



**I'm not an expert in
sustainability –
and that's ok!**

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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)

WORKSHOP OUTLINE

- What does it mean to be an expert in ESD?
Broadening understandings of teacher expertise
 - Group discussion
- Pedagogical approaches that decenter teachers' subject matter expertise
 - Group work
- Wrapping up

Intended learning outcomes:

- Develop and implement teaching and learning activities that foster students' ability to address WPs.
- Leverage opportunities and overcome barriers to integrating sustainability in engineering education.
- Critically engage with your own and students' knowledge, values, and emotions related to WPs.



"I don't know anything about sustainable development!"

What did my wise colleague do?

- Talked to me about sustainable development, their course and the students
- Gave me a book and other publications
- Invited me to follow their teaching
- Made statements
- Challenged me to think

"Of course I can teach for sustainable development!"

(Agneta Bränberg, Associate professor
of teaching in electronics, May 2023)



What does it mean to be an expert in ESD?

- Discuss based on your preparations regarding
 - what knowledge and competencies your colleagues leverage in their ESD practice and how
 - your personal superpowers for ESD
- Post your answers in the Padlet
 - Create a post by double-clicking anywhere
 - You can create connections to other groups' answers by pressing the three vertical dots in the top right corner of your post

(10 minutes)

UNIVERSITY TEACHER EXPERTISE

“Teacher expertise is determined by how teachers carry out the tasks in their domain.”

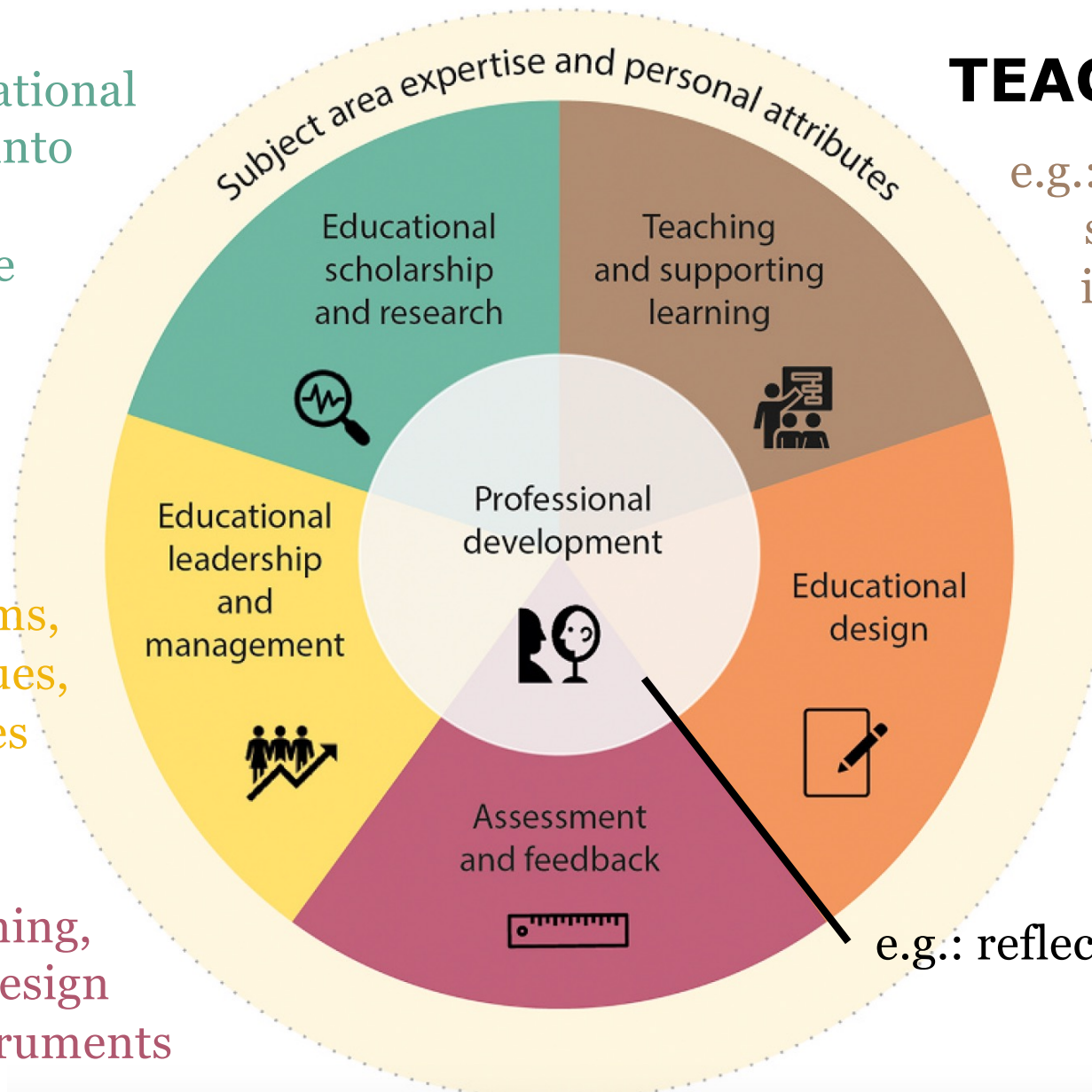
(van Dijk, 2020)

