NTNU | SEED

Integrating sustainability into MNT education

Johanna Lönngren

May 29-30, 2024

Har du meldt deg på SEEDs nyhetsbrev?

ntnu.no/seed

ESD workshop series 2024:

1. Introduction to Education for Sustainable Development (8-9/2, online)
2. There's no perfect solution to real-world problems: Teaching sustainability with wicked problems (29/2)
3. Engineers are human beings too: Dealing with values, emotions, and morality (1/3)
4. I'm not an expert in sustainability! (18-19/3, online)
5. How to integrate sustainability into already crammed courses (29/5)
6. Meeting students' expectations and leveraging their engagement (30/5)

What has happened since last time?

Spend 5 minutes in your groups to share where you are today in relation to ESD, if you have any questions/concerns you would like to raise, and what you hope to get out of the last two workshops.

How to integrate sustainability into already crammed courses

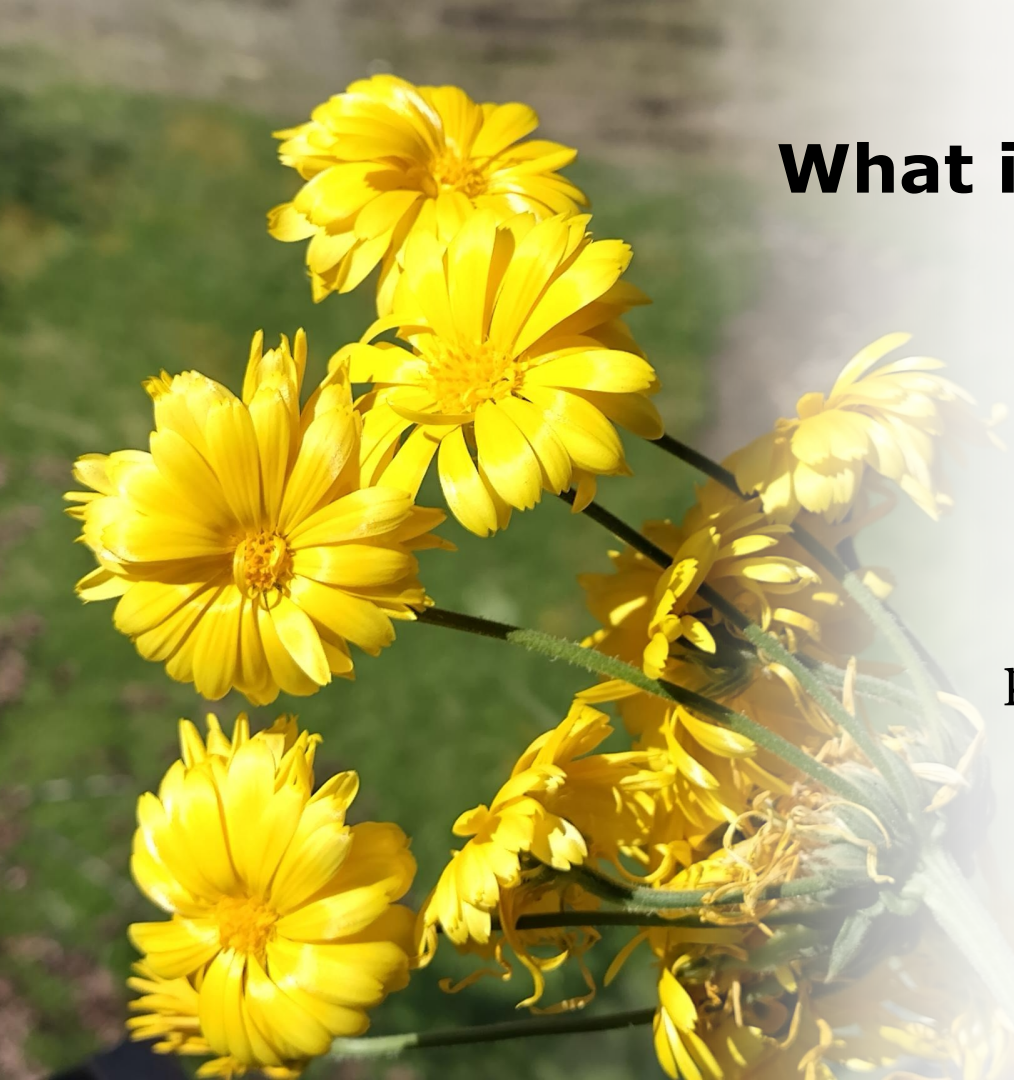
Johanna Lönngren
2024-05-29

WORKSHOP OUTLINE

- Content integration (incl. short exercises)
- Integration beyond content
- Exercise: develop integrative learning outcomes & teaching activities

