

Sustainability in Teaching -course

Session 2



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Aalto-universitetet
Aalto University



25.3.2022
12-15

Timeline of the course *(changes possible)*

Reading task for respective week	Mon	Tue	Wed	Thu	Fri
	7.3.	8.3.	9.3. Pre-assignment (questionnaire) Introduction	10.3. Reading task: Sustainability.no w-material	11.3. Session 1: Introduction to sust. & Sust. in field specific context
Wiek et al 2011	14.3.	15.3.	16.3.	17.3.	18.3.
	21.3.	22.3. Homework from session 1	23.3.	24.3.	25.3. Session 2: Integration of sustainability in higher education, Competencies
SDG-article(s)	28.3.-1.4. Discussion with colleague (book time slot in time)				
Video	4.4.	5.4. Homework from session 2	6.4.	7.4.	8.4. Session 3: SDG framework

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.	11.-15.4. Discussion with student (book time slot in time)				
Video	18.4.	19.4. Homework from session 3	20.4.	21.4.	22.4. Session 4: Teaching methods
Reading task (tbc)	25.4.	26.4.	27.4.	28.4.	29.4.
	2.5.	3.5. SULITEST Homework from session 4	4.5.	5.5.	6.5. Session 5: Teaching and assessment methods Values in teaching
Reading task (tbc)	9.5.	10.5.	11.5.	12.5.	13.5.
	16.5.	17.5. Homework from session 5	18.5.	19.5.	20.5. Session 6: Dealing with emotions and anxiety Closing
Deadline of final reflection:					

COURSE SESSION,
at 12-15
EET

READING TASKS
(due before
contact
sessions)

**Home work
assignment
DLs**

**OTHER
ASSIGNMENT**

Session outline and objectives

Session outline

1. Different starting points for integrating sustainability

Break

2. Introduction to competencies for sustainability

Break

3. Applying competencies into you own field

Learning outcomes of this session

During this session you will:

- Familiarise yourself with the different approaches to integrate sustainability into teaching on course or programme level
- Reflect on how key competencies for sustainability can be used in developing teaching in one's own subject field

Ways of working during sessions

Group work/discussions in breakout rooms

BR Chair duties

- Handing out the floor, keeping track of time
- Securing respectful and balanced dialogue
- Taking notes (if applicable), reporting to the whole group

Reading materials sharing in MyCourses



Different starting points for integrating sustainability

Based on your homework reflections

General guidelines:

Breakout room: 8 min

- Pair discussion

Topic of discussion:

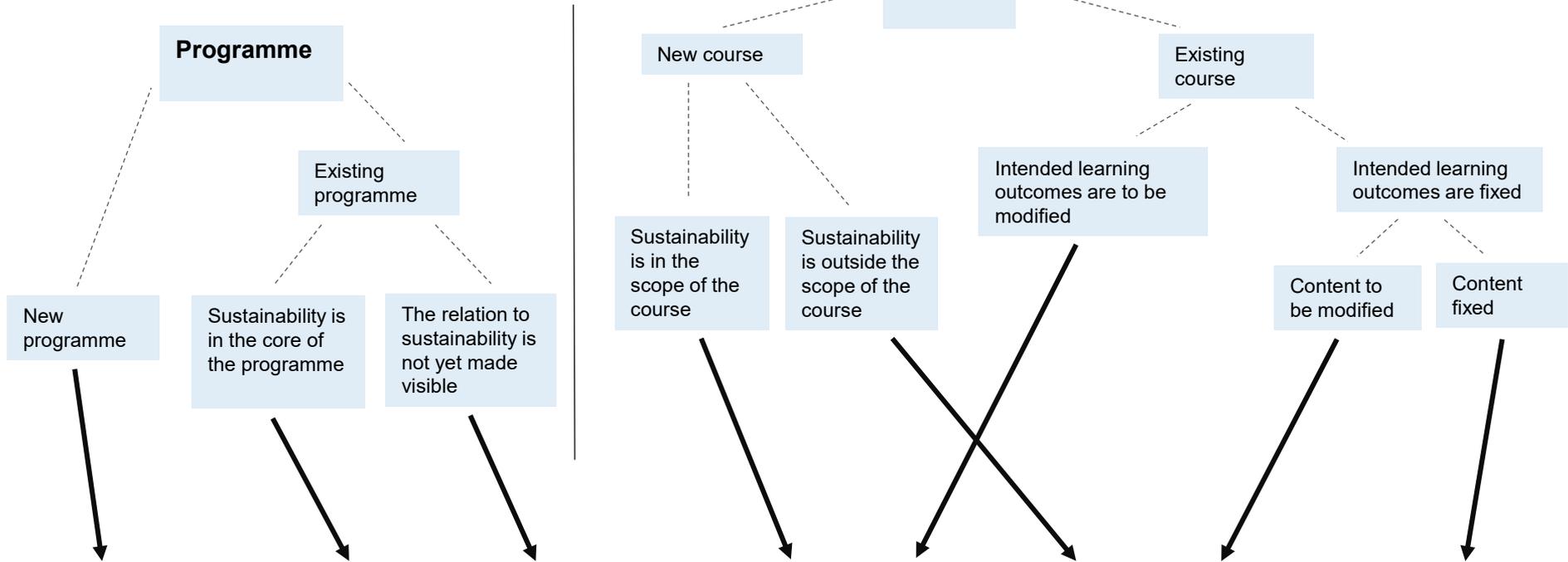
What kind of starting point for sustainability integration did you identify for your own teaching?