TEACHER TASKS

e.g.: apply educational theory, inquiry into own teaching, share knowledge on teaching & learning

e.g.: coordinate courses/programs, support colleagues, influence policies

e.g.: assess learning, give feedback, design assessment instruments



e.g.: organize learning situations, provide instructions, adapt to learners' needs

e.g.: define learning goals, select learning activities, use evaluations for educational development

e.g.: reflect, ask for feedback

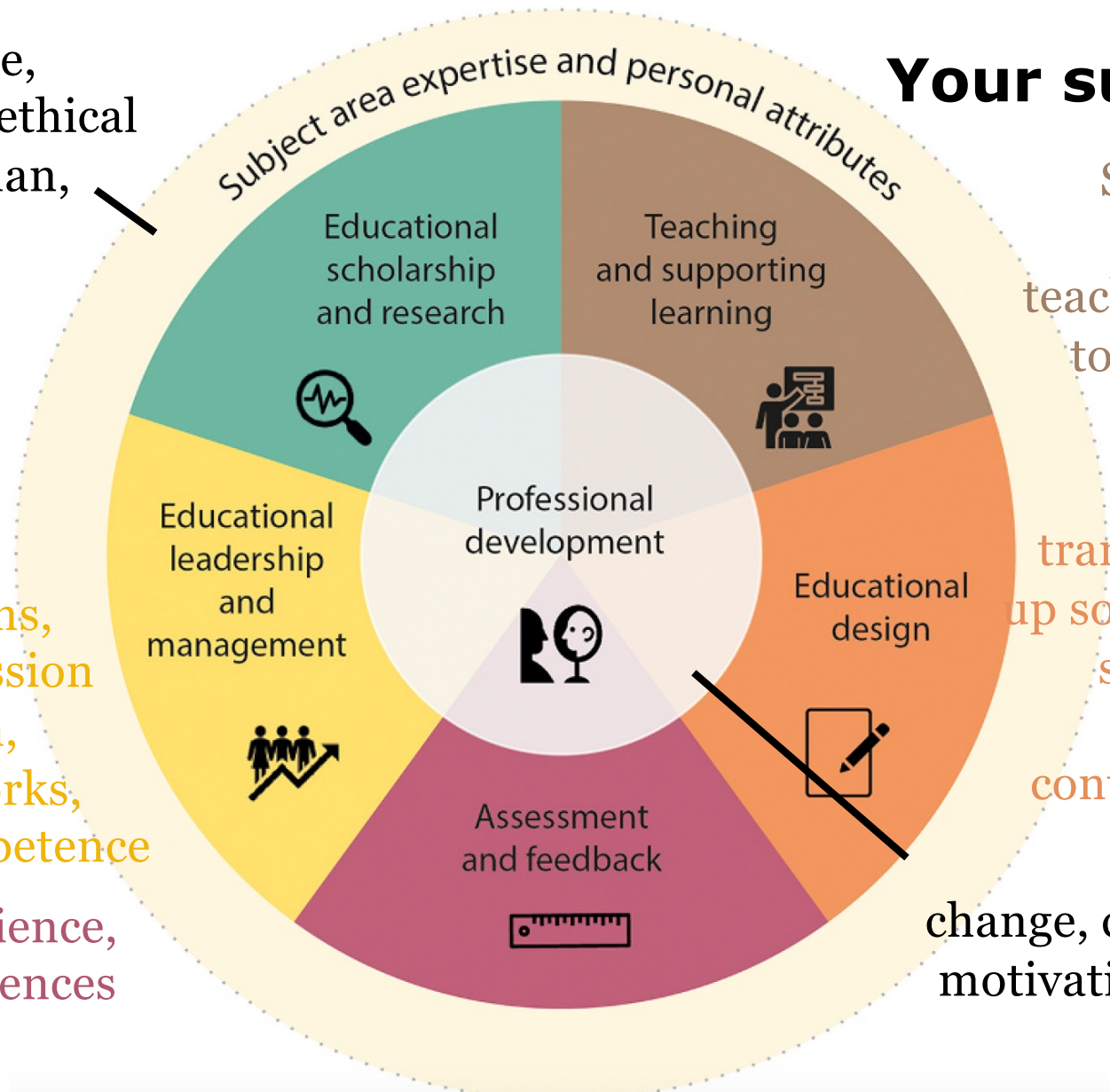
(van Dijk, 2020)