Intended learning outcomes:

- Formulate intended learning outcomes & develop teaching and learning activities in ESD.
- Leverage opportunities and overcome barriers to integrating sustainability in engineering education.



What is content integration?

"a curriculum approach that purposefully draws together knowledge, perspectives, and methods of inquiry from more than one discipline to develop a more powerful understanding of a central idea, issue, person, or event.

(Huck, 2019; Parker, 2005)

Why do we need content integration in ESD?

JL: What did you think about [the ethics essay] that you had to write?

S: It felt like […] it was just a tick-box exercise. Like it was just a check mark, a point on a list that you had to cross out. And then just like "oh look, our students in [subject area] need to be ethical!" "Well, just throw *this* at them […]!"

JL: Right. Can you *pinpoint* what it was that made you feel that way?

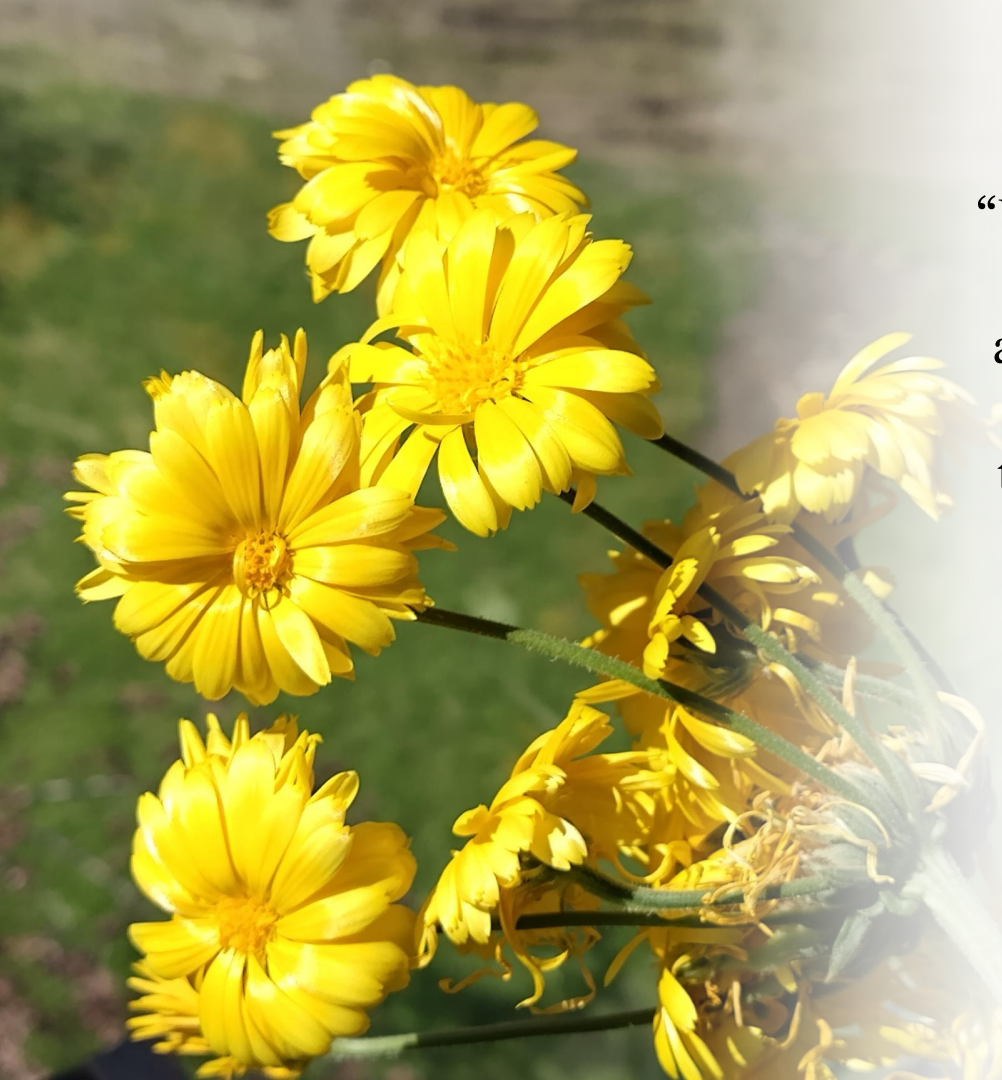
S: I think […] it was quite *badly integrated* with the other assignments [in the course]. It really did not have *anything* to do with anything else [in the course].

