

# The what and how of transdisciplinary (TD) learning

TD Academy Webinar

6 December 2023

Presenters: TD Academy fellow group on “Transdisciplinary learning towards collective transformation”

**Gemma O’Sullivan** (Copernicus Institute, Utrecht University)

**BinBin Pearce** (Faculty of Technology, Policy & Management, TUDelft)

**Ulrike Zeshan** (PACT Institute, University of Central Lancashire)

**Jillian Student** (WIMEK and Environmental Policy group, Wageningen University & Research)



# The landscape of transdisciplinary learning

*Gemma O'Sullivan*



# Transdisciplinarity

## Research Method? Pedagogy? Ideology? Philosophy? Goal? Theory? Action? Competence?

Transdisciplinarity (TD): interactions are extended outside academia to solve problems of societal importance through integration of knowledge from different actors. (League of European Research Universities, 2016, p. 12)

### Orientation

An orientation composed of “values, attitudes, and beliefs and conceptual skills and behaviors” ( Misra et al., 2015, p. 6)

### Approach

TD approaches are needed where causal pathways of a societal challenge transcend disciplinary boundaries (OECD, 2020).

### Purpose

“the knowledge–action gap” (Gibbs, Neuhauser & Fam (2018)



# Transdisciplinarity

Jantsch  
1970s

Social purpose

Gibbons et al.  
1990s

Piaget  
1970s

Superior stage

Nicolescu  
1980s

European tradition  
Pohl, Hirsch-Hadorn et al.  
2000s

Dr. Gemma O'Sullivan



## Search terms

Curriculum: what is taught - a value position and a shared way of life that teaches a certain worldview or set of values through action (Eisner, 1994).

“transdisc\*” and “curriculum” and “design” within article title, abstract and keywords in Scopus and Web of Science between 1970 and 2022.

Refined to 100 articles

*plus*

Articles listed by td-net’s annual report ***A Tour d’horizon of literature related to transdisciplinarity.***



# Transdisciplinary learning

Learning as a group/team process: students, academic and extra-academic actors (Gibbs, 2017; Klein, 2018; Fam et al., 2018).

Learning process is expressed as competence development (Pearce, 2021; Crosby et al., 2018)

TD as a problem-solving processes, for example, problem identification, problem definition, clarification of aims, problem analysis including context and development of strategies to address the problem

Literature reflects the two pillars of TD: knowledge integration and actionable knowledge (closing the knowledge action gap)



## Inter/intrapersonal/ epistemological competencies (literature)

- perform in a flat structure, communication, problem solving, collaborating (Pearce, 2021; Crosby et al., 2018)
- collaboration, reflexivity, openness, flexibility and communication but also attitudes or dispositions (Augsburg, 2014)
- empathy, open-mindedness, sensitivity, social skills, facilitation, knowledge brokerage and the ability to build trust (OECD, 2020)
- team knowledge (e.g., task understanding, shared mental models, role knowledge); team skills (e.g., communication, assertiveness, situation assessment) and team attitudes (e.g., team orientation, trust, cohesion) (National Research Council, 2015)
- competency for deliberation, learning from each other, development of meaningful social relations with group members, cognitive emotion (Boix-Mansilla et al., 2016)
- academic humility, self reflection (Hawkins, 2017)
- communication, reflexivity, team development and project management, flexibility, adaptability, participation, dialogue and collaboration (Gibbs, 2017)



# U-shaped

Integration

Actionable  
knowledge

Interpersonal  
Intrapersonal  
Epistemological







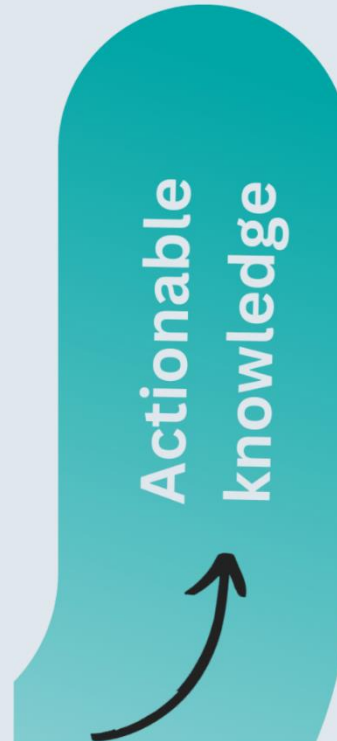
## U-shaped



Jointly formulate problems with extra-academic actors; show how knowledge from multiple disciplines must be brought to bear in order to solve a problem; co-produce and integrate knowledge; frame complex problems using diverse perspectives



## U-shaped



Close the knowledge-action gap:  
Implement and assess societal and scientific outcomes;  
Develop solutions for real-world problems;  
Apply concepts in the real world.



## But how?

Problem-oriented methodology (integration and actionable knowledge)

Transversal academic knowledge e.g. systems thinking

Real-life case studies

Stakeholder analysis with real stakeholders

Challenge-based learning (CBL): Integration happens in the classroom i.e. students seek out information from within or outside their discipline to solve a challenge (e.g. Greenhalgh-Spencer et al., 2017).