Subject expertise,
altruism, hope, ethical
awareness, human,
intelligence

Research skills,
pedagogical
knowledge,
ESD knowledge

Working in teams,
enthusiasm, passion
about education,
academic networks,
leadership competence

Teachers' experience,
students' experiences



Your superpowers

Student-centered,
active learning,
teaching skills, ability
to motivate, caring,
physical presence

Interdisciplinary,
transdisciplinary, set
up social contract with
students, focus on
skills rather than
content, gamification

Willing to learn &
change, curiosity, interest,
motivation, responsibility

(van Dijk, 2020)

Teacher competencies in HE	Influence
Personality: Energy, Helpfulness, Integrity & reliability, Multiculturalism, Morality	Develop students' personality & general behavior; positive role model
Professionalism: Theoretical & practical knowledge, Experience, Discipline, Creativity	Students' acquisition of knowledge
Educational: Transmissibility, Studiousness, Planning, Adaptability, Coaching, Inventiveness	Cultivate students' intellectual abilities; consolidate knowledge
Scientificity: Resourcefulness, Innovativeness, Imagination, Diligence, Persistence, Effectiveness	Develop knowledge for progress & growth of society; quality indicator of educational institutes
Communication: Listening, Persuasion, Empathy, Presentation, Collaboration	Students' acquisition of knowledge; avoid misunderstandings; effective and meaningful interaction
Digitality: Digital literacy & pedagogy, Digital communication & cooperation, Creating digital content, Safety, Basic troubleshooting	Use of digital technology; achieve educational goals & facilitate communication

(Dervenis et al., 2022)

THREE TRADITIONS OF ENVIRONMENTAL AND SUSTAINABILITY EDUCATION (IN SWEDEN)

TRADITION	ASSUMPTION
Facts-based environmental education	Knowledge about environmental problems will lead to sustainable action
Normative environmental education	Developing sustainability norms will lead to sustainable action
Critical/pluralistic tradition: Education for sustainable development (ESD)	Addressing sustainability challenges requires viewing them from multiple perspectives & acknowledging conflicts of interest.

