There’s no perfect solution to real-world problems!

Teaching sustainability with wicked problems

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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)

UMEÅ UNIVERSITY

WORKSHOP OUTLINE

- Presentation: Wicked problems (WP) as a pedagogical tool for ESD
    - Exercise 1: Formulate intended learning outcomes for WP teaching
- Exercise 2: World café on the WP of integrating sustainability into STEM education

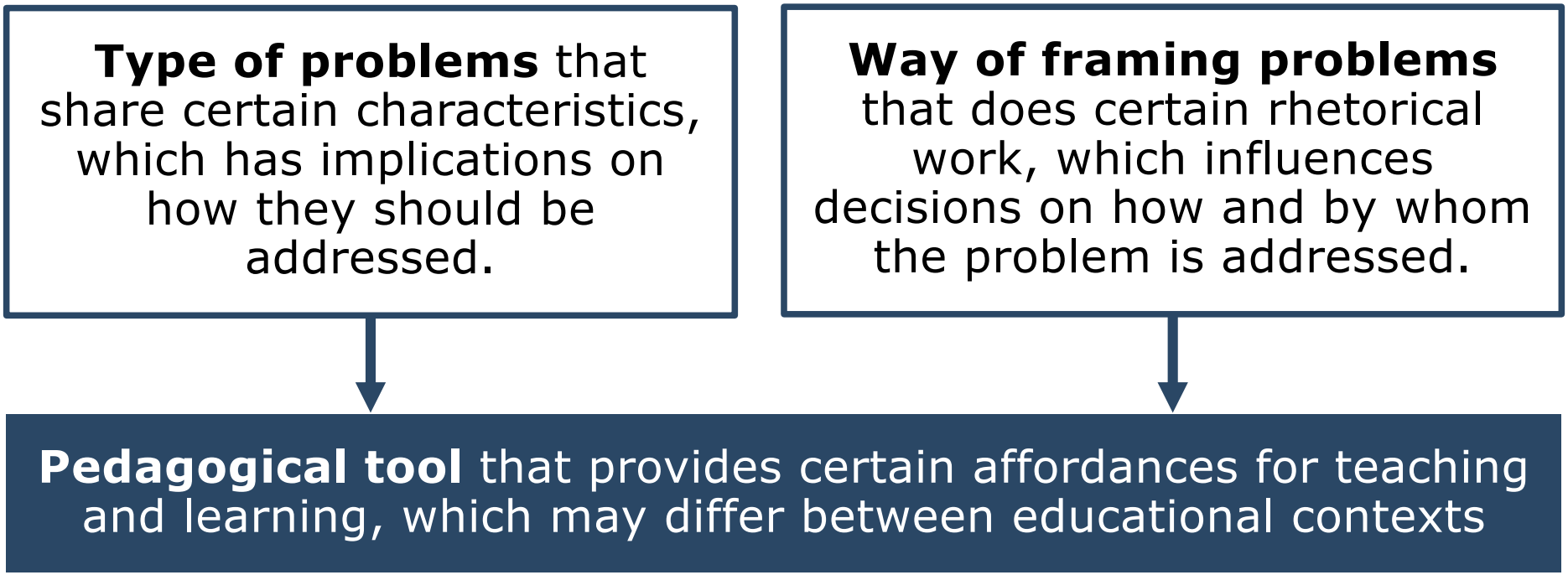
Intended learning outcomes:

- Role model the use of sustainability key competencies in discussions about WPs.
- Critically engage with their own and students' knowledge, values, and emotions related to WPs.

A ROSE BY ANY OTHER NAME...

(Lönngren & van Poeck 2021)

WHAT ARE WICKED PROBLEMS AND HOW CAN WE USE THEM IN ESD?