- A) What kind of possibilities do you have for developing your teaching?
- B) What kind of topics did you recognize as relevant?

Different starting points for integrating sustainability

Looking for my starting point for sustainability integration

I work on a...



Analysing the future

What kind of future is desirable in our operating environment? How could we accelerate the transitions needed through education? What kind of capabilities do our graduates need in 2030 and onwards?

Programme analysis and adjustment

You have already applied sustainability to the programme. Analysis of desired graduate capabilities, curriculum mapping might help you to identify possibilities for improvements.

Building common understanding

In a programme where sustainability is not yet been discussed the process starts by building common understanding among the programme staff and stakeholders.

Intended learning outcomes

Think about the learning outcomes, what should student learn in relation to the topic of the course? You can also apply "*Content approach*" or "*Encountering sustainability*"

Content approach to sustainability

Even though the course ILOs do not cover sustainability you can try to identify what kind of sustainability related topics are relevant for the course. You can also apply "*Encountering sustainability*"

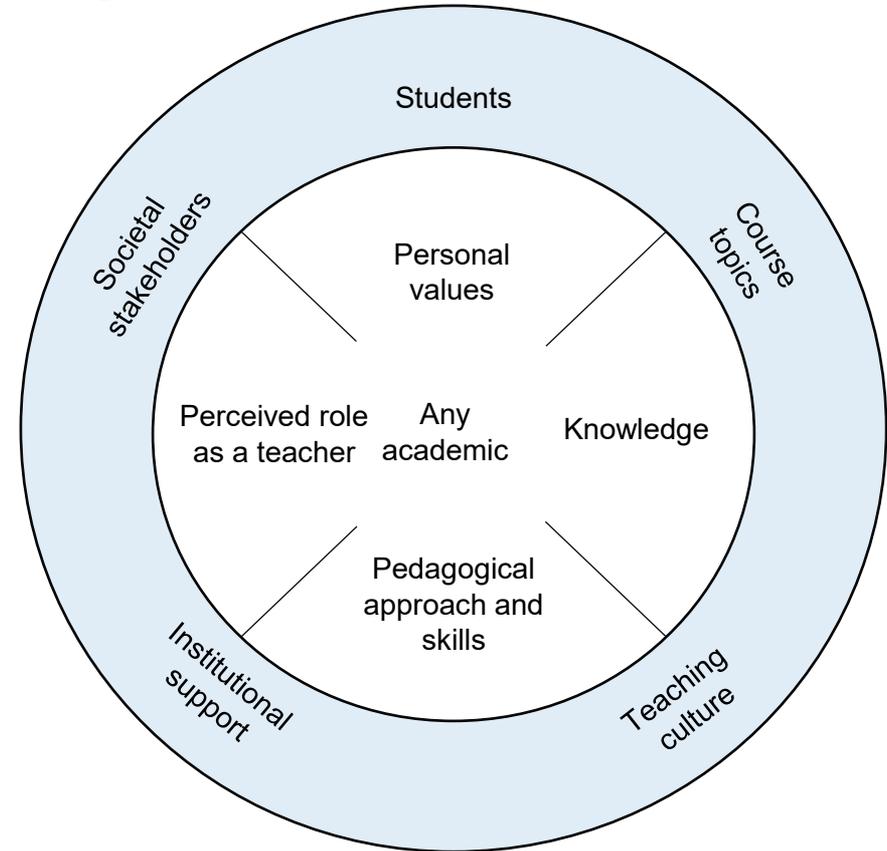
Encountering sustainability

You could try setting sustainability as a context of an assignment. This could benefit students' learning on topics that are relevant for them professionally or personally.