(Öhman 2009)

METAPHORS OF LEARNING

Acquisition of knowledge

- Teachers impart content knowledge to students
- Teachers must know the subject matter & how to transmit it
- Focus on already-existing sustainability knowledge
- Crucial for facts-based environmental education

Participation in practices

- Students are socialized into communities of practice; teachers are guides/role models
- Teachers must be proficient in practice & how to facilitate for others to participate
- Focus on sustainability key competencies
- Crucial for ESD

Co-creation of knowledge/practices/agency

- Students & educators co-create new knowledge about a unique real-life challenge
- Teachers as (facilitating) co-learners

(Engeström, 2016; Sfard, 1998)

ESD KEY COMPETENCIES

Competence	... is the ability to
Systems thinking	Analyze relationships and non-linear dynamics in complex systems; deal with uncertainty
Anticipatory	Develop and evaluate future scenarios; assess consequences; deal with risks and change
Normative	Identify and critically discuss and reflect norms and values; assess how they relate to values underlying the sustainable development concept
Strategic	Identify and navigate structural hindrances to achieving sustainability; iteratively assess strategies for sustainability transitions
Inter-personal	Inspire & motivate stakeholders to participate in sustainability initiatives; facilitate collaboration among stakeholders; deal with conflicts; learn from others; empathy
Intra-personal	Reflect on, assess and regulate one's own emotions, thoughts, and actions; critically reflect on one's role in local and global communities
Implementation	Implement innovative sustainability solutions; iteratively assess and adjust implementation processes; work towards radical transformation
Integrated problem solving	Combine and apply different key competencies and problem-solving frameworks to develop disruptive, inclusive and equitable sustainability solutions; transdisciplinarity

(Brundiers et al 2021)

PEDAGOGICAL APPROACHES THAT DECENTER TEACHERS' SUBJECT EXPERTISE

(Real-life issues are too big for individual experts!)

Problem-based learning

Project-based learning

Wicked problems

Service learning

Science-in-context

Challenge-based learning

Expertise on wicked problems is – by definition – distributed and co-constructed!

- 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

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*

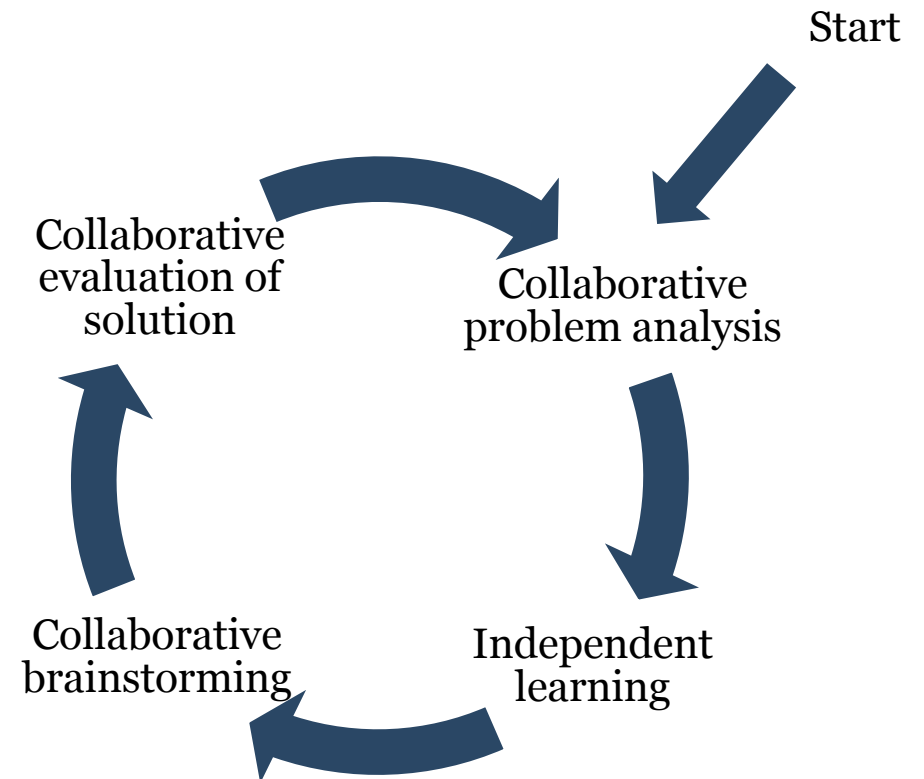
(Dewulf & Biesbroek 2018; McCune 2023; Rittel & Webber 1973)

PROBLEM-BASED LEARNING

“PBL involves presenting students with an **authentic problem** prior to any instruction or preparation.