(Ison et al. 2015; Lönngren & vanPoeck 2021)

WICKED PROBLEMS AS A TYPE OF PROBLEM

Characterized by high levels of

- Complexity
- Uncertainty
  - Epistemic uncertainty: lack of knowledge
  - Ontological uncertainty: irreducible unpredictability
  - Ambiguity: different ways of framing
- Value conflicts

→ No consensus on problem definitions, (criteria for assessing) quality of solutions, or acceptable side effects

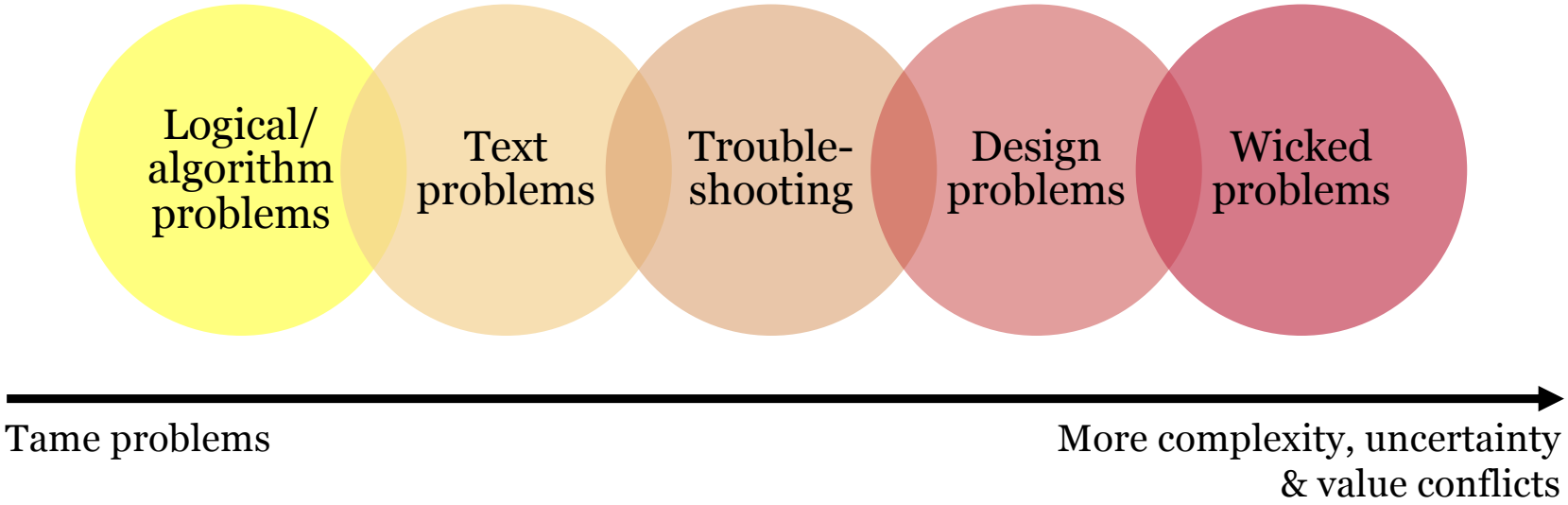
→ Divergence across space, time, social groups, disciplines, …

→ Unique, context-dependent, connected to other problems

→ Every attempt at solving has consequences

(Dewulf & Biesbroek 2018; McCune 2023; Rittel & Webber 1973)

WICKED PROBLEMS AS A TYPE OF PROBLEM



(Adapted from Jonassen 2000)

WICKED PROBLEMS AS A WAY OF FRAMING PROBLEMS

Rather than different *types* of problems, the terms “wicked” or “tame” can be seen as describing different ways of *framing/describing* problems.

By describing a problem as wicked, we also create expectations about how it should be addressed.

(Ison et al. 2015)

WICKED PROBLEMS AS A WAY OF FRAMING PROBLEMS

→ Any topic can be taught as more or less wicked!

Dealing with global climate change requires building enough carbon capture and storage facilities.

Statistics is about calculating probabilities.