What is influencing on how we implement sustainability?

- Academics are in a key role in implementing sustainability into higher education institutions (HEI).
- However, various things affect how we are able to integrate sustainability, they can be
 - personal (personal values),
 - related to the institutional context (teaching culture) or
 - external (societal stakeholders).

Thomas 2016, Barth 2013



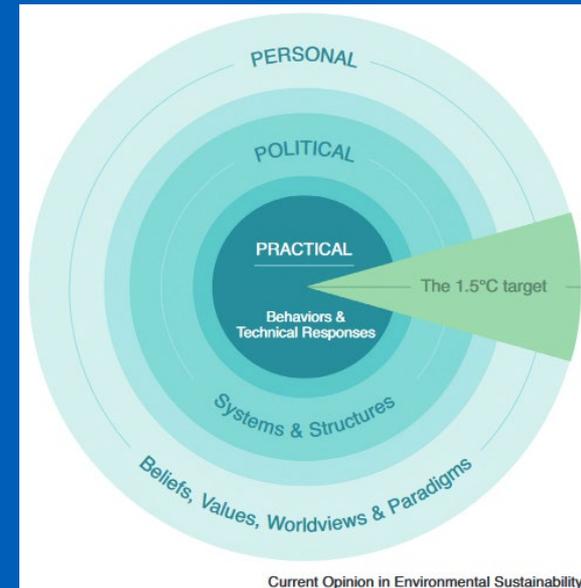
Different spheres of sustainability in teaching

Spheres of sustainability transformation: Practical, political and personal (O'Brien, 2018)

- Personal and political generate conditions for practical transformations
- All must be recognized

Implications to teaching sustainability:

- The spheres are considered differently in different disciplines. E.g.:
 - In engineering education: the practical sphere might be highlighted, but political and personal gain less attention. (Mulder 2017)
 - In the field of arts the personal sphere is more explicitly addressed.



Continuum of approaches within sustainability teaching

Solution focused approach

Focuses on field specific sustainability solutions or pragmatic applications.

Analysis of the impacts of providing services or products. (e.g. life cycle analysis, SDG based analysis)

Systemic change approach

Focuses on transition management.

Applies transdisciplinary approach

These approaches should interact, and graduates need competencies in all approaches.

Two levels of integration

Curriculum development

What are the desired sustainability related graduate competencies?

How can the course contribute to programme level learning outcomes?



How do the courses support achievement of desired graduate competencies?

Course development

What are the meaningful connections to sustainability in my course?

Tools and practices to discuss sustainability across the programme

1. Graduate competencies

- Engaging the teachers to build shared understanding
- Workshops and discussions
- Benchmarks, student surveys, dialogue with societal stakeholders may also be helpful

2. Mapping the curriculum

- Identifying the current situation and development possibilities
- Workshops and discussions
- Curriculum mapping tool helps systematic development
- You can also start bottom-up and discuss with a colleague!

3. Discussing the plans with others

- Discussion on the implementation plans with your colleagues will help you align the courses across the programme
- Workshops and discussions
- Curriculum mapping (e.g. mapping sustainability contents).

4. Collaboration and co-teaching in courses

Curriculum map from WAT master's programme

Period	Course (á 5 ects)	Define the concept of sustainability and describe the key global scientific and political frameworks relating to it [knowledge]	Explain the fundamentals of the current state of the world, including fact knowledge and orders of magnitude relevant to the field [knowledge]	Identify and analyse cause-consequence relations and feedback loops relevant to water sector and apply short- and long-term strategic planning based on those analyses [skill]	Apply relevant engineering approaches and methods to define and solve water-related sustainability challenges [skill]	Promote a functioning and sustainable society with flexible and creative mindset [identity]	Recognise, reflect and critically analyse own mental models and behavior in relation to other people and the natural environment [identity]	
I	Water and environmental engineering 15cr	X	X	x	x	x	X	
II	Groundwater hydrology		X	x	x			
III	Hydrological modelling	X		x	x	X		
IV	Environmental hydraulics		x	x	x	X	x (X)	
IV	Surface water resources		x (X)	x	x			
II	Sustainable built environment		X			X	x (X)	
II	Sustainability in environmental engineering	X	x		x	x		
III	Water and governance	X	x		x		x	
III	Sustainable global technologies (SGT) studio 10 cr	X		X		X	X	
V	Water and people in a changing world	X	x	x	x		X	
II	Urban water systems	X	X	x	x		X	
III	Physical and chemical treatment of water and waste		X	x	x (X)	x	X	
IV	Biological treatment of water and waste		X		x	X		
IV	Design and management of water and wastewater networks		x (X)	x (X)	x	X	X	
V	Modelling and control of water and wastewater treatment processes				x	X		
	Study tracks:	COMMON COURSE	WATER RESOURCES	WATER AND DEVELOPMENT	WATER AND WASTEWATER			
	Labels:	x: covered trough substance		X: covered specifically related to sustainability				
		X: content could/should be added to reach the virtual course ILOs						