The idea is to use the problem to introduce the concepts and problem-solving skills necessary to solve the problem.”

(Massa, 2008)



CHALLENGE-BASED LEARNING

“Within CBE, the entire learning experience for students is centered around a **real-life challenge**, which is delineated by the students themselves.”

(enlight-eu.org)

Act

- Design solution
- Implement
- Evaluate

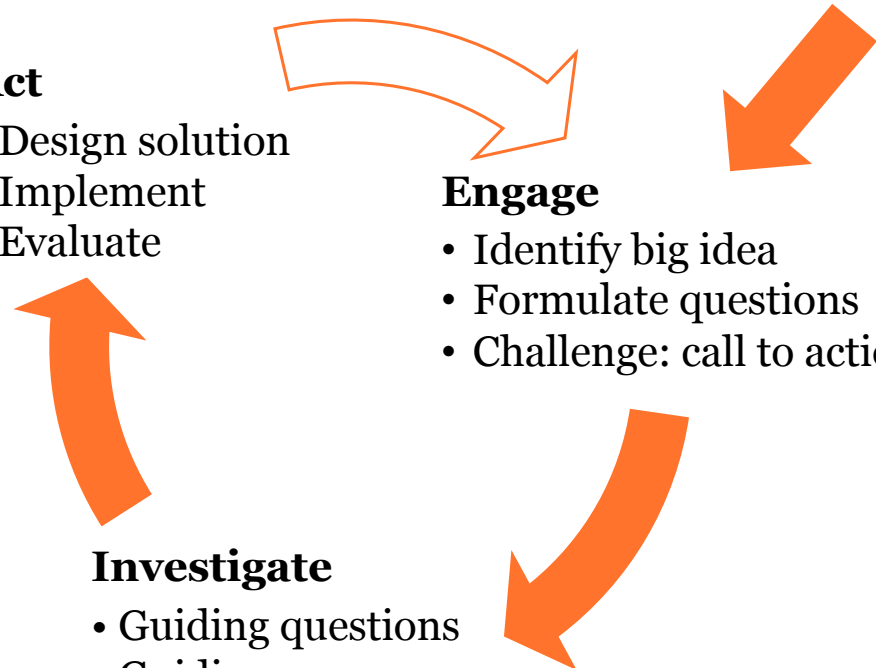
Engage

- Identify big idea
- Formulate questions
