diaries, panel discussions**

- **Teaching methods and techniques in day-to-day teaching and learning**

Examples of integration with varying pedagogical approaches

1. **Assignment contextualized in sustainability (pre-task video)**

2. **Using the SDGs to integrate sustainability content**

3. Sessions and exercises developed and piloted in Aalto
   - Qualitative LCA and expert panel to integrate sustainability
   - Exercise based on qualitative LCA and systems thinking

4. Applying ready-made teaching material: literacy test and (board) games

Example 1: Assignment contextualized in sustainability

- Focus and learning objectives **outside** of sustainability scope
- Context of exercise / assignment around a chosen sustainability theme
- E.g. calculations, …

A. Your pre-task: Video presentation by Tomi Kauppinen, Head of Aalto Online Learning

Example 2: SDGs in teaching
ELEC-E8124 Intelligent buildings (Jaakko Ketomäki)

1. Pre-lesson task: familiarization with SDGs, video in Youtube

2. Discussion: Which of the sustainability goals are connected to buildings? Why?

3. Joint collection of relevant sustainability entry points

4. Student group work: How can intelligency of the buildings support achieving the sustainability goals?

5. Feedback and reflection

Ecological sustainability
    Energy, materials, recycling
Economic sustainability
    Lifecycle, efficient energy and material use, maintenance of buildings
Social and cultural sustainability
    Cultural traditions of build environment, knowing of history, wellbeing of workers

How can intelligency of the buildings support achieving the sustainability goals? Which of them?
(Group work for students)

Examples:

Demand response

Cut the energy peaks

Wise use of heat pumps

Management of temperatures with low temperature heating networks

Utilisation rate

Efficient use of buildings

Intermittent heating

Adjustment of internal temperatures as a function of presense/no presense

Circular economy

Wise use of materials

Reducing CO_2

Building phase, use phase and demolition

Waste management

Optimizing traveling

Also time saving and organizing life

Examples of integration with varying pedagogical approaches

1. Assignment contextualized in sustainability (pre-task video)
2. Using the SDGs to integrate sustainability content
3. **Sessions and exercises developed and piloted in Aalto**
   - **Qualitative LCA and expert panel to integrate sustainability**
   - **Exercise supporting systems thinking**
4. Applying ready-made teaching material
   - Sustainability literacy test and
   - Board games
   - Climate University courses

Selected Aalto pilots 2021-22

Course level & size	Sustaina bility-related ILOs	Assess-ment	Teaching activity developed	Student engagement	Approach	Topic addressed
BA 1st year, ~200	Yes	No	90 min integrative and interactive lecture + stakeholder panel	Passive with some group/pair discussions	Content: Basic knowledge on discipline-specific sustainability challenges & solutions	Impact through qualitative LCA (circular economy)
BA 1st year, ~200	No	Yes Oral, in groups	90 min integrative and interactive lecture + group reflection as homework	Passive with some group/pair discussions & reflective homework	Content & competencies: Basic knowledge on discipline-specific sustainability challenges & solutions	Impact through qualitative LCA, emphasizing waste management
MA, ~20	Yes	Yes Also oral feedback	Sustainability-oriented group project + 45min lecture + group home assignment on systems thinking	Active, research-based, problem-solving	Competencies: systems and values thinking, interpersonal, problem solving	Project impact through sustainability science and LCA frameworks
MA, 10-20	Yes	Yes	Sustainability-oriented group project + debate	Active, research-based, problem-solving	Competencies: systems and values thinking, interpersonal, intrapersonal	Competencies

Aalto-yliopisto
Aalto-universitetet
Aalto University

Elina Kähkönen,

University Lecturer

A! Co-Educator Team /
Aaltonaut

- Two examples of
  sustainability integration for
  mass courses

Project course: Technological innovation project (CHEM)

1. Pre-assignment: reflection on definitions and dimensions of sustainability, identification of sustainability connections of project

2. Lecture about

- Basics of sustainability with activating tasks, discussion

- Impact, systemic approach

3. Group assignment: Visualize the sustainability impact of your project

- Template (use voluntary), free format reporting (visuals)

4. Group presentations → feedback → option for revision → part of final reporting of the project work

Aalto-yliopisto
Aalto-universitetet
Aalto University

INSTRUCTIONS: This table can be used for inspiration and practical help when starting to draw your mind maps (or similar visualisations on your project's impact on sustainability). How to use the table? You can e.g. first simply identify and list the process life cycle phases that are applicable to your project (the first column). Then you can start mapping your project phases against the different sustainability aspects: does our project have any impact on the sustainability aspect in quesion - write the impact into the right cell. After mapping, start differentiating between positive and negative impacts (or neutral), long-term and short-term effects and finally, identifying connections and possible trade-offs between different sustainability aspects. You can e.g. use colours and other tools to indicate, if an impact is positive or negative, long-term or short-term, *local*, regional or **global**. Use you imagination!