Learning spaces: Living Labs

Curriculum design?

Within an epistemological and pedagogical space such as TD – which necessarily falls between and above disciplines – to analyse the principles that transform knowledge into curricula.



## Design principles

Create a favourable cognitive and affective environment

Create a liminal space "betwixt and between"

- Recognise uncertainty and fear
- Epistemological neutrality
- No hierarchy
- Physical space
- Build confidence

Nurture “a climate of conviviality” and “a dynamically co-constructed space with a set of rules and objectives that members develop” (Boix-Mansilla et al., 2016, p. 594)

- Facilitator
- Create a shared narrative

Imagine collective competence development

- nurture the “social-interactive qualities” of individuals i.e. sociability, communicative styles, effective leadership (Boix-Mansilla, 2016, p. 594)

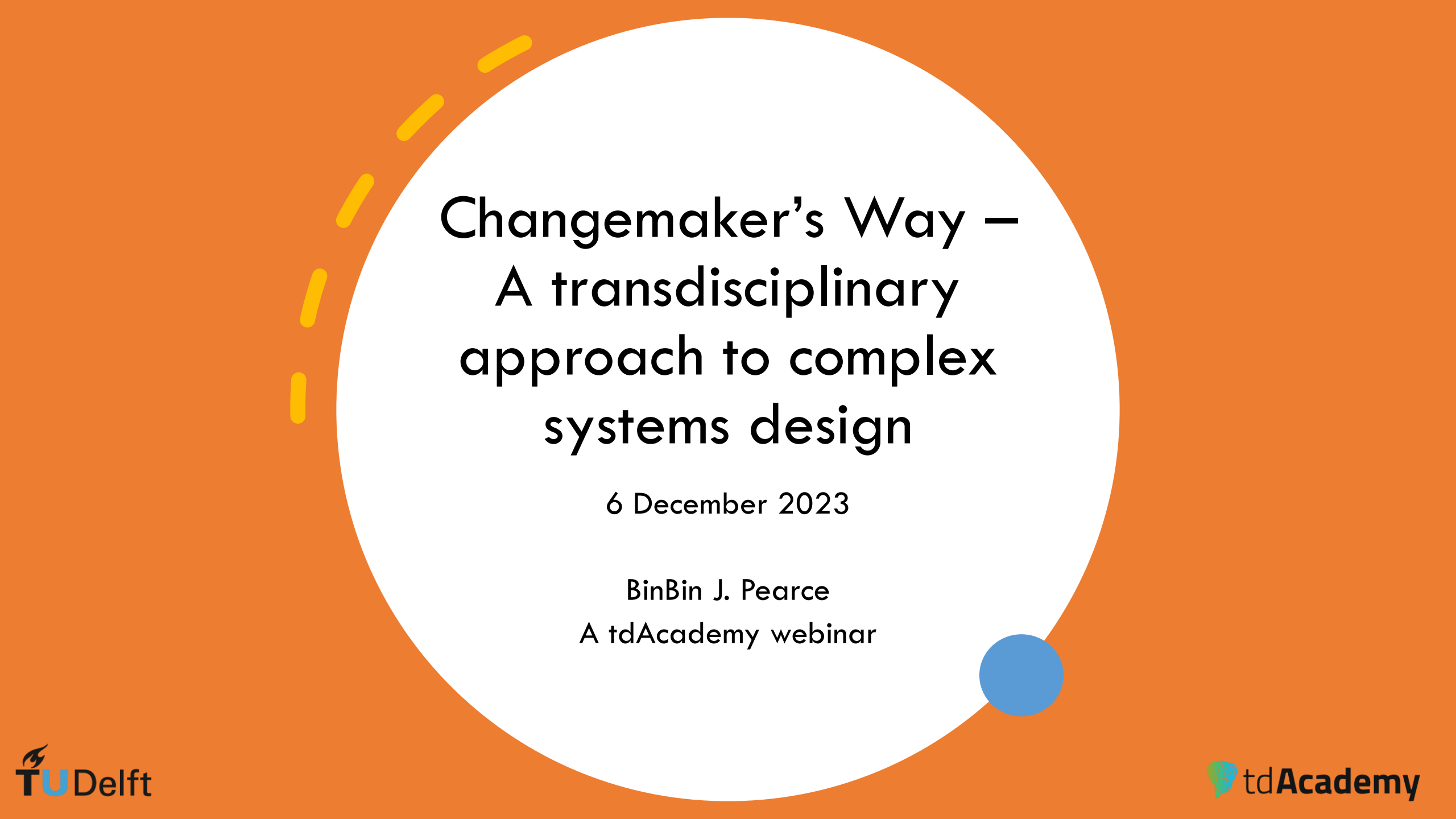
Structure the curriculum methodology around a challenge:

- Transversal - Transdisciplinary - Challenge



# Thank you

*We finally, although it was complicated, we finally agree on the narrative beyond disciplines. So this is already one indicator of success. [iH2]*