- Challenge: call to action

Investigate

- Guiding questions
- Guiding resources
- Summarize learning

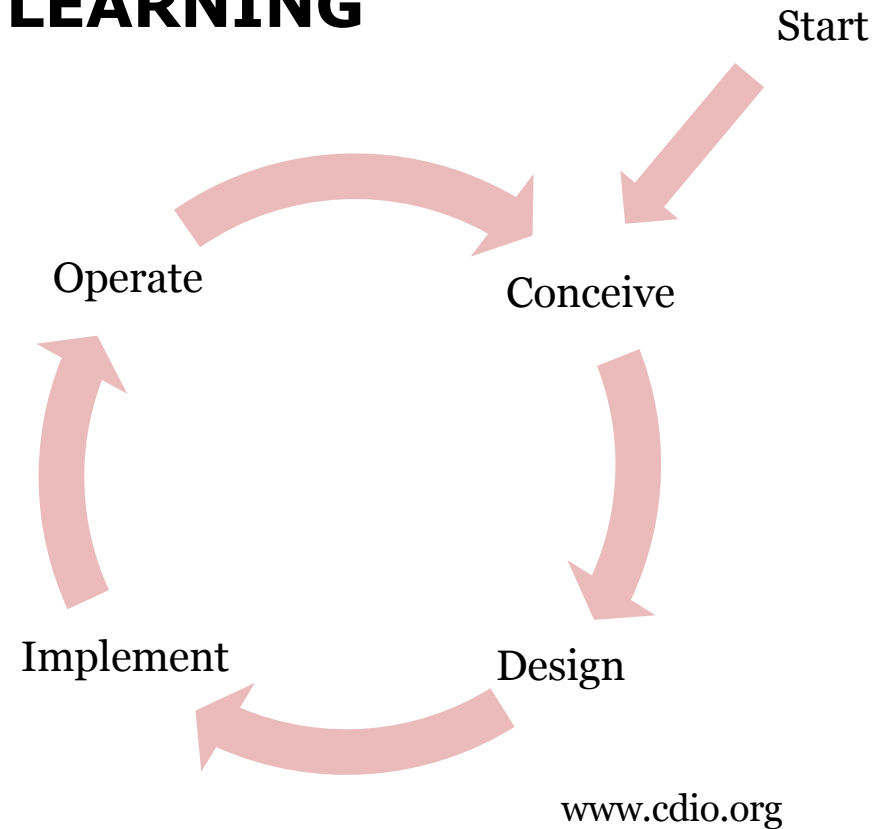
Start

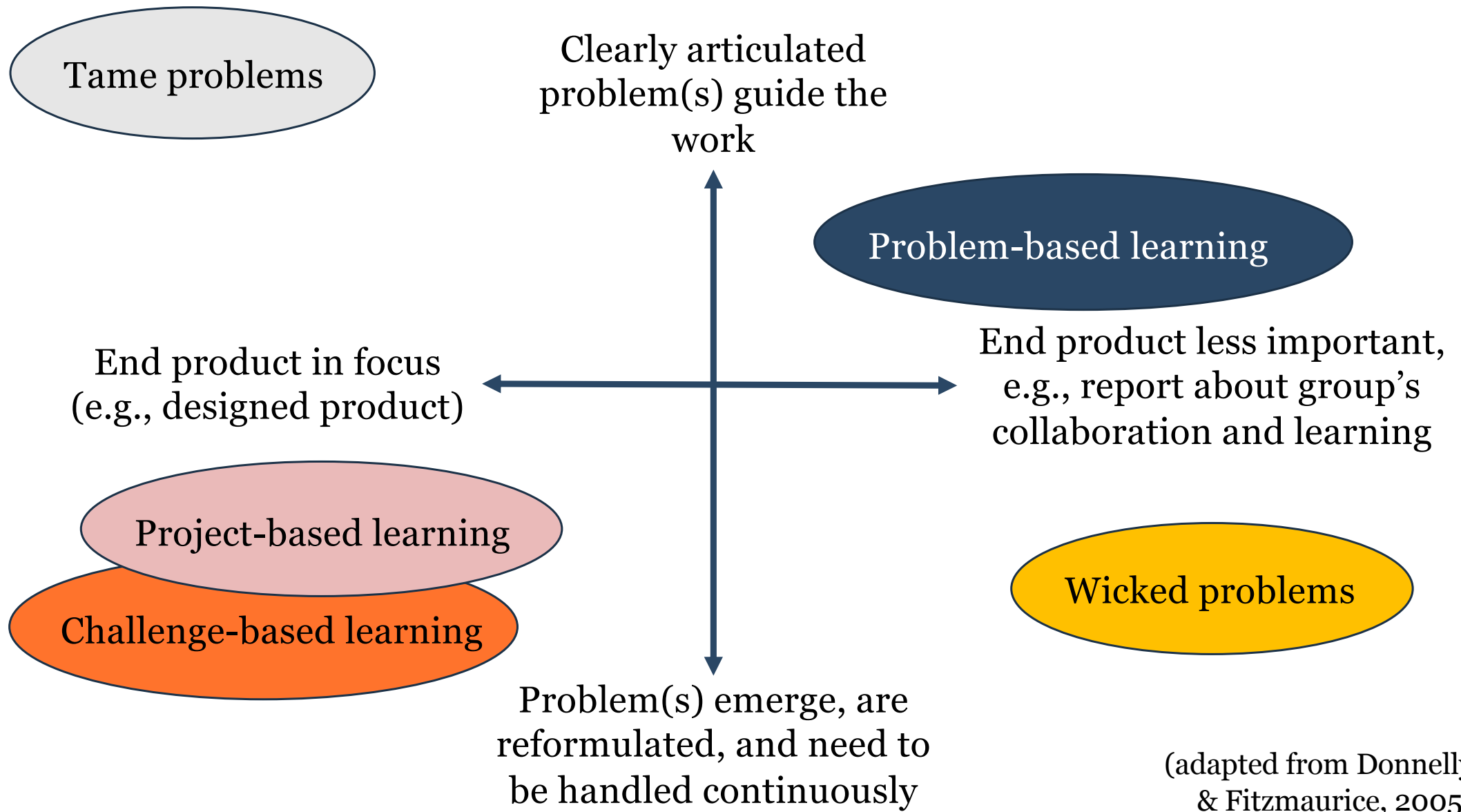


PROJECT-BASED LEARNING

“Project-based learning typically begins with an **end product** or ‘artifact’ in mind, the production of which requires specific content knowledge or skills and typically raises one or more problems which students must solve together.”