Break

10 minutes



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Competencies in sustainability

Some background on competencies

Competence* = a functionally linked complex of knowledge, skills, and attitudes that enable successful task performance and problem solving (Wiek et al. 2011)

Different interpretations of competence:

- Competence as something that the student/graduate can do (and perform) in practice. These are often measurable.
- Competence as personality development. Slow process that cannot be directly observed or measured.

Transformative competencies for 2030 of the OECD (2019) and sustainability competencies are connected to both interpretations.

Alternative way of defining what ought to be learned: knowing, doing, being

Key competencies for sustainability

Competence framework developed by Wiek et al. (2011 and 2016):

- **Most referenced** sustainability competence framework
- Based on an *integrated sustainability research and problem-solving framework*
- Focus on competencies that are needed for “**change agents**” or “**transition managers**” (Wiek et al. 2011)
- **Interlinked and interdependent:** each competence plays a part in the problem-solving process
- **In order to be *sustainability* competencies, topical knowledge on sustainability is essential.**
- Further developed by Brundiers et al (2021): **intrapersonal and implementation competences**

Systems thinking	Anticipatory / futures thinking
Strategic-thinking	Normative / values-thinking
Interpersonal / collaborative	Integrated problem-solving
Intrapersonal / Self-awareness	Implementation

UNESCO key competencies for sustainability

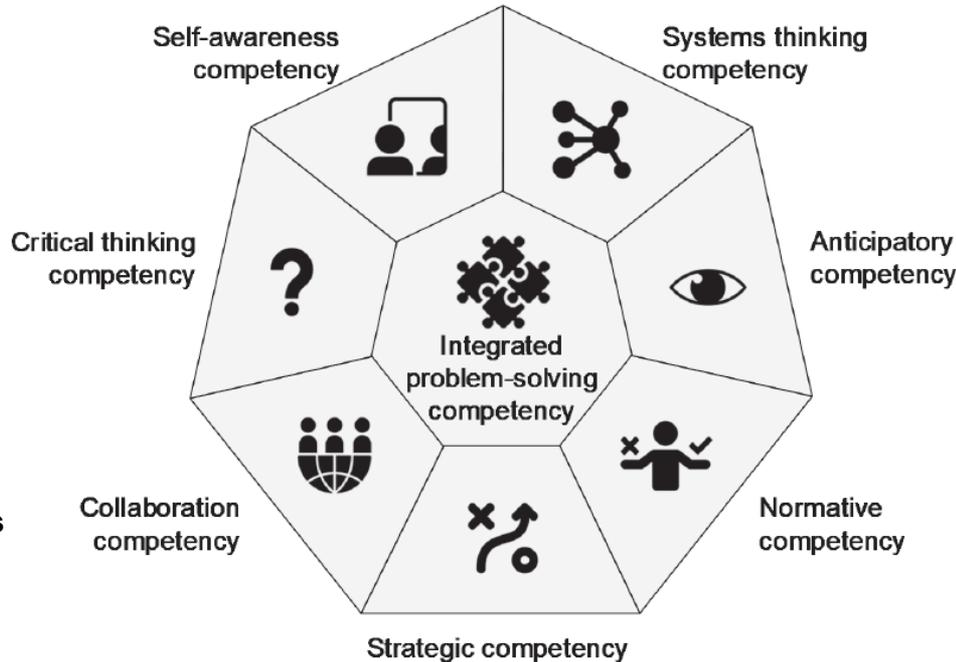
Awareness of one's own emotions, desires, thoughts, behaviors, and personality

- Self reflection
- Feelings, desires

Critical use and evaluation of information

Collaborate in each step of the problem-solving process

- Inter-/transdisciplinary collaboration
- Leadership, empathy



Analyse complex problem in current state and its history

- Structures, subsystems,
- Feedback loops, cause-effect

Craft future sustainability visions, create non-intervention scenarios

- Possible/desirable futures
- Path dependencies
- Scenarios

Map, specify, apply, reconcile and negotiate sustainability values

- Justice, fairness,
- Risk, trade-offs, ethical

Develop sustainability transition strategies

- Intentions, action
- Success factors, obstacles

(Wiek et al 2011; UNESCO 2017; Rosén et al 2019, Brundiers et al 2021)