# Changemaker's Way – A transdisciplinary approach to complex systems design

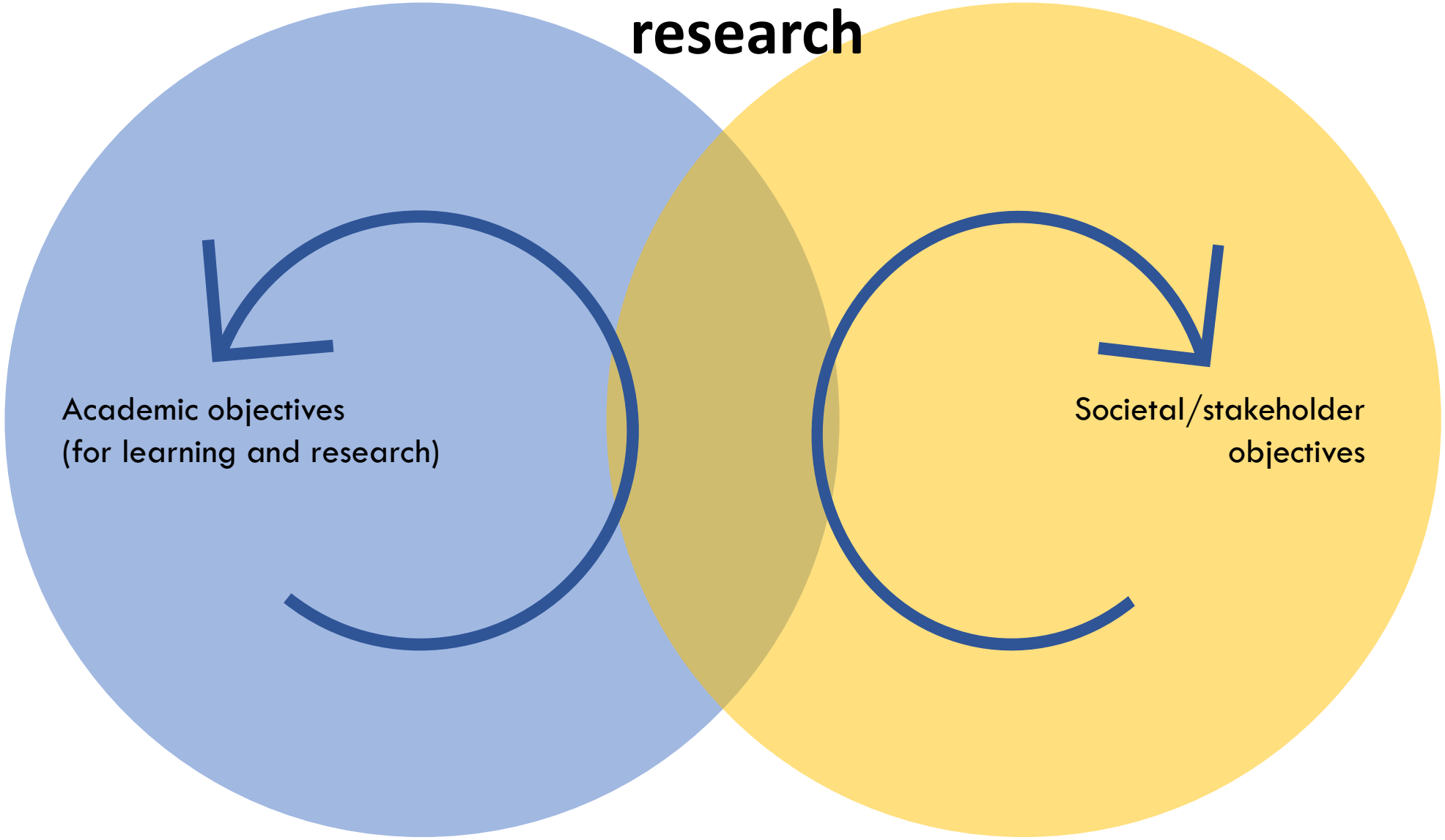
6 December 2023

BinBin J. Pearce  
A tdAcademy webinar

# **transdisciplinary...**

- setting
- processes and practices
- outputs
- mindset