TAMING

"WICKEDING"

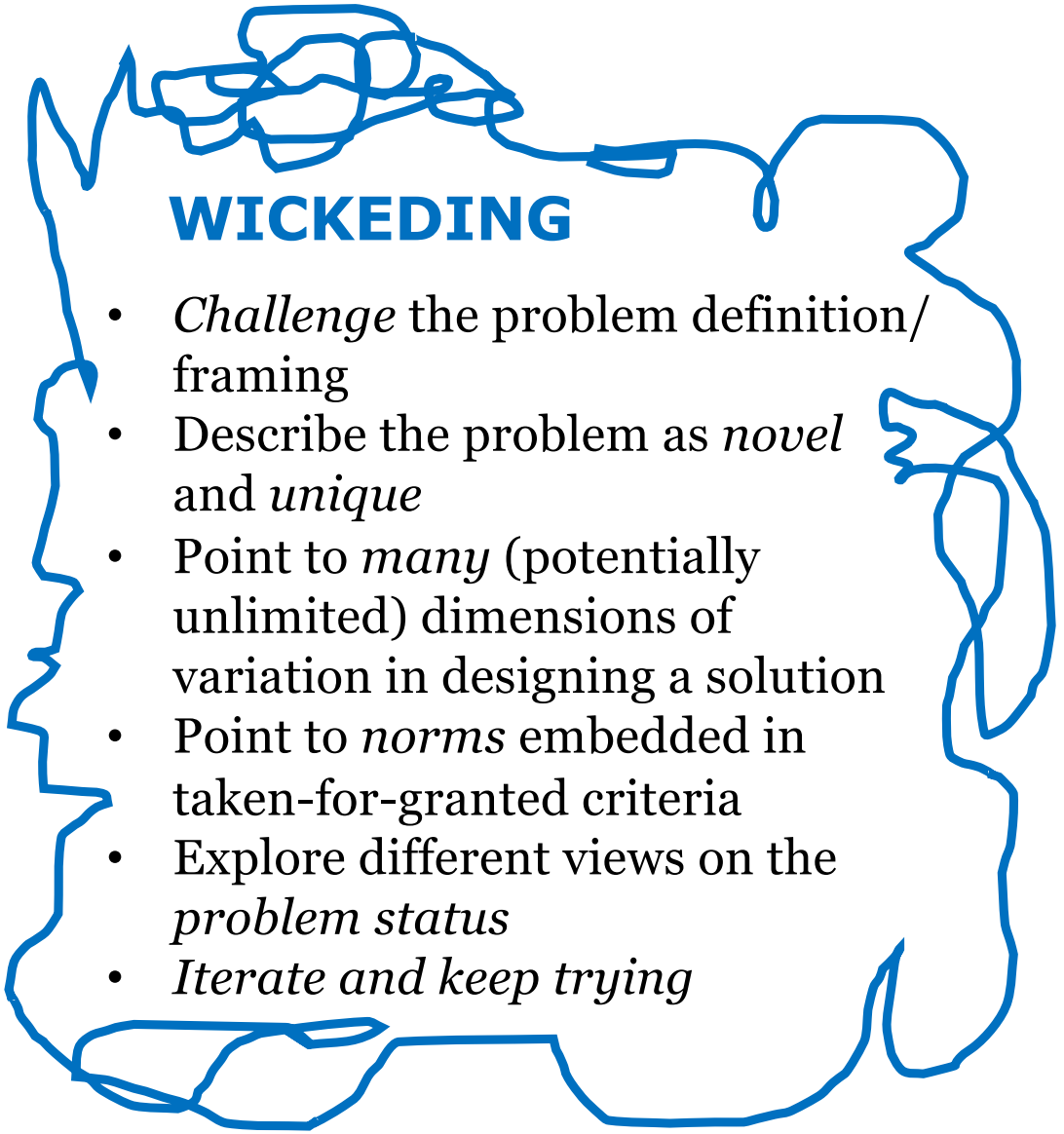
Dealing with global climate change requires paying attention to diverse cultural values, societal structures, individual preferences, social justice, ...

