

# *Sustainability in Teaching -course*

Session 4



Aalto-yliopisto  
Aalto-universitetet  
Aalto University



28.10.2022  
12:15-15:00

# 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

# Meeting with a student - reflections

## General guidelines:

**Breakout rooms: 5+5 min**

- "Speed Dating"
- In pairs, 5 mins each
- 2 rounds

## Topic of discussion:

- **Share your pair ONE interesting insight from your discussion with the student.**

# 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

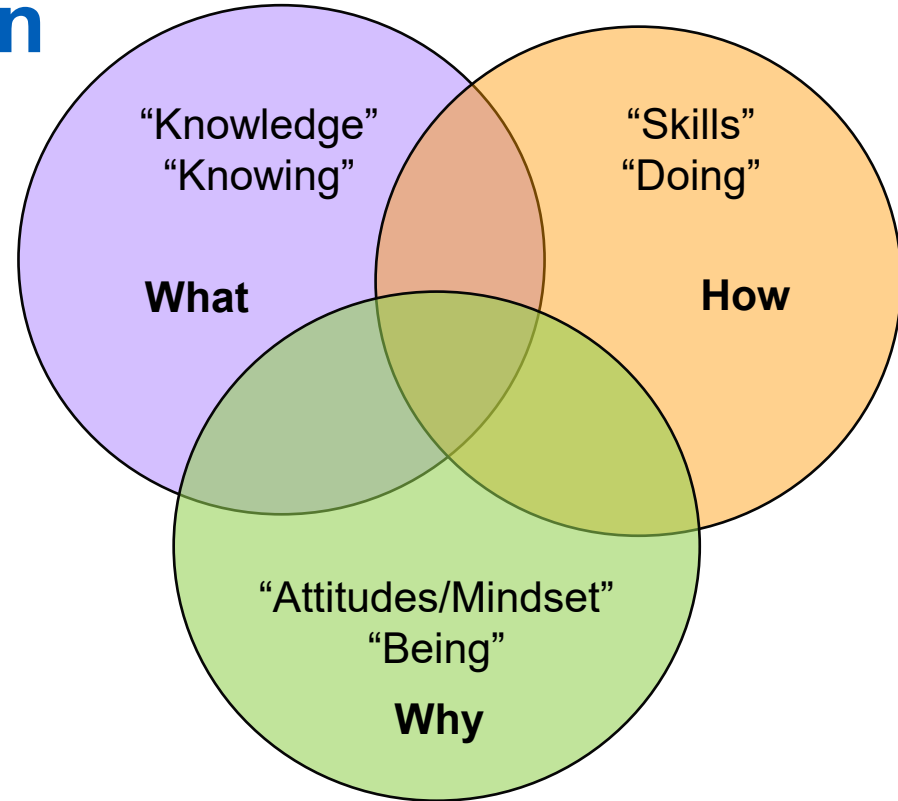
Sustainability education:

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



→ 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)