# transdisciplinary setting for learning and research

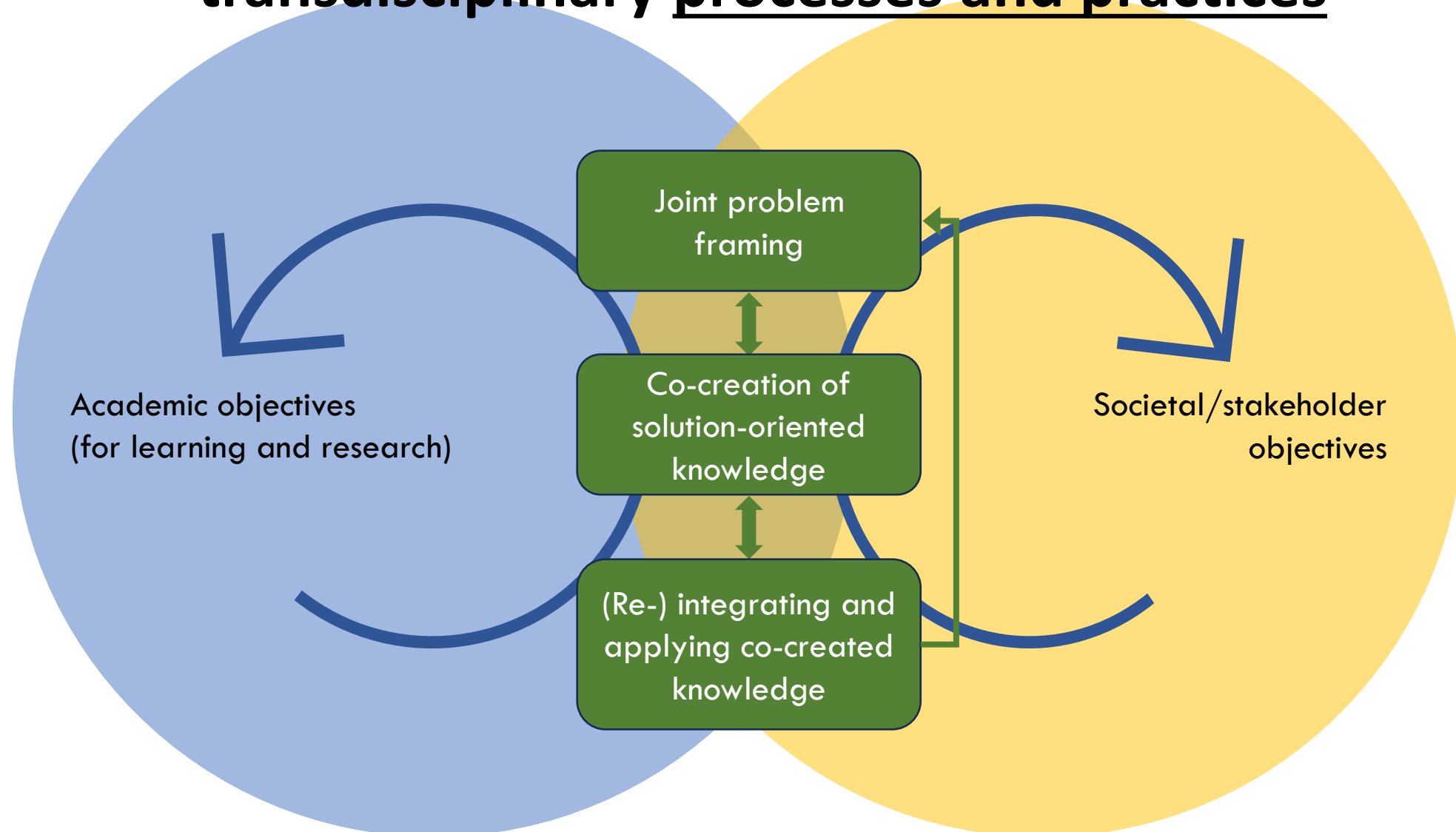


Academic objectives  
(for learning and research)

Societal/stakeholder  
objectives



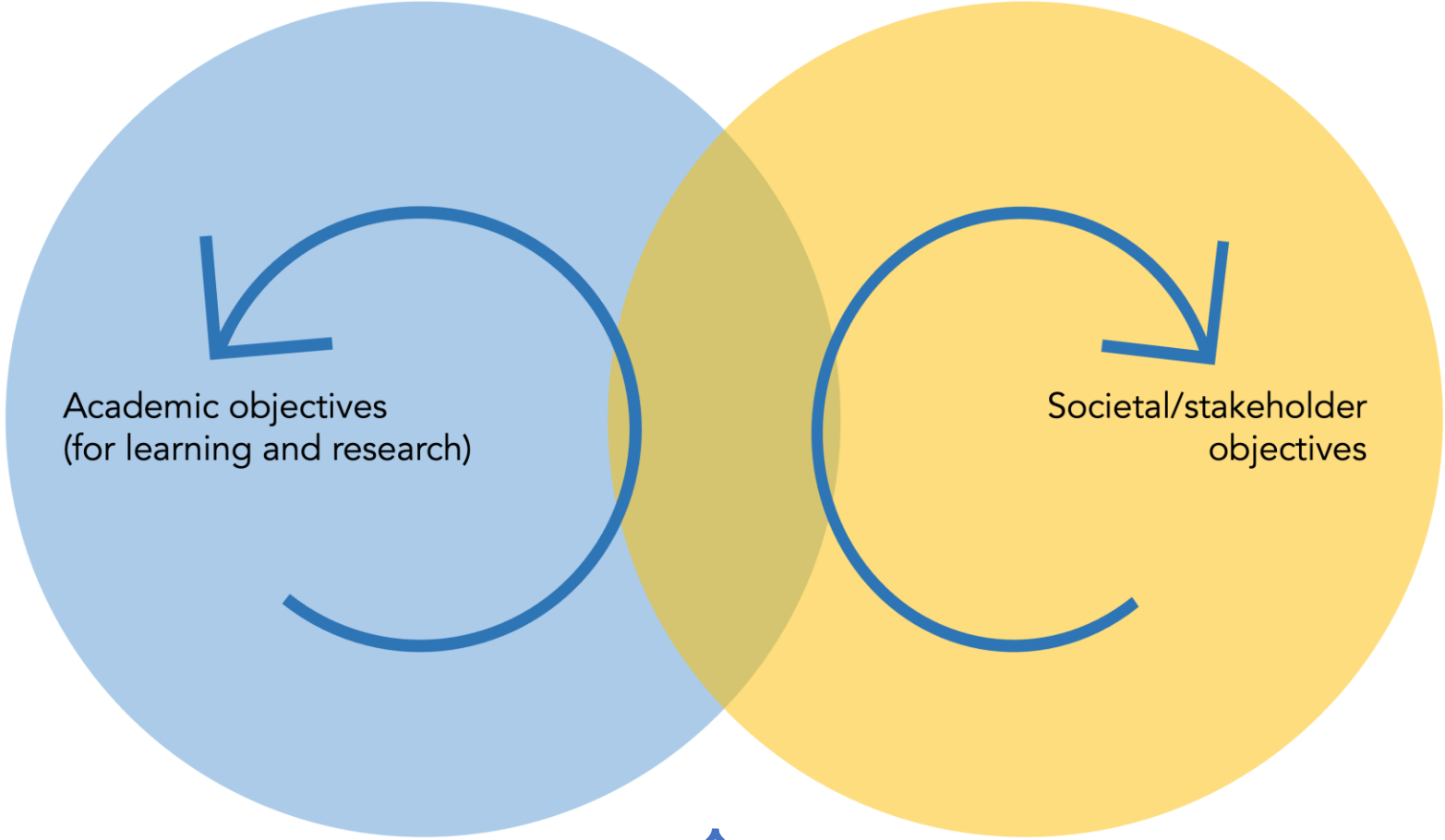
# transdisciplinary processes and practices