Statistics is about providing a quantitative basis for decision-making that affects people and planet.

TAMING

- *Fix* the problem definition/ framing
- Describe the problem as *identical* to a previously solved problem
- Claim that there is a *limited number* of possible solutions from which to "choose"
- Define "*objective*" criteria for evaluating the solution
- Claim that the problem is *solved* when not everyone agrees it is
- *Give up*

(Conklin 2005)



WICKEDING

- *Challenge* the problem definition/ framing
- Describe the problem as *novel* and *unique*
- Point to *many* (potentially unlimited) dimensions of variation in designing a solution
- Point to *norms* embedded in taken-for-granted criteria
- Explore different views on the *problem status*
- *Iterate and keep trying*

EXAMPLES OF INTENDED LEARNING OUTCOMES

WP as a type of problems

- Identify a wicked problem one may encounter in the profession and describe why it is wicked.
- Recognize when one encounters a wicked problem and address the problem without taming it.

WP as a way of framing problems

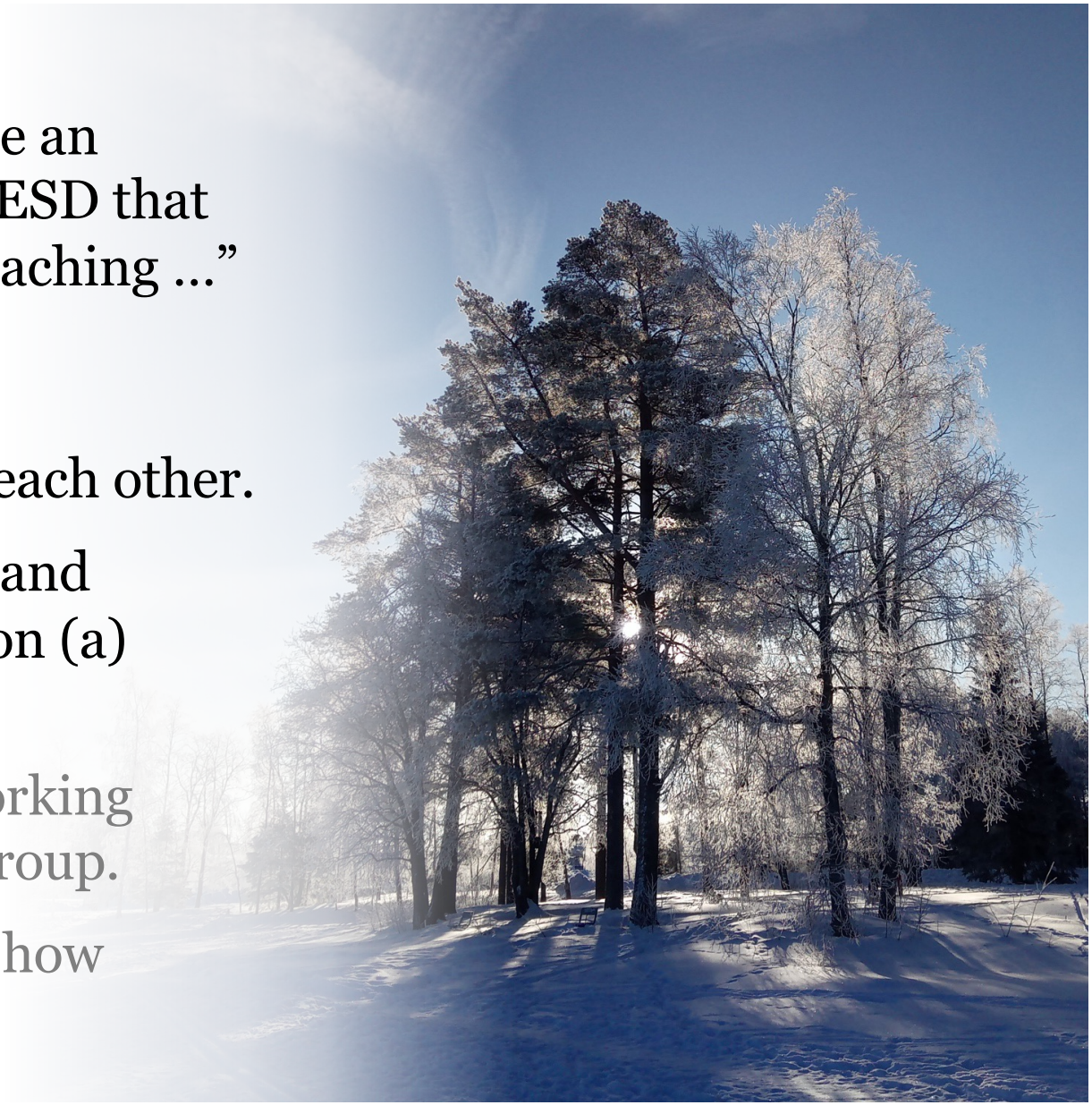
- Describe a problem as wicked and describe several possible ways of addressing the problem, without inappropriately taming the problem.
- In collaboration with others explore and develop common values that can serve as a basis for collaboratively addressing the problem.