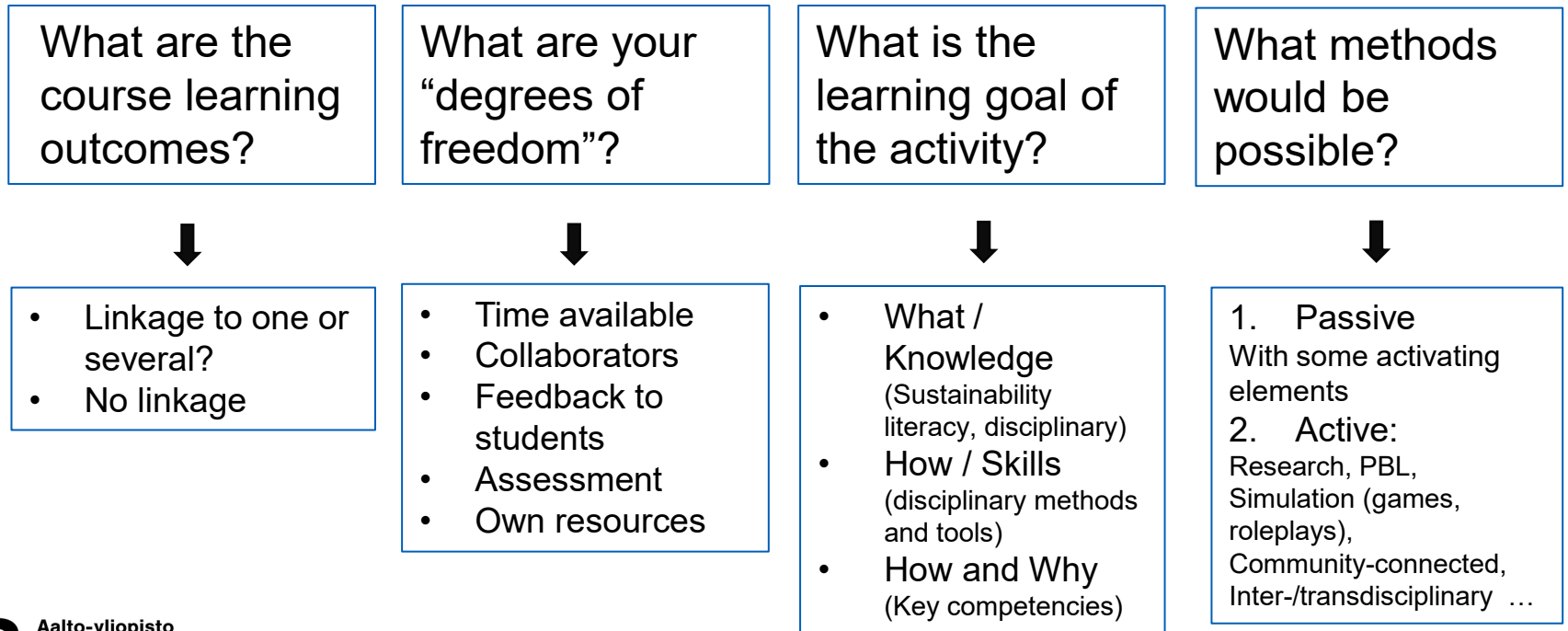
→ Combining different types of learning activities (methods) essential, if aiming at improving all the spheres, the “what, how and why”. This includes:

- 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)

# 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)



# Your turn: collecting learning experiences / teaching methods

## Step 1: In Flinga

- 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? Describe briefly.**

## Step 2: Still in the same Flinga

- Let's organize our notes according to learning objective categories ("knowing, doing, being")
- Drag your note to appropriate field



# *Break*

10 minutes



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

- Is the teaching method *sustainable*, given a mass course of 300+ participants and only little teaching assistance resource?
- It is possible to use diverse teaching methods in early phase of B. studies, e.g. in project course
- Availability of databases and software to analyze all kinds of energy consumption, materials sustainability etc.?

# 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 (box on the right)
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

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  - **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	Sustainability-related ILOs	Assessment	Teaching activity developed	Student engagement	Approach	Topic addressed
BA 1 <sup>st</sup> 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 1 <sup>st</sup> 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