Lang, D. J., Wiek, A., Bergmann, M., Stauffacher, M., Martens, P., Moll, P., Swilling, M., & Thomas, C. J. (2012). Transdisciplinary research in sustainability science: Practice, principles, and challenges. *Sustainability Science*, 7(S1), 25–43. <https://doi.org/10.1007/s11625-011-0149-x>

Pearce, B. J., & Ejderyan, O. (2020). Joint problem framing as reflexive practice: Honing a transdisciplinary skill. *Sustainability Science*, 15(3), 683–698. <https://doi.org/10.1007/s11625-019-00744-2>

# transdisciplinary outputs

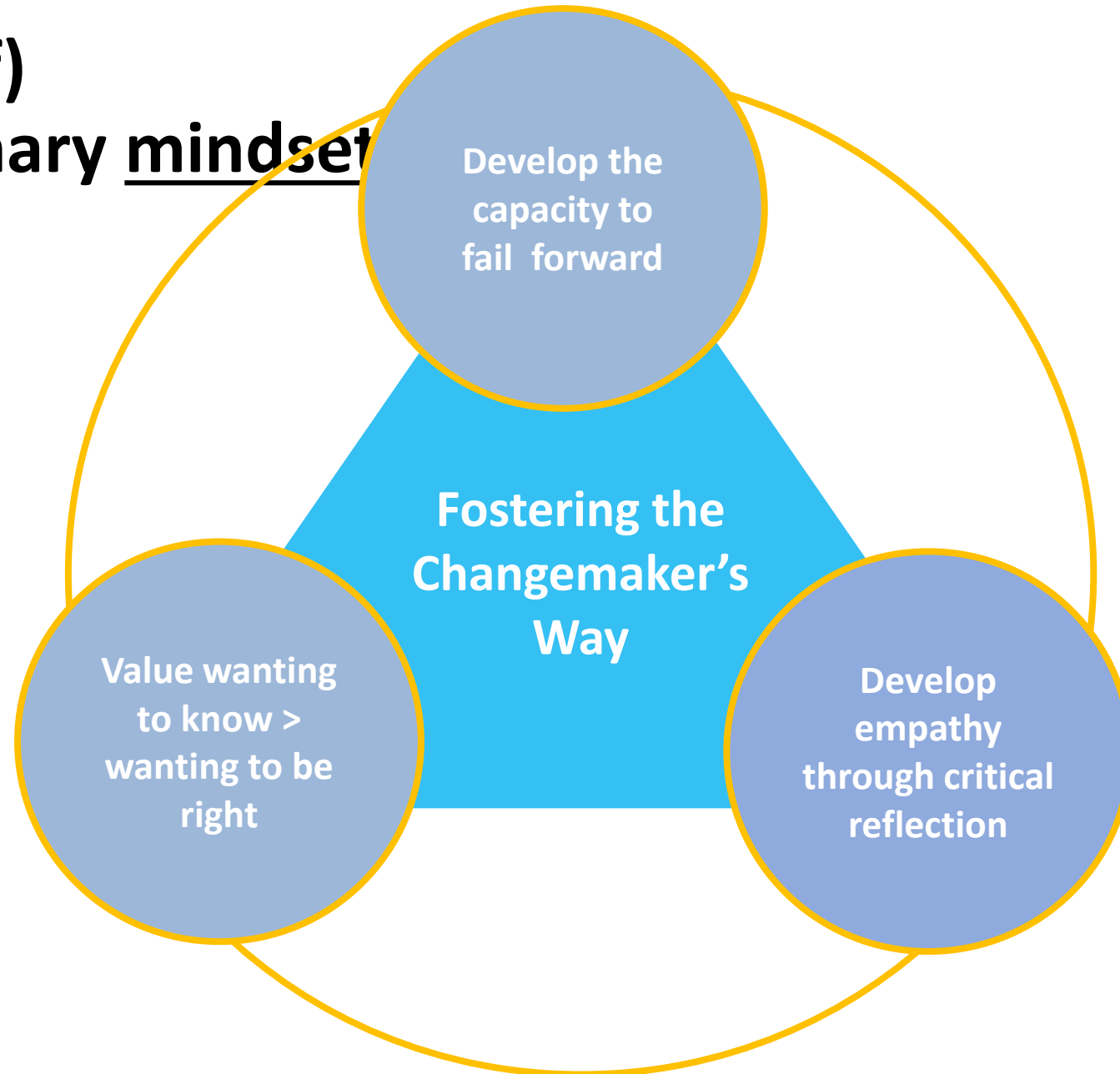


System knowledge  
“What is?”

Target knowledge  
“What should the goal be?”

Transformation knowledge  
“How do we get there?”

(an example of)  
a transdisciplinary mindset

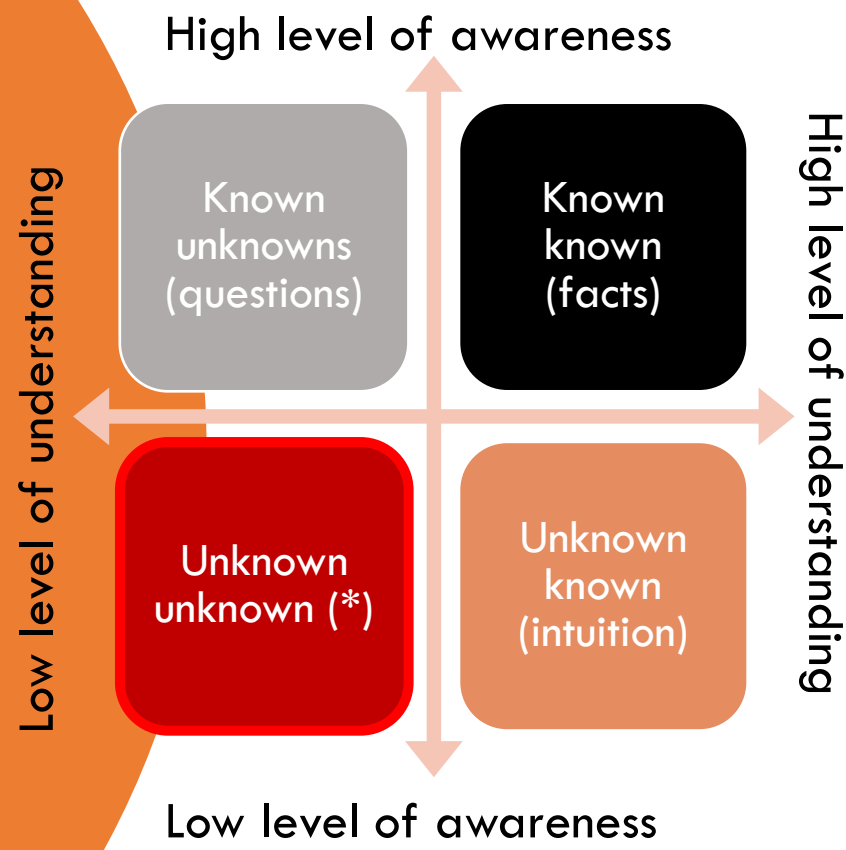


# How is this vision being developed?

## Developing curriculum that:

- **Works with complexity and complex systems:** designing for real world case studies