(Adapted from Lönngren & Svanström, 2015)

Preparation task: “Formulate an intended learning outcome for ESD that you could use for any of your teaching …”

In groups:

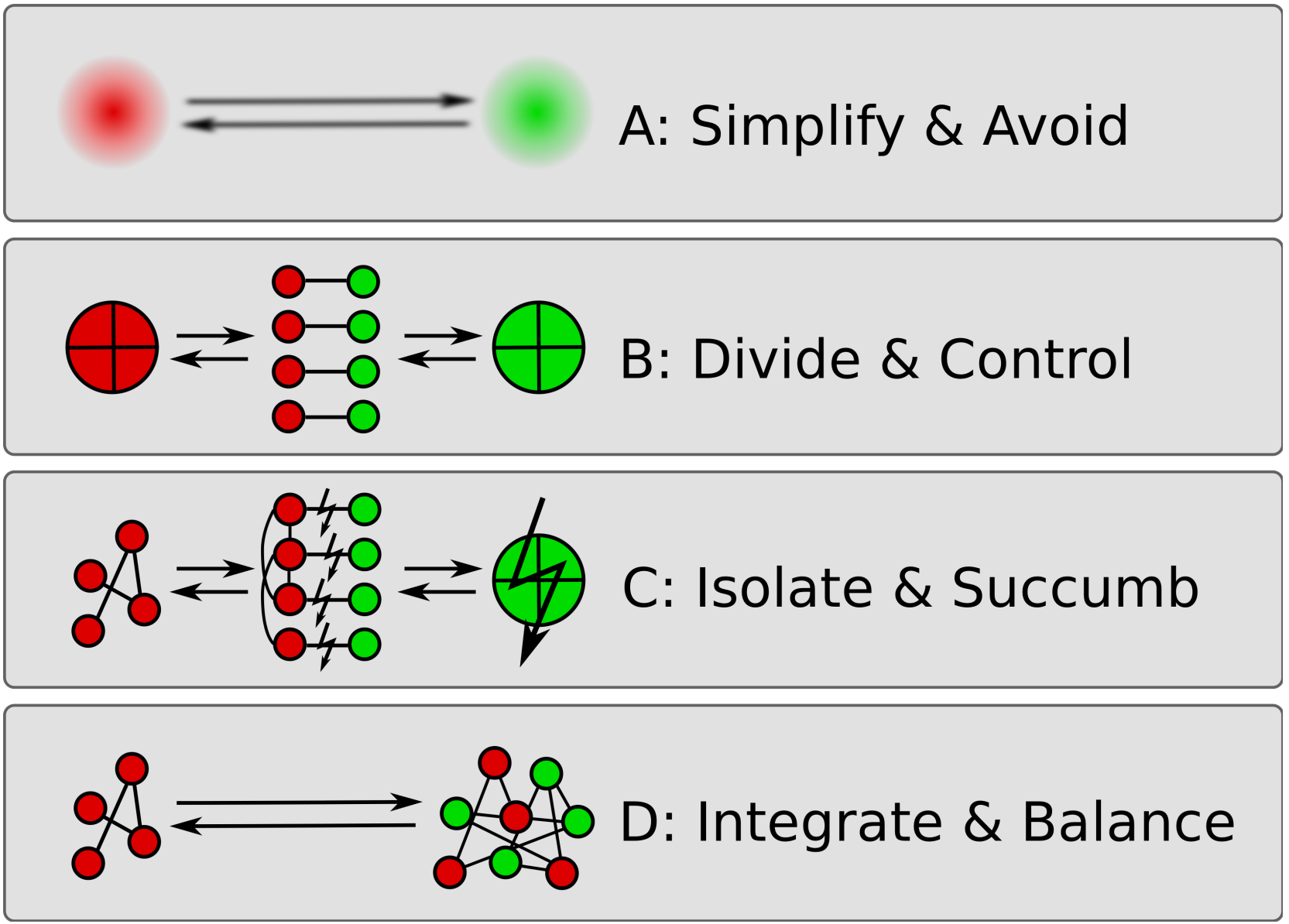
- Briefly share your ILOs with each other.
- Choose one ILO to start with and together rephrase it to focus on (a) wicked problem(s).
- If you have time, continue working with the other ILOs in your group.
- If you still have time, discuss how you could teach for the ILOs.