Key competencies, topical knowledge and academic skills

Academic skills

Basic capacities in critical thinking, communication, pluralistic thinking, research, data management, also self-regulated learning and generic problem-solving skills

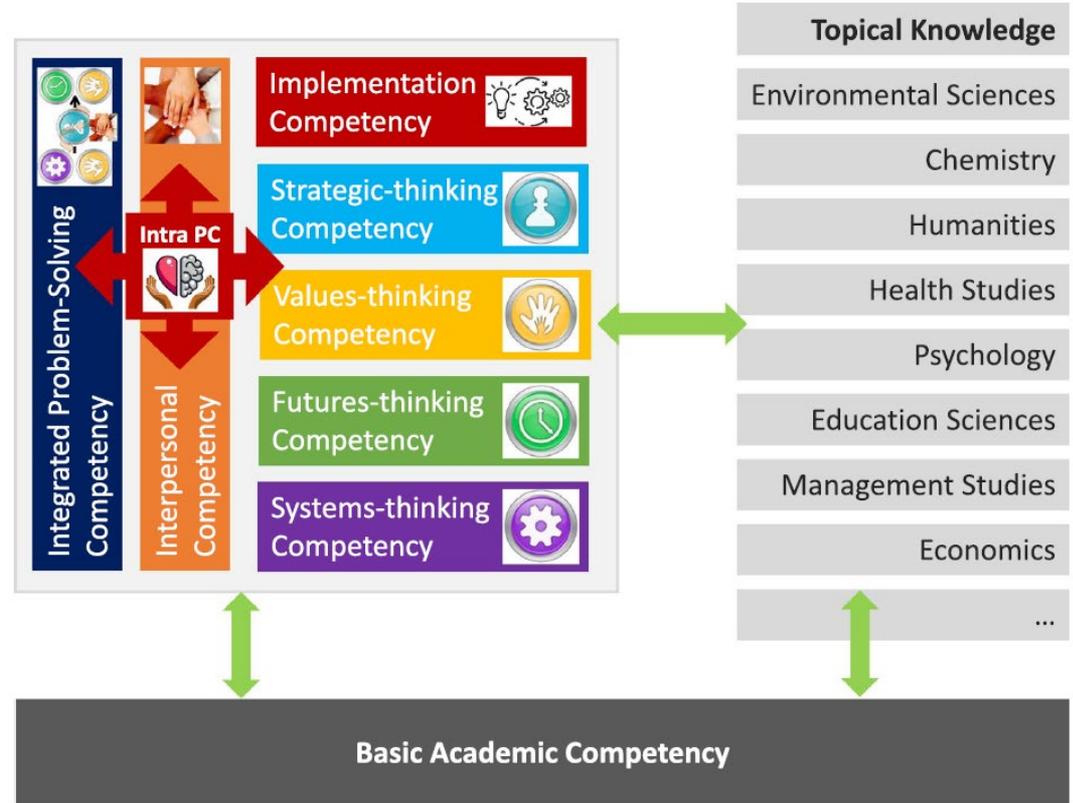
Topical knowledge

Substance and task specific knowledge and skills

Sustainability key competencies

Interdependent: each contribute to the integrated problem-solving process

Brundiens et al. (2021)



A fictional example of a graduate working for a global reinsurer in its 'Department of Sustainability, Emerging and Political Risk Management'.
Brundiens et al. (2021)