- **Integrates systems thinking with design (head + heart):** linking rigorous analysis, questioning assumptions, with empathy and building intuition

Complex systems have unknown unknowns



Develop the capacity to fail forwards

- \*Be humble enough to take small steps in large systems, but;
- \*Audacious enough to experiment and take (measured) risks

# How is this vision being developed?

## Developing curriculum that:

- **Works with complexity and complex systems:** using and designing for real world case studies
- **Integrates systems thinking with design\* (head + heart):** linking rigorous analysis, questioning assumptions, with empathy and building intuition

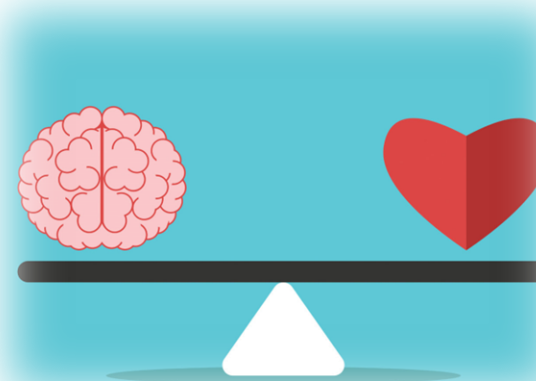
\*Pohl, C., Pearce, B., Mader, M., Senn, L., & Krütli, P. (2020). Integrating systems and design thinking in transdisciplinary case studies. *GAIA - Ecological Perspectives for Science and Society*, 29(4), 258–266. <https://doi.org/10.14512/gaia.29.4.11>