(Donnelly & Fitzmaurice, 2005).





SCIENCE-IN-CONTEXT

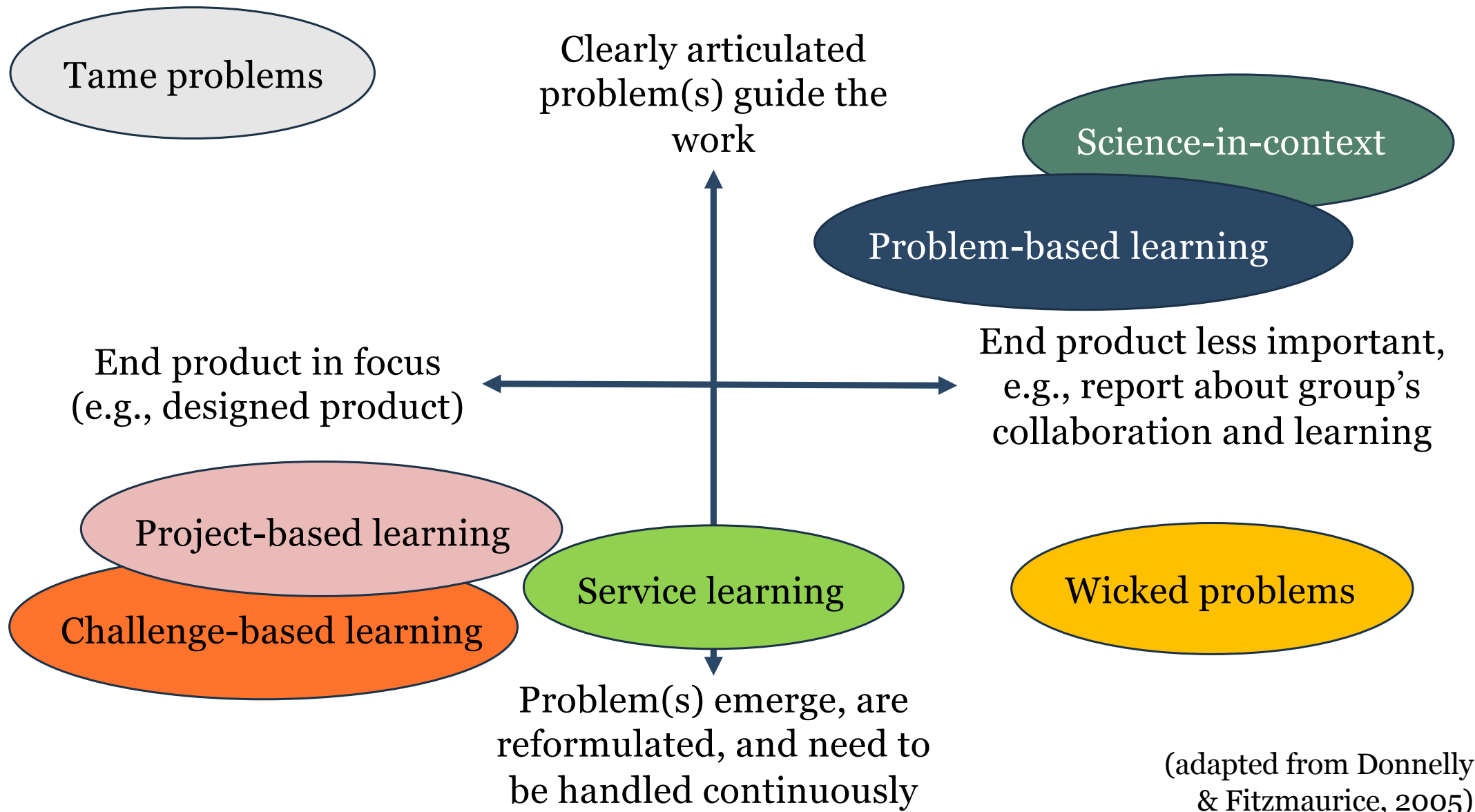
- Several traditions, e.g.
 - Socio-scientific issues (SSI)
 - Science, Technology, Society and Environment (STSE)
- Focus on
 - Social & cultural context of science, e.g., politics, economy, gender
 - Ethics & morality
 - Relations between scientific/technological and societal issues
 - Societal issues that are personally relevant for students, controversial and ill-structured