**Elina Kähkönen,**  
University Lecturer  
A! Co-Educator Team /  
Aaltonaut

- Two examples of sustainability integration for mass courses





# Project course: Technological innovation project (CHEM)



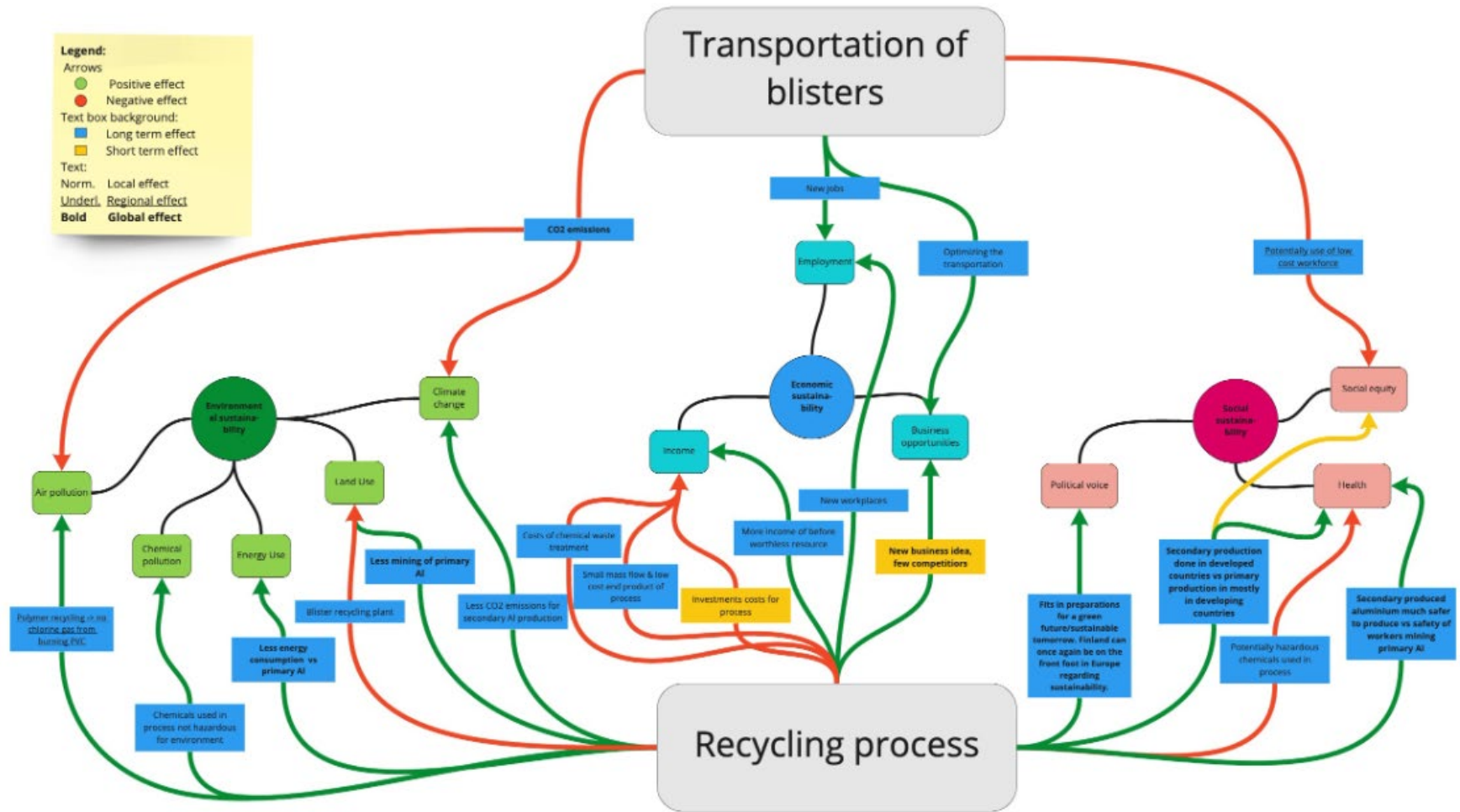
1. Pre-assignment: reflection on definitions and dimensions of sustainability, identification of sustainability connections of project
2. Lecture about
  - Basics of sustainability with activating tasks, discussion
  - Impact, systemic approach
3. Group assignment: **Visualize the sustainability impact 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

**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 question - 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 your 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.

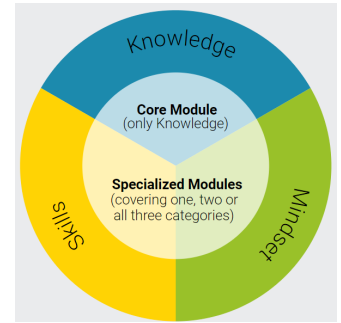
	Dimension of sustainability																					
	Ecological (according to the Planetary Boundaries)							Economic				Social (according to the Doughnut model)										
Process phases (following "basic" product life cycle)	Land use/ conversion	Climate change/ Energy	Biodiversity	Chemical or air pollution	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?																						