\*Taimur, S., Peukert, D., & Pearce, B. J. (2023). Design Thinking. In T. Philipp & T. Schmohl (Eds.), *Handbook: Transdisciplinary Learning* (1st ed., Vol. 6, pp. 83–92). Bielefeld: transcript Verlag. <https://doi.org/10.14361/9783839463475-010>

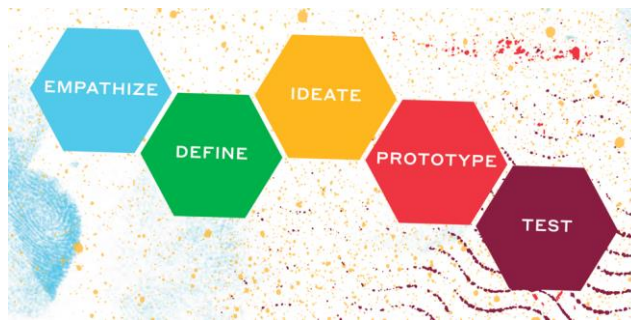
# Integrated 'systems and design thinking'

Structured methodology bringing together systems thinking and design thinking to enable students to frame and address a complex societal problem

Head – Analytical  
and critical  
thinking  
(cognitive domain)



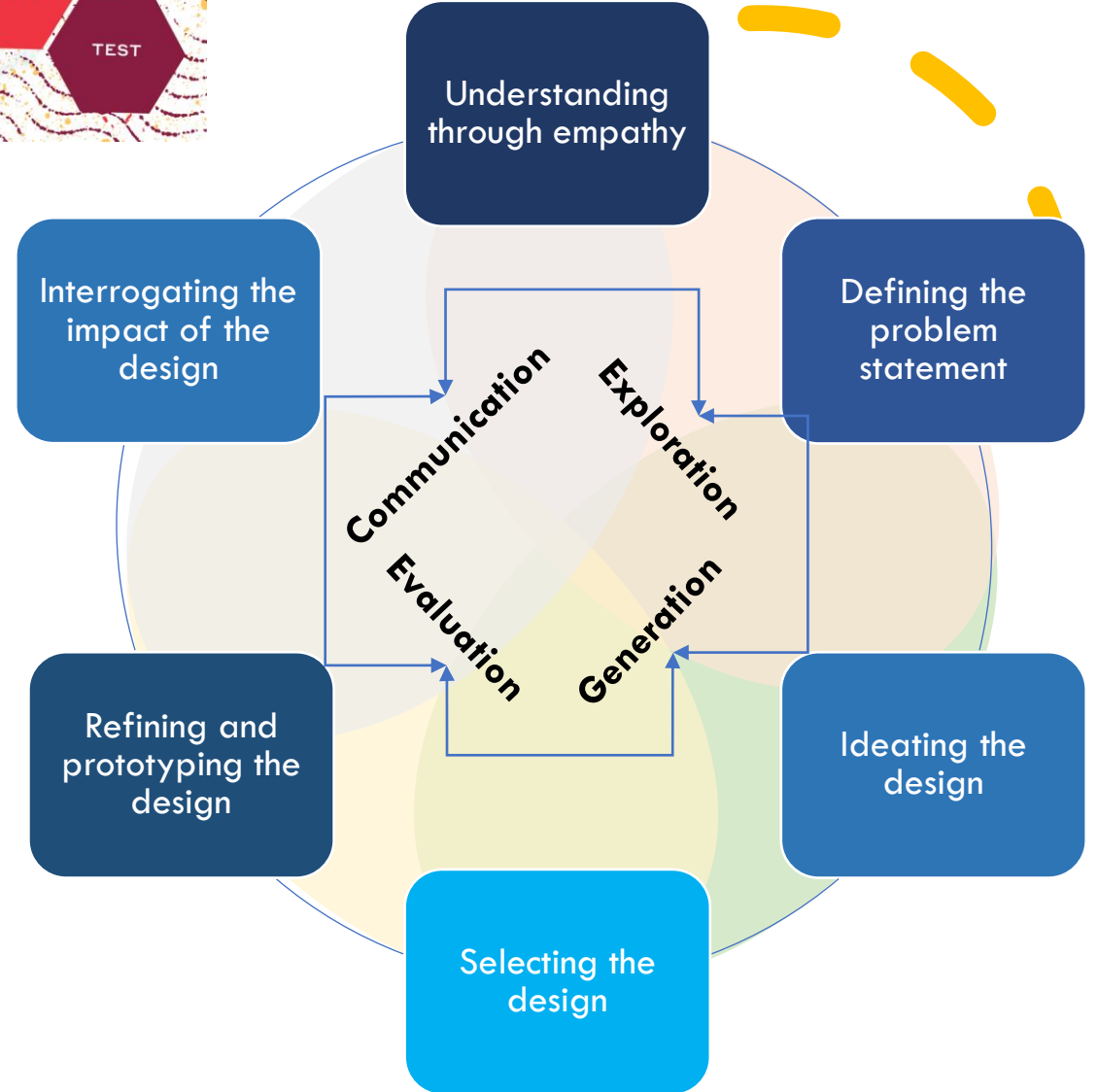
Heart –  
Creative thinking  
(cognitive +  
affective  
domains)