(Lönngren, 2021)

More than a “nice change”!

“ethics, that's actually very interesting. … so it [the ethics essay] was an interesting assignment. Maybe not so relevant for the course, but it's nice to have a change [from the normal course content] every now and then.

(Lönngren, 2021)



"When skilled, knowledgeable teachers employ integrated methods, student achievement is equal to, or better than, that of students who are taught in the traditional separate-subject approach."

Other benefits:

- Cover more content per time unit
- Shows how content is relevant in diverse contexts
- Facilitates understanding of complex content

(Hinde, 2005)

Two approaches to content integration

Infusion

- "Aspects of one subject area are inserted or infused into a second to help the learner gain deeper understanding of the second."

Fusion

- "Two or more subject areas are merged in such a way that they form a new unified idea."

(Hinde, 2005; Parker, 2005)

In groups: Try to identify examples for both approaches to content integration that involve some type of sustainability content. Start exploring examples from your own or colleagues' teaching. If you don't know of any real examples, discuss hypothetical cases. Take notes!

Continuum model of types of integration

Fully integrated	Pre-structured core	Broad fields	Fusion	Correlation/ sequenced
• Starts from problems chosen by students • Student-directed	• Starts from problems pre-determined by teacher • Focus on students' lives and experiences	• Starts from broad theme • Focus on synthesis across subject areas	• Starts from selected content areas • Focus on merging those areas into a new unified idea	• Subject divisions retained, but content areas are related • Teacher-directed

In groups: Revisit your examples of content integration. Do they fit into any of these types of integration? If so, which ones? If not, what is missing in the model?

(Hinde, 2005; Parker, 2005)

Dimensions of integration

(adapted from literature on multicultural education)

	Content integration	Explore disciplinary assumptions & reduce prejudices	Equal levels of expectations & student achievement across disciplines
Addition			
Transformation: change meaning of disciplines			
Social action: empower students to leverage integrated knowledge			

(Agirdag et al., 2016)

	Content integration	Explore disciplinary assumptions &	Equal levels of expectations & student achievement
Addition			
Transformation: change meaning of disciplines			
Social action: empower students to leverage integrated knowledge			

S: [I] thought [they] must have *known* about [the manipulation] and that they'd done something *wrong*, even if they didn't want to.

JL: Do you have any idea how you could have reacted if you had been given such a task?

S: [...] *I* think you'd *do* it because your bosses tell you to. But you do not *want* to *anyways*.

→ ESD content needs to be combined with key competencies (e.g., strategic, implementation, inter-personal)!

(Lönngren, 2021)

	Content integration	Explore disciplinary assumptions & reduce prejudices	Equal levels of expectations & student achievement across disciplines
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Social actior students to l integrated k			

Teacher: “We have so *little* on ethics throughout the entire *education*, even during PhD studies. [There's this attitude] that, like, *technology* is *technology* and it's *true* or *false* and there *isn't* really much to have an opinion about.”

→ ESD content needs to be combined with key competencies (e.g., normative, systems thinking)!

(Lönngren, 2021)

	Content integration	Explore disciplinary assumptions & reduce prejudices	Equal levels of expectations & student achievement across disciplines
Addition			
Tran mea			
Socia stud integ			

Teacher: You'll have an exam in this course on Thursday, but I don't think you'll have any problems with it. If you've done what you were supposed to during the course, then you'll pass the exam. Then you'll have an exam in the mechanics course a week later and I've nothing to say about that one. But I've seen students who've passed, even in their first attempt, so I know that it's possible.

	Content integration	Explore disciplinary assumptions & reduce prejudices	Equal levels of expectations & student achievement across disciplines
Addition			
Transform meaning o			
Social acti students t integrated			

What if??

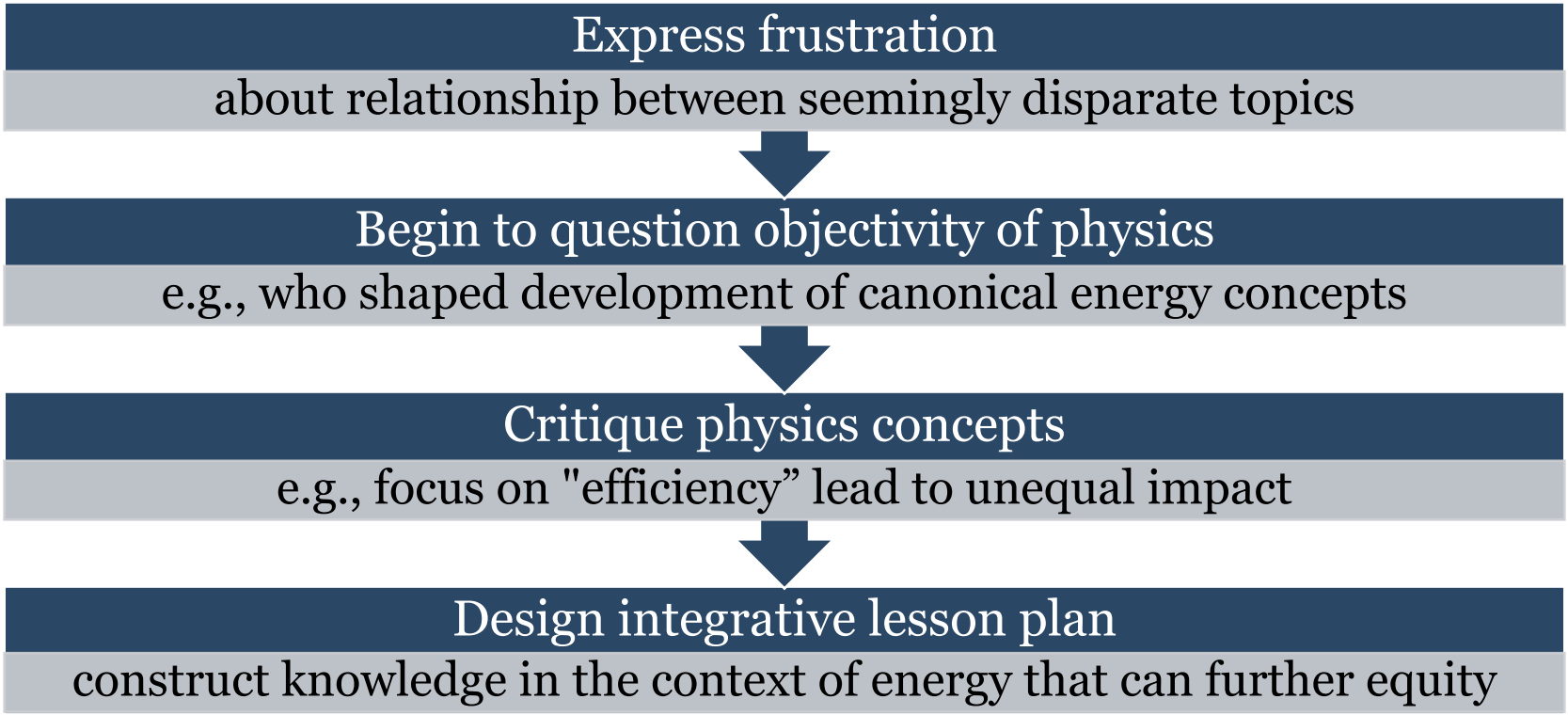
Teacher: You won't have any problems with the mechanics exam. If you've done what you were supposed to during the course, then you'll pass the exam. Then you'll have an exam in the sustainability course a week later and I've nothing to say about that one. But I've seen students who've passed, even in their first attempt, so I know that it's possible.

	Content integration	Explore disciplinary assumptions & reduce prejudices	Equal levels of expectations & student achievement across disciplines
Addition			

→ Our own approach to ESD matters!

- Talk about ESD as important, challenging, rewarding, needed for students' careers, central to your departments' teaching & research, …
- Avoid vague language & hedges in describing ESD
  e.g., "we will talk a little bit about …", "sustainability and stuff like that"
- Assess ESD learning
  like learning in any other subject: e.g., grade if other learning is graded
- Ensure progression!

Example: integrating energy & equity

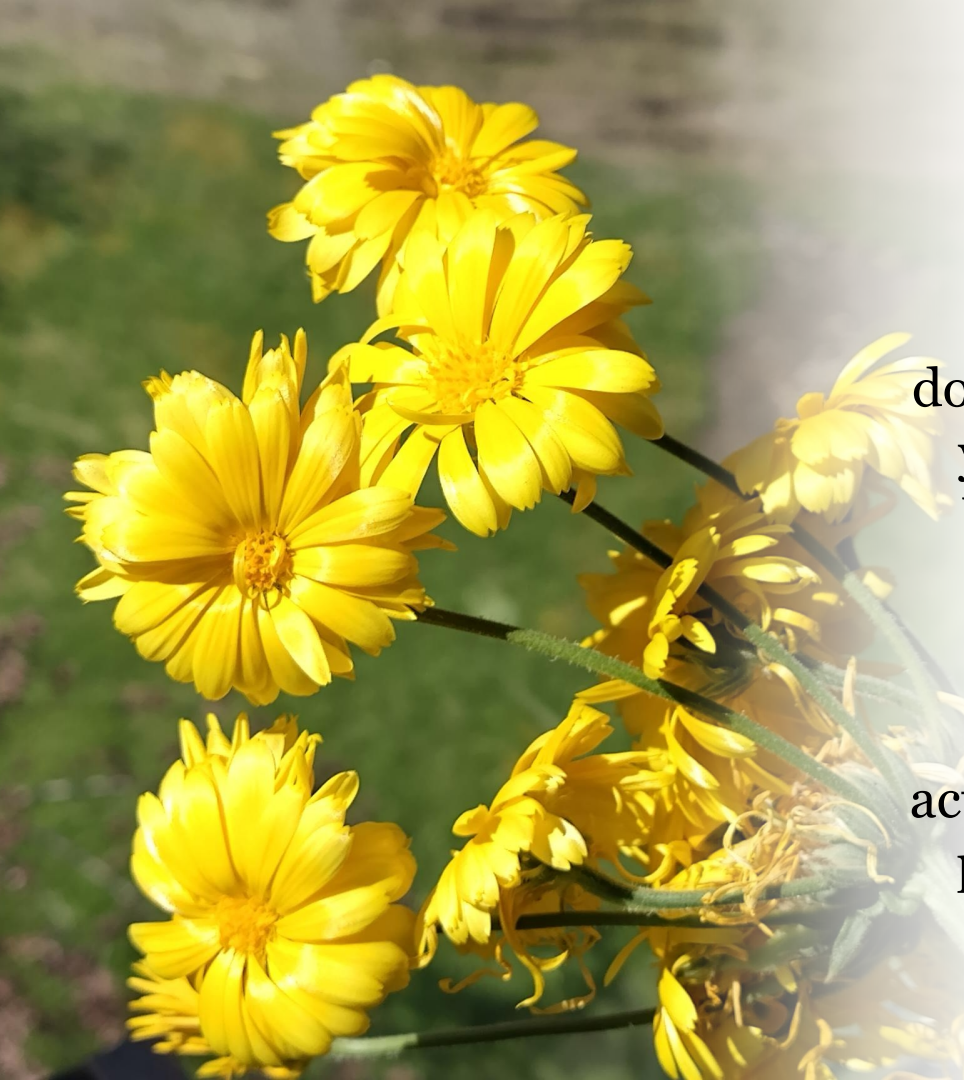


(Robertson et al., 2023)

Caveats to avoid during integration

- Distorting content
  e.g., adding steps to a production process that don't normally belong to it
- Loosing depth
  e.g., many small pieces from different areas, without proper depth in any
- Loosing educational purpose
  e.g., exercises that are related to several areas, but don't help achieve learning goals in any of them
- Too difficult, impossible, or strange tasks
  e.g., dance performance of a political document
- For ESD: forgetting key competencies, pedagogical approaches, & broader societal purpose/relevance

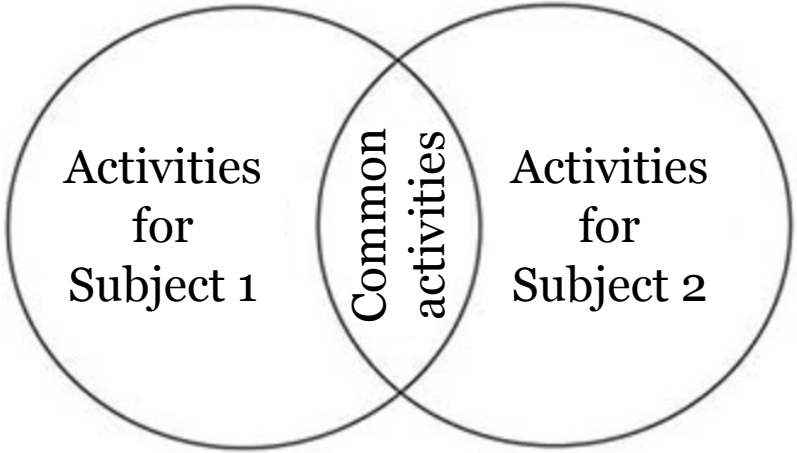
(Hinde, 2005; Lönngren, 2023)

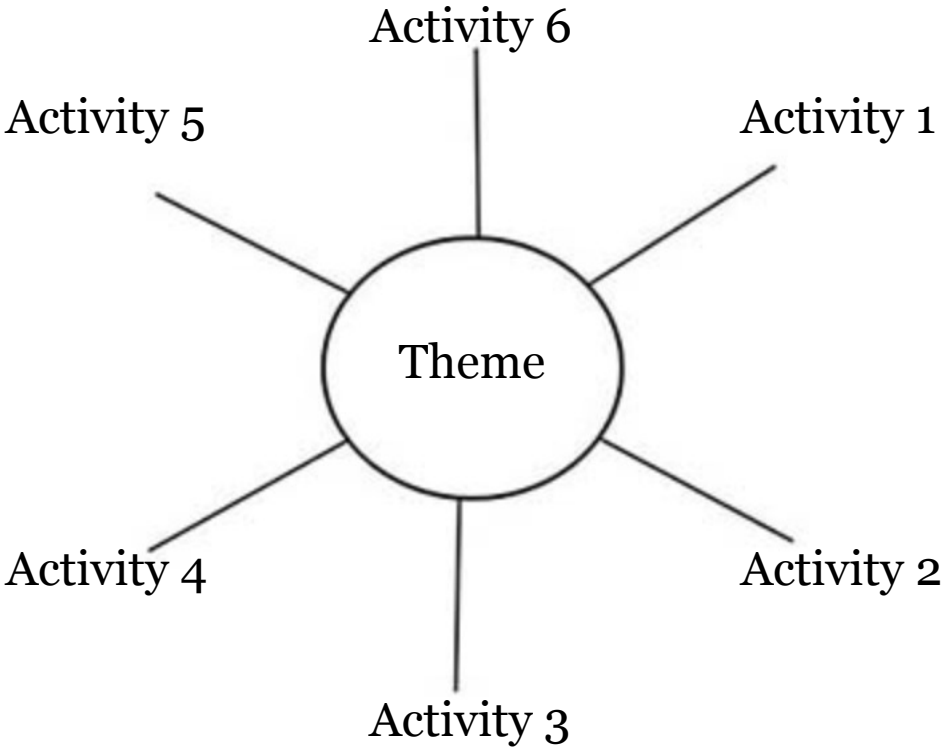


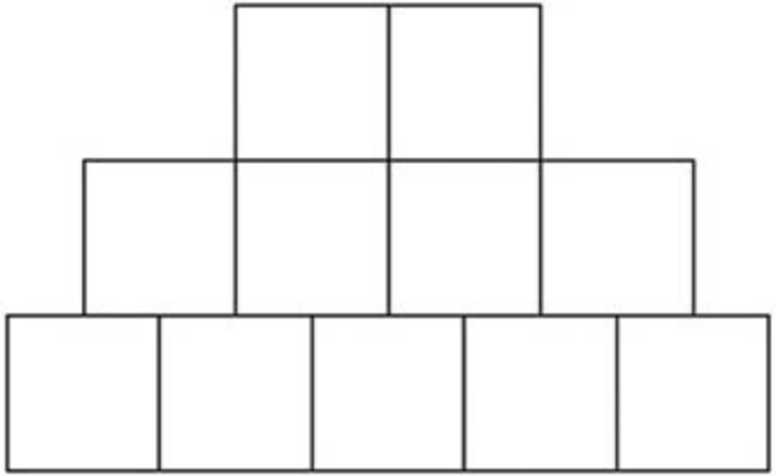
Individual brainstorming:

2 min: Choose a subject area you teach/work with pedagogically. Write down topics, activities, and abilities that you consider part of that content area. Write only one topic per post-it. Don't overthink this, it's just brainstorming.

2 min: Now focus on sustainability as a subject area. Write down topics, activities, and abilities that you consider part of sustainability as a subject area.







(https://www.open.edu/openlearncreate/mod/oucontent/view.php?id=57289&printable=1)

In groups:

1. Pool your post-its and collaboratively rearrange them in clusters of related topics/competencies. Each cluster should include at least one subject-specific and one sustainability-related post-it. (5-10 min)
2. Choose a cluster covering all (as many as possible) of your subject areas and select a theme* that integrates the diverse post-its in the cluster. You can start from a broad theme (e.g., biodiversity), but try to then make it more specific.
3. For that cluster, clarify the theme* and formulate a learning outcome that has (a) meaningful educational purpose(s) for all included subjects. If you want an extra challenge, formulate a learning outcome for first-year students.
4. Identify learning activities that can help your students achieve that outcome.
5. Represent your system of theme & learning activities graphically.

*If you need creative inspiration for defining a theme, you can use the images on the story dices. Choose an image and try to relate it to each of the included subject areas, for example through metaphors or descriptions of a scenery or social interaction.

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