Remember that these various sustainability aspects in the table are examples drawing from scientific research (PB and doughnut models) - you don't need to use them all! You can also get inspiration e.g. from the SDGs when identifying the sustainability impacts of your projects. However, be prepared to justify and elaborate on the impacts and the connections and trade-offs you identify and present in the visualisation. In this elaboration, it is recommendable to use at least some existing framework or model of classifying the concept of sustainability.

| | Dimension of sustainability | | | | | | | | | | | | | | | | | | | | |
| | Ecological (according to the Planetary Boundaries) | | | | | | | Economic | | | | Social (according to the Doughnut model) | | | | | | | | | |
Process phases (following "basic" product life cycle)	Land use/ conversion	Climate change/ Energy	Biodiversity	Chemical or air pollution	Freshwater withdrawal	N / P loading Biogeo-chemical flows	Ocean acidification	Other?	Income	Business opportunities	Employment / decent work	Other?	Gender equality	Health	Social equity	Education	Housing	Energy, Food, Water	Other basic needs	Peace and justice	Political voice	Other?
Resource acquisition																						
Transport																						
Processing																						
Use phase (e.g. by business sector, user behavior ...)																						
End of use / recycling																						
Other?																						

Aalto-universitetet
Aalto University

Courtesy of student group: Satu Siitonen, Patrik Granvik, Max Hertogs, Otto Joutsiniemi, Vis Floris Calvin, Kegels Thibaud Ludo Liliane

Examples of integration with varying pedagogical approaches

1. Assignment contextualized in sustainability (pre-task video)
2. Using the SDGs to integrate sustainability content
3. Sessions and exercises developed and piloted in Aalto
   • Qualitative LCA and expert panel to integrate sustainability
   • Exercise supporting systems thinking
4. **Applying ready-made teaching material**
   • **Sustainability literacy test**
   • **Board games**
   • **Climate University courses (material)**

Sustainability Literacy Test
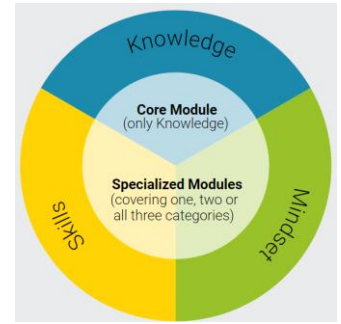
Background

- **Since 2013 (after Rio+20)**

- **Co-creation of questions**

- **Almost 50 countries**

- **> 430 universities**

- **> 45000 students**

About

- **30 international questions** (randomly drawn from a large pool of questions)

- **Additional set of 10-20 questions**
  - SDGs, national questions …

- **Multiple-choice**

- **Educative:** right answer with references provided after answering

Sulitest pros and cons

- Ready-made questions addressing sustainability from many aspects

- Increases students' awareness

- Inspires creating various types of assignments around it

- Reference data from thousands of other students

- Possibility of conducting research with it

- Free to use for universities

- Takes time to familiarize with it

- Students need to register in order to take the test

- May be difficult to link the wide-ranging topics with own subject area

- Questions cannot be chosen by teacher, but are randomly drawn to each test session
  - Comparison between test sessions difficult for the same reason

A? Aalto-yliopisto
Aalto-universitetet
Aalto University

Karvinen et al. (2017) https://www.sefi.be/wp-content/uploads/SEFI_2017_PROCEEDINGS.pdf

Board games in sustainability education

Based on flipped classroom and active learning

Improve sustainability competencies:
Strategic, system's, values thinking
Inter-/intrapersonal competencies

Include varying topics:
Climate change / fact knowledge
Polarity thinking
Debating / argumentation
Critical minerals
Tragedy of the commons
Ecosystem dynamics
SDGs
…

Boardgames we have in Aalto:

Images: snowflakeeducation.com

Dilemma,
played as a part of course work
(3-step flipped classroom)

2,5 days structure with pre-assignments, game
seminar and follow-up task

PROs

- Ready-made, but editable material and learning outcomes make it easy
  to start designing your teaching
- Easy to add content you wish to emphasize / relevant to your field
- Possibility to embed the game platform (Snowflake) in MyCourses
  makes it smooth for students to use
- Students found it engaging, educative and fun way to learn

CONs

- Takes time to familiarize with the concept and the material
- Snowflake is a startup – access to the material is behind licenses

Summary: ready-made material

There is plenty of ready-made (online) games and other teaching material

- If you know some good ones, please share your sources and experiences!