Value wanting to know > wanting to be right

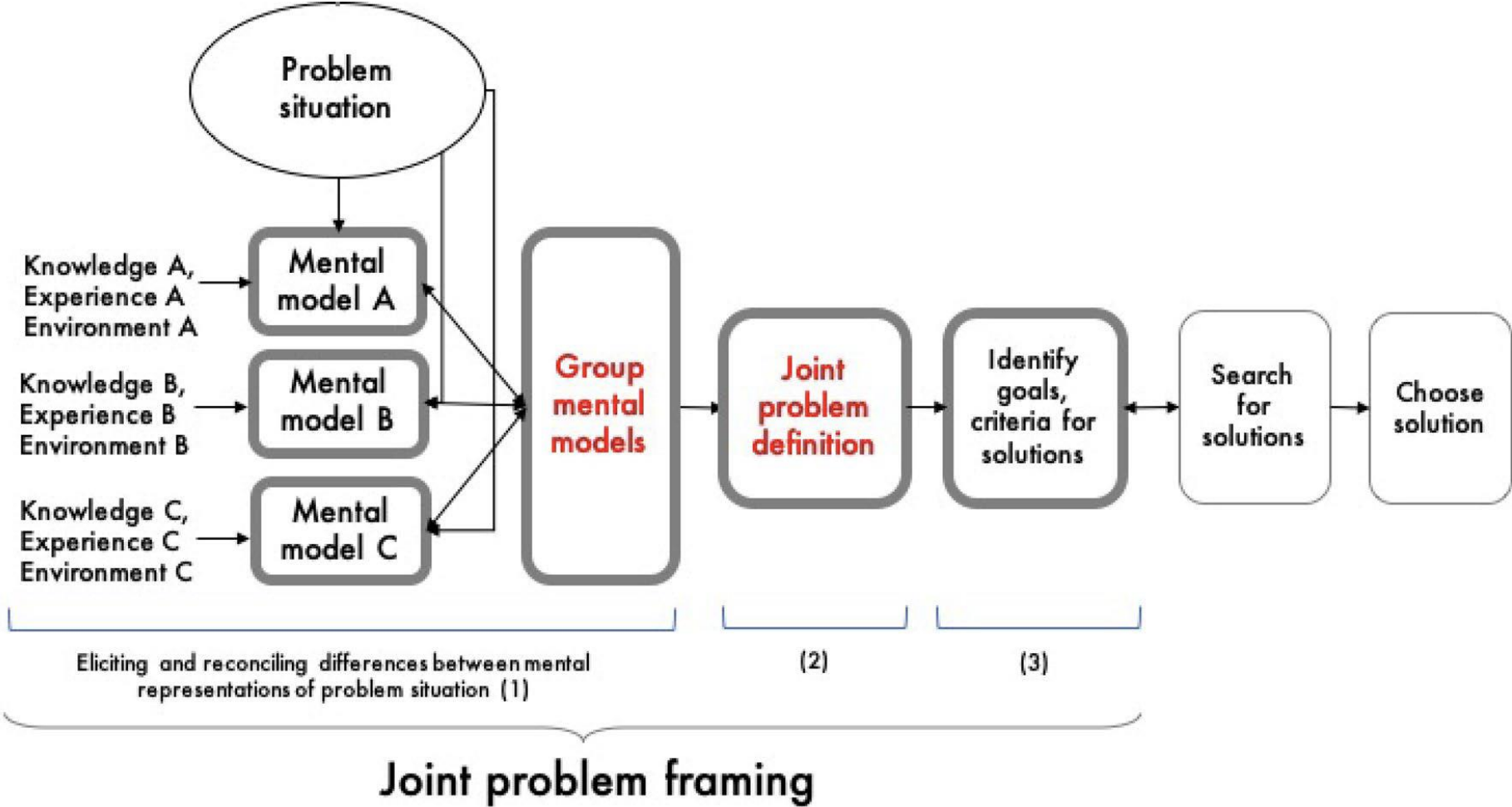
# An adapted design thinking cycle for complex systems

Develop empathy through critical reflection





# Next steps – Building the Delft Problem Framing Lab





**Thanks,  
let's talk more  
later!**

BinBin J. Pearce  
Faculty of Technology, Policy and Management  
Delft University of Technology  
b.j.pearce-1@tudelft.nl

# Broadening human capacities in TD learning

Ulrike Zeshan

University of Central Lancashire, UK

[uzeshan@uclan.ac.uk](mailto:uzeshan@uclan.ac.uk)

# Humans: Our (untapped) capacities