Your thoughts on the competencies

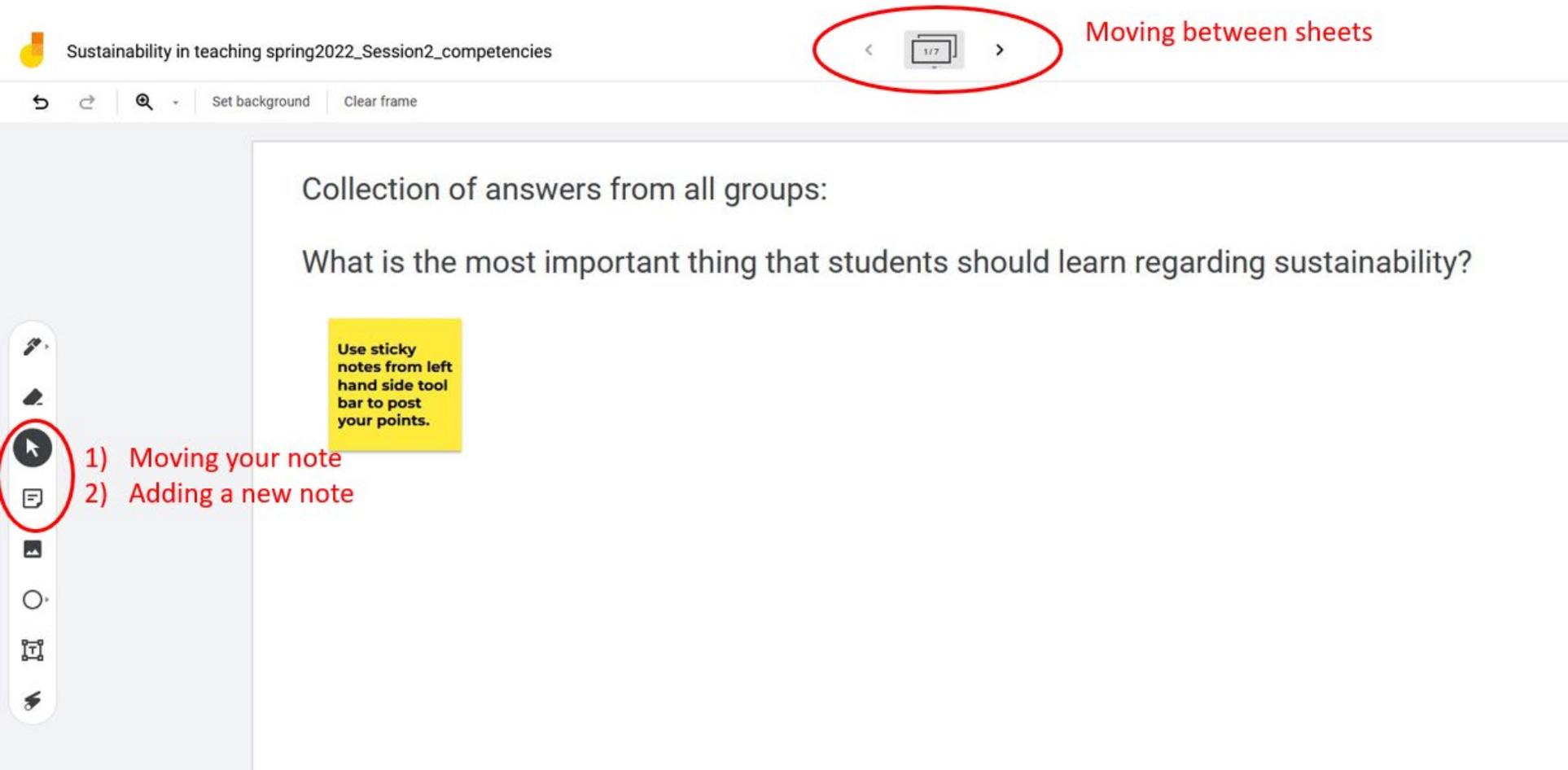
Think for 2 min :

**In your opinion, what is most essential for
students to learn during their studies
regarding sustainability?**



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Documenting your discussion in Jamboard



Sustainability in teaching spring2022_Session2_competencies

Moving between sheets

Collection of answers from all groups:

What is the most important thing that students should learn regarding sustainability?

Use sticky notes from left hand side tool bar to post your points.

- 1) Moving your note
- 2) Adding a new note

The image shows a Jamboard interface. At the top, there is a title bar with the text "Sustainability in teaching spring2022_Session2_competencies". To the right of the title bar, there are navigation arrows and a sheet indicator showing "1/7", which is circled in red. To the right of this, the text "Moving between sheets" is written in red. Below the title bar is a toolbar with icons for undo, redo, search, and "Set background" and "Clear frame". The main workspace contains the text "Collection of answers from all groups:" and "What is the most important thing that students should learn regarding sustainability?". A yellow sticky note is placed on the workspace with the text "Use sticky notes from left hand side tool bar to post your points.". On the left side, there is a vertical toolbar with various icons. The mouse cursor icon and the sticky note icon are circled in red. To the right of these icons, a list of instructions is provided: "1) Moving your note" and "2) Adding a new note".