- Always some effort needs to be put on learning and evaluating the material

Other ready-made material:

- En-ROADS (climateinteractive.org)

- Climate Puzzle - D-mat

- Climate university (see below)

Bachelor's level	CIRCULAR.NOW	CLIMATE.NOW	SUSTAINABLE.NOW
Master's level	SYSTEMSCHANGE.NOW	SOLUTIONS.NOW	LEADERSHIP FOR SUSTAINABLE CHANGE
Additional	CLIMATECOMMS.NOW	STATISTICAL TOOLS FOR CLIMATE AND ATMOSPHERIC SCIENCE	LUKIOLAISEN ILMASTO.NYT

Break

Designated groups

Group 1: Sofia, Dina, Astrid

Group 2: Henriikka, Petra, Nina

Group 3: Tom B., Tom R., Hakan, Lena

Group 4: Neha, Tiia, Weiwei, Gerhard

Group 5: Donya, Anahita, Mika, Dandan

Group 6: Karin, Christine, Susa

Small group discussion

General guidelines:

Group discussion: 15 min

- Field specific groups
- Room chair: First in alphabetic (first name)
- Be prepared for a joint discussion

Topic of discussion:

Go back to the Flinga you created earlier today:

- Elaborate on your entries:
  - What learning activity did you include, where did you position it, why?
- Discuss how these activities support particularly sustainability related learning?
- What about practicalities in implementation?
  - Possibilities and limitations?

Homework: Work on either 1A or 1B

1A: Describe one learning activity aiming at advancing learning of sustainability competencies or sustainability related content *that you have (successfully) used in your teaching before.* Be as precise as possible. Explicate, what was the aim of the activity and how was it concretely implemented (f2f, online, timing, instructions, equipment,…).
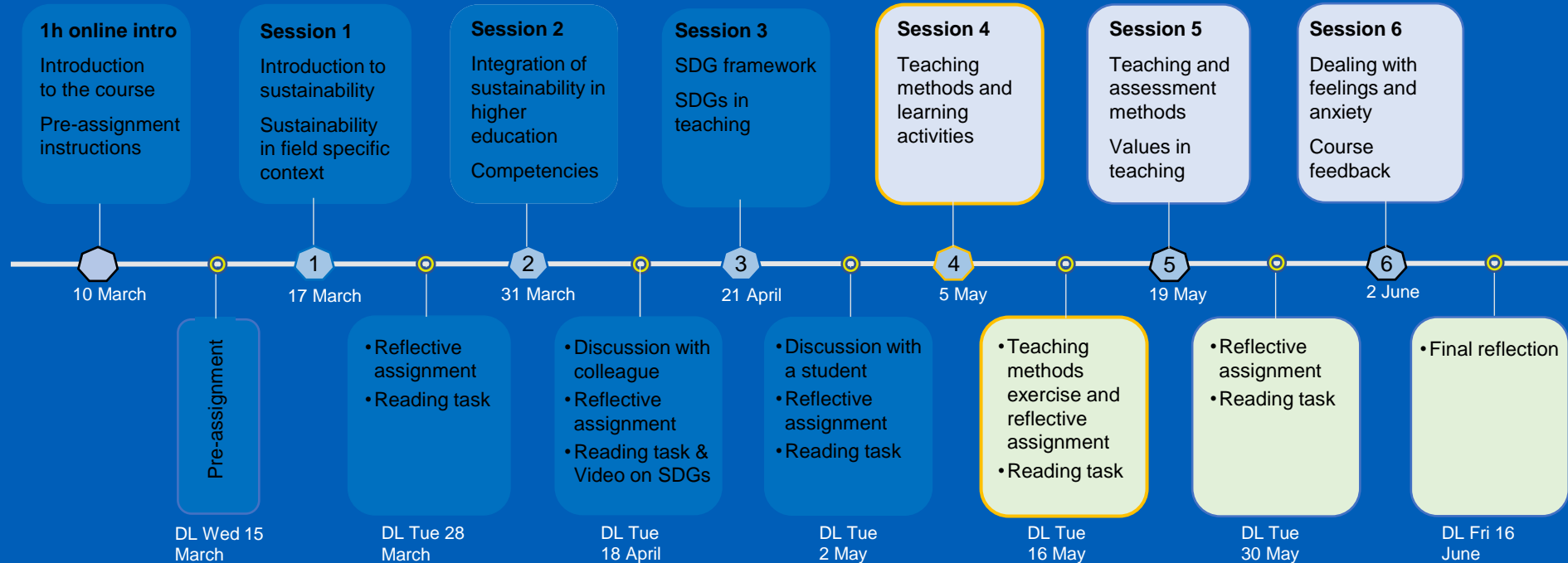
Reflect on it, e.g. how could you develop it further, for what kind of situations could you recommend this exercise, are there any critical points, etc.