(Bencze et al., 2020)

SERVICE LEARNING

- Often organized as project-based learning
- Focus on addressing real-world problems in local communities, in close collaboration with societal actors
- Can generate strong emotional engagement and, thus, strengthen learning and sense of social responsibility

(Molderez & Fonseca, 2018)



Norway as a climate hero

“Norway’s target is to be carbon-neutral in 2030, if emissions cuts are made by other countries, and by 2050 regardless of international emission cuts. The country’s electricity and heating is largely covered by hydropower, leaving transport and oil and gas **extraction and processing** as the largest emitters.”
(Kattel et al., 2021)

Norway as a climate villain

“Norway is the third largest exporter of natural gas in the world In recent years, Norway has supplied between 20 and 25 per cent of the EU and United Kingdom gas demand. Nearly all oil and gas produced on the Norwegian shelf is exported. Combined, oil and gas exceeds half of the total value of Norwegian exports of goods. This makes oil and gas the most important export commodities in the Norwegian economy.”
(norskpetroleum.no)

Work in groups: How would you teach about this overarching issue through ESD?

1. Agree on a real/hypothetical student group & course context for the teaching
2. Define an intended learning outcome (ILO)
3. Develop a **rough** idea of a teaching and learning activity for that ILO
4. Prepare a **single** slide/image to briefly share your ideas in plenum

We will continue in plenum at 14:35.



SOME WAYS FORWARD

- **Inter- & transdisciplinary** collaboration
- **Pedagogical approaches** that decenter teachers' subject expertise
- Focus on **key competencies**
- “Wickeding” existing **content**
- Challenge definitions of expertise with students & colleagues:
 - “No one is an expert.”
 - Focus on “tools, values, competence, not only knowledge”
 - Teachers as facilitators and co-learners
 - The world is changing – we don't know what knowledge students will need
 - “How can we be experts in our discipline without sustainability?”
- **START SMALL!**

Preparation tasks for workshops 5 & 6 coming soon!

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