Your reflections

General guidelines:

Breakout room: 15 min

- Group discussion (random groups, 3-4 persons in a group)
- For framework slides, see chat.
- Documentation of group discussion in Jamboard **(Sheet 1)**
- Group chair: Shortest last name (# of letters)

Topic of discussion:

- Share: What is most essential for students to learn during their studies regarding sustainability?
- What do you think about the competency framework?
- *Write down main points of your discussion and prepare to share them with others.*

Break



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Applying competencies for sustainability to different disciplinary settings

- **Competencies for sustainability are designed originally for sustainability graduates.**
- **The application of the competencies in different disciplinary settings is less addressed.**
- **When applying the competencies, important to consider how they are relevant in your disciplinary context.**

Competency: Systems-thinking

Suggested Intended learning outcome for systems thinking (Wiek et al. 2016)

- Graduates, who are competent in systems thinking, are **able to analyse sustainability problems cutting across different domains** (or sectors) **and scales** (i.e. from local to global), thereby applying systems concepts including systems ontologies, cause-effect structures, cascading effects, inertia, feedback loops, structuration, etc.

Application in WAT master's programme-level ILOs

- Identify the societal context relevant to the water and environment and comprehend the different scales and key drivers applicable to water and environmental engineering



Systems thinking in learning outcomes and teaching

WAT-E1100 Water and Environmental Engineering 15 ECTS (common course)

Systems thinking, such as: Global and local cause-effect, structures, sub-systems, cascading effects

Learning outcome / topical knowledge

Understand the principles of the hydrological cycle and water resources management, including the role of hydraulic structures

Understand the key principles of good environmental and water quality

Identify the broader societal context relevant to water and environmental engineering, including the key governance and entrepreneurial aspects

Implementation / topical skills

Modeling climate scenarios

Essay based on articles + lab work with “mystery” water samples

Water as a cross-cutting element in e.g. food security and health issues + who is involved in managing these

Designated group

Group 1: Jenni, Matti K.

Group 2: Julia V., Simo

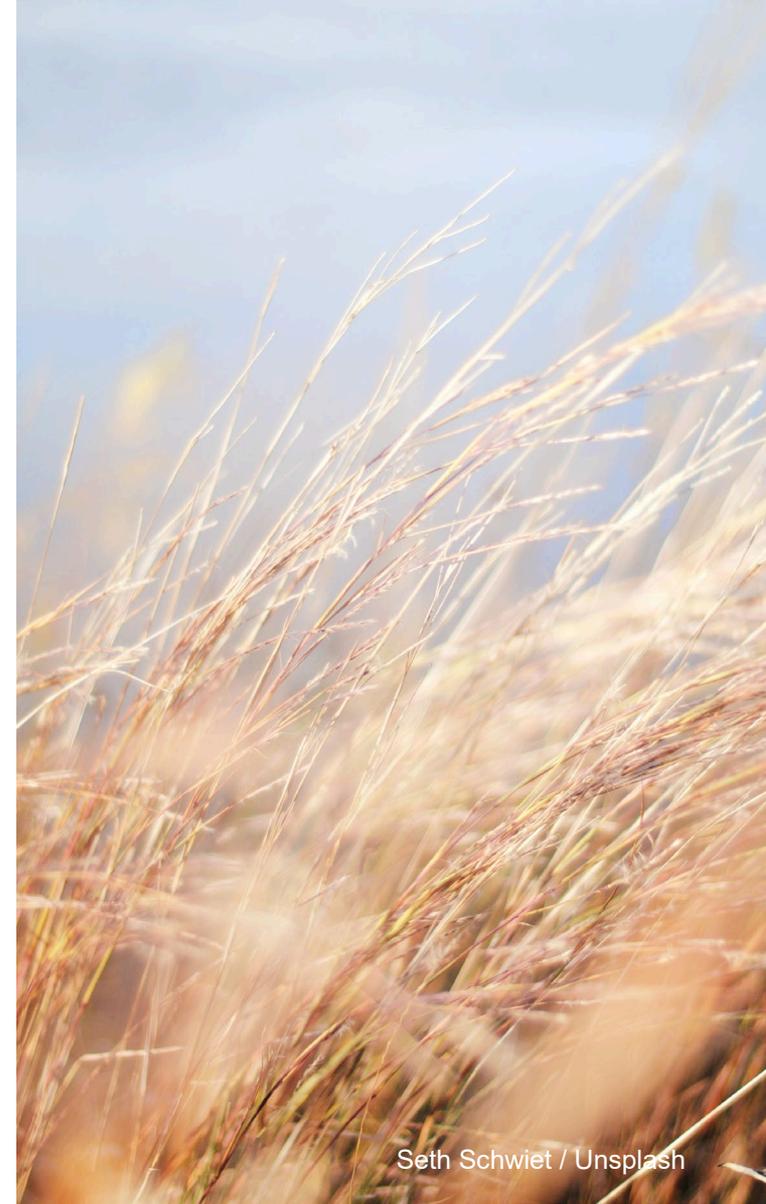
Group 3: Roope, Heli, Kirsi, Kaj, Reetta