1B: Based on the previous session, design one teaching activity for sustainability integration (sustainability competencies or sustainability related content) for your own course. Be as precise as possible. Explicate, what is the aim of the activity and how would you concretely implement it (f2f /online, timing, preparations, instructions, equipment,…).

Both tasks: Apart from your individual submission, summarize your description into one .ppt-slide, which you share in the MyCourses Discussion forum. Make sure someone from "outside" understands your method. The submission in the Discussion Forum are visible for everyone. Comment / ask a question concerning the posted one-slider of at least one peer.

A? Aalto-yliopisto
Aalto-universitetet
Aalto University

Sessions and assignments

1h online intro

Introduction to the course

Pre-assignment instructions

Session 1

Introduction to sustainability

Sustainability in field specific context

Session 2

Integration of sustainability in higher education

Competencies

Session 3

SDG framework

SDGs in teaching

Session 4

Teaching methods and learning activities

Session 5

Teaching and assessment methods

Values in teaching

Session 6

Dealing with feelings and anxiety

Course feedback

10 March — 1 (17 March) — 2 (31 March) — 3 (21 April) — 4 (5 May) — 5 (19 May) — 6 (2 June)

Pre-assignment

DL Wed 15 March

- Reflective assignment
- Reading task

DL Tue 28 March

- Discussion with colleague
- Reflective assignment
- Reading task & Video on SDGs

DL Tue 18 April

- Discussion with a student
- Reflective assignment
- Reading task

DL Tue 2 May

- Teaching methods exercise and reflective assignment
- Reading task

DL Tue 16 May

- Reflective assignment
- Reading task

DL Tue 30 May

- Final reflection

DL Fri 16 June

A"

Aalto-yliopisto
Aalto-universitetet
Aalto University

Deadline of *Reflective assignments* always on Tuesday at 12.00 before the next session

Next session in two weeks…

1. **Assignment 4 (dl 16.5.)** <u>includes 2 submissions:</u>

a) Description + reflection of an existing teaching & learning activity
OR
b) Designing a new teaching activity for your course
→ Submit to MyCourses submission box (as usual)

AND
➢ **Share with others as one .ppt-slide**
→ Submit to MyCourses Discussion Forum

2. **Take the Sulitest,** **dl** <u>**19.5. at 10.00**</u>

3. **Reading task:** Shephard & Egan 2018

Next session Fri 19.5.2023 online!

Literature

Karvinen et al.: Sustainability literacy and engineering: Experiences from a literacy test as a teaching and assessment tool in Nordic universities (2017). 45th Annual Conference of the European Society for Engineering Education, SEFI 2017. https://www.sefi.be/wp-content/uploads/SEFI_2017_PROCEEDINGS.pdf

Lozano et al. (2019): Teaching Sustainability in European Higher Education Institutions: Assessing the Connections between Competences and Pedagogical Approaches. Sustainability 2019, 11(6), 1602; https://doi.org/10.3390/su11061602

Savickas, M. L. (1997). Career adaptability: An integrative construct for life-span, life-space theory. The Career Development Quarterly, 45(3), 247–259. https://doi.org/10.1002/j.2161-0045.1997.tb00469.x

Segalàs, J, Ferrer-Balas D, Svanström M, Lundqvist U, and Mulder, KF (2009), What has to be learnt for sustainability? A comparison of bachelor engineering education competences at three European universities, Sustainability Science, 4(1), 17.

Sipos, Y., Battisti, B., & Grimm, K. (2008). Achieving transformative sustainability learning: engaging head, hands and heart. International journal of sustainability in higher education. https://doi.org/10.1108/14676370810842193

Tejedor, G.; Segalàs, J.; Barrón, Á.; Fernández-Morilla, M.; Fuertes, M.T.; Ruiz-Morales, J.; Gutiérrez, I.; García-González, E.; Aramburuzabala, P.; Hernández, À. Didactic Strategies to Promote Competencies in Sustainability. Sustainability 2019, 11, 2086. https://doi.org/10.3390/su11072086

UNESCO (2017): Education for Sustainable Development Goals: learning objectives; 2017 (unesco.de)

A! Aalto-yliopisto
Aalto-universitetet
Aalto University