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- 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

# 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:



# 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 \(climateinteractive.org\)](https://climateinteractive.org)
- [Climate Puzzle - D-mat](#)
- [Climate university \(see below\)](#)

Bachelor's level



CIRCULAR.NOW



CLIMATE.NOW

AALTO  
PHYS-E0580



SUSTAINABLE.NOW

Master's level



SYSTEMSCHANGENOW

AALTO  
MS-E2136



SOLUTIONS.NOW



LEADERSHIP FOR  
SUSTAINABLE CHANGE

Additional



CLIMATECOMMS.NOW



STATISTICAL TOOLS  
FOR CLIMATE AND  
ATMOSPHERIC SCIENCE



LUKIOLAISEN  
ILMASTO.NYT

# *Break*



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# Designated group (note changes)

**Group 1:** Tamara, ~~Victor~~, Janet, Marja

**Group 2:** Jouni, ~~Sam~~, Henriikki, Janika

**Group 3:** Karolina, Irina, Henrik, Oguz

**Group 4:** Eeva B., ~~Susan~~, Julia

**Group 5:** Ville, ~~Eeva-L. R.~~, ~~Jacky~~, Eero



# Small group discussion

## General guidelines:

### Breakout room: 20 min

- Field specific groups
- Room chair: First in alphabetic (first name)
- *Complement Flinga based on your discussion*
- Be prepared for a joint discussion (10 min)

## Topic of discussion:

Go back to the Flinga you created earlier today

- Elaborate on your entries:
  - What method did you include, where did you position it, why?
- Discuss how these methods support particularly sustainability related learning?
- What about practicalities in implementation?
  - Possibilities and limitations?
- Which of the methods could develop the key competencies you consider the most important (recall Session 2)?
  - Are there any competencies you consider important, but think are not addressed by these methods?



# **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.



# Timeline of the course *(changes possible)*

Reading task for respective week	Mon	Tue	Wed	Thu	Fri
					<b>9.9. Session 0:</b> Course practicalities
Sustainability.n ow-material	<b>12.9.</b>	<b>13.9.</b>	<b>14.9.</b> Pre-assignment (questionnaire) Introduction	<b>15.9.</b>	<b>16.9. Session 1:</b> Introduction to sust. & Sust. in field specific context
Wiek et al 2011	<b>19.9.</b>	<b>20.9.</b>	<b>21.9.</b>	<b>22.9.</b>	<b>23.9.</b>
	<b>26.9.</b>	<b>27.9.</b> Homework from session 1	<b>28.9.</b>	<b>29.9.</b>	<b>30.9. Session 2:</b> Integration of sustainability in higher education, Competencies
	<b>3.10.-7.10.</b> Discussion with colleague (book time slot in time)				
SDG-articles, two options, read at least one	<b>10.10.</b>	<b>11.10.</b> Homework from session 2	<b>12.10.</b>	<b>13.10.</b>	<b>14.10. Session 3:</b> SDG framework
Video					

**COURSE  
SESSION,**  
at 12-15

**READING  
TASKS**  
(due  
before  
contact  
sessions)

**Homework  
assignment  
DLs**

**OTHER  
ASSIGNMENT**

# Timeline of the course *(changes possible)*

Reading task for respective week	Mon	Tue	Wed	Thu	Fri
Tejedor et al	17.-21.10. Discussion with student (book time slot in time)				
Video	24.10.	25.10. Homework from session 3	26.10.	27.10.	28.10. <b>Session 4:</b> Teaching methods TapRoom
Reading task Shephard & Egan 2018	31.10.	1.11.	2.11.	3.11.	4.11.
	7.11.	8.11. SULITEST Homework from session 4	9.11.	10.11.	11.11. <b>Session 5:</b> Teaching and assessment methods Values in teaching
Reading task (tbc)	14.11.	15.11.	16.11.	17.11.	18.11.
	21.11.	22.11. Homework from session 5	23.11.	24.11.	25.11. <b>Session 6:</b> Dealing with emotions and anxiety Closing
Deadline of final reflection: 9.12.					

**COURSE  
SESSION,**  
at 12-15  
EET

**READING  
TASKS**  
(due before  
contact  
sessions)

**Home work  
assignment  
DLs**

**OTHER  
ASSIGNMENT**

# Next session in two weeks...

## 1. Assignment 4 (dl 8.11.)

- a) Description + reflection of existing teaching method /learning activity learning

OR

- b) Designing a new teaching activity for your course

AND

- Share with others as one .ppt-slide

## 2. Take the Sulitest, dl 11.11. at 10.00

## 3. Reading task: Shephard & Egan 2018



# 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](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 \(unesco.de\)](https://www.unesco.org/en/education/sustainable-development-goals)*