Group 4: Camilla, Roza, Sven, Claudio, Tuulia

Group 5: Paulo, Fares, Matti P., Jaan



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Seth Schviet / Unsplash

Your reflections

General guidelines:

Individually 5 min

Breakout room: 15 min

- Field specific groups
- Documentation in Jamboard (**group specific sheets 2-7**)
- Group chair: Longest last name (# of letters)

Topic of discussion:

Applying the competencies for sustainability into field specific context

Think individually:

- which 1-2 competencies are most relevant for your graduates from sustainability perspective? What should students learn in practice? Write down your thoughts in Jamboard.

Discuss in group:

- What competencies did you see as most relevant?
- How could you use key competencies for sustainability in your teaching?

Next session...

- **Assignment:**
 - Written assignment, instructions and submission in MyCourses
 - DL for the assignment Tue 5.4.2022
- **Peer discussion:** Book a timeslot for an informal discussion with a department colleague (s.o. preferably not on this course). Topic of discussion:
→ *What are the **most relevant** and **important** sustainability competencies in your field?* Share a brief reflection in the assignment.
- **Reading task:** See MyCourses
- **Watch** a short video for inspiration on interconnectedness of the SDGs (link in MyCourses)

Next session Fri 8.4.2022!

Literature

Barth, M. 2013. Many roads lead to sustainability: a process-oriented analysis of change in higher education. *International Journal of Sustainability in Higher Education* Vol. 14 No. 2, 2013 pp. 160-175

Brundiens, K., Barth, M., Cebrián, G., Cohen, M., Diaz, L., Doucette-Remington, S., Dripps, W., Habron, G., Harre, N., Jarchows, M., Losche, K., Michel, J., Mochizuki, Y., Rieckmann, M., Parnell, R., Walker, P., Zint, M. (2021). Key competencies in sustainability in higher education—toward an agreed-upon reference framework. *Sustainability Science* 16, p. 13–29. <https://doi.org/10.1007/s11625-020-00838-2>

Mulder, K. (2017). Strategic competences for concrete action towards sustainability: An oxymoron? *Engineering education for sustainable future. Renewable and sustainable Energy Reviews* 68 (2017) 1106-1111. <https://doi.org/10.1016/j.rser.2016.03.038>

Mäkinen, M. and Annala, J. (2010). Osaamisperustaisen opetussuunnitelman monet merkitykset korkeakoulutuksessa. *Kasvatus & Aika*. 4:4, 41–61.

OECD (2019): The OECD Learning Compass 2030. <https://www.oecd.org/education/2030-project/teaching-and-learning/learning/>

Rosén, Karvinen, Keskinen et al. (2019): Mapping the CDIO syllabus to the UNESCO key competencies for sustainability 2019 in Proceedings of the international CDIO conference ISBN: 978-87-7507-459-4. <https://doi.org/10.7146/aul.347>

Schaffar, B. (2021). Competent uses of competence: on the difference between a value-judgment and empirical assessability. *Nord. J. Stud. Educ. Policy*, 7: 2, 55–64. <https://doi.org/10.1080/20020317.2021.1958993>

Thomas, I. Challenges for implementation of education for sustainable development in higher education institutions. In: Barth M, Michelsen G, Rieckmann M, Thomas I (eds) 2016 Handbook of higher education for sustainable development. Routledge, London, pp 56-71.

UNESCO (2017): [Education for Sustainable Development Goals: learning objectives; 2017 \(unesco.de\)](https://www.unesco.org/en/education/2017-learning-objectives)

Wiek A, Bernstein M, Foley R, Cohen M, Forrest N, Kuzdas C, Kay B, Withycombe Keeler L (2016) Operationalising competencies in higher education for sustainable development. In: Barth M, Michelsen G, Rieckmann M, Thomas I (eds) 2016 Handbook of higher education for sustainable development. Routledge, London, pp 241–260.

Wiek A, Withycombe L, Redman CL (2011) Key competencies in sustainability: a reference framework for academic program development. *Sustainability Science* 6(2):203–218. <https://doi.org/10.1007/s11625-011-0132-6>

Questions, comments



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