WATER SHORTAGE IN JORDAN

- Four countries (Syria, Israel, Lebanon, Jordan)
- Extreme water shortage in the entire region
- Political tensions & struggles over resources

4 WAYS OF ADDRESSING WICKED PROBLEMS



(Lönngren et al. 2017)

WORLD CAFÉ

Assumptions:

- people already have within them the wisdom and creativity to confront even the most difficult challenges
- the answers we need are available to us
- we are wiser together than we are alone.

Design principles

1. Set the context: Identify aim, themes, participants, …
2. Create hospitable space: make participants feel comfortable, safe & welcome
3. Explore questions that matter: relevant to participants' real-life concerns
4. Encourage everyone's contribution, but don't force people to speak who don't want to
5. Connect diverse perspectives: moving between tables & meet new people
6. Listen together for patterns and insights: create a holistic understanding together
7. Share collective discoveries in plenum

(www.worldcafe.com; https://theworldcafe.com/wp-content/uploads/2015/07/Cafe-To-Go-Revised.pdf)

World café on the wicked problem of Integrating sustainability into STEM education

1. How is it that we are pressed by high workloads, and we are taking the time to learn about ESD?
2. Why do we say that sustainability is important in engineering and don't educate all engineering students for it?
3. How is it that we can teach ESD and highly technical content simultaneously?
4. How is it that we can teach ESD without being experts in sustainability?
5. Why do we say that interdisciplinary education is important and uphold organizational structures that favour mono-disciplinary education?

~10 minutes at each table/whiteboard. Take notes/drawings/… that the next group can understand and expand on.

DEVELOPING "WICKED QUESTIONS"
for use in a world café exercise on a wicked problem

A good wicked question:

- Helps us to name the central tensions/paradoxes (the elephant in the room)
- Surfaces underlying, often contradictory assumptions
- Does not have obvious answers
- Opens up more questions, options, inquiries
- Is NOT a trick question, or rhetorical; not blaming or finger pointing.

Individually: Formulate (a) "wicked question(s)" for your own teaching. Write it/them on the whiteboard

- "If citizens … want … why do we … ?"
- "How is it that we are … and we are … simultaneously?"
- "Why do we say … and do … ?"

(https://www.liberatingstructures.com/4-wicked-questions/; www.worldcafe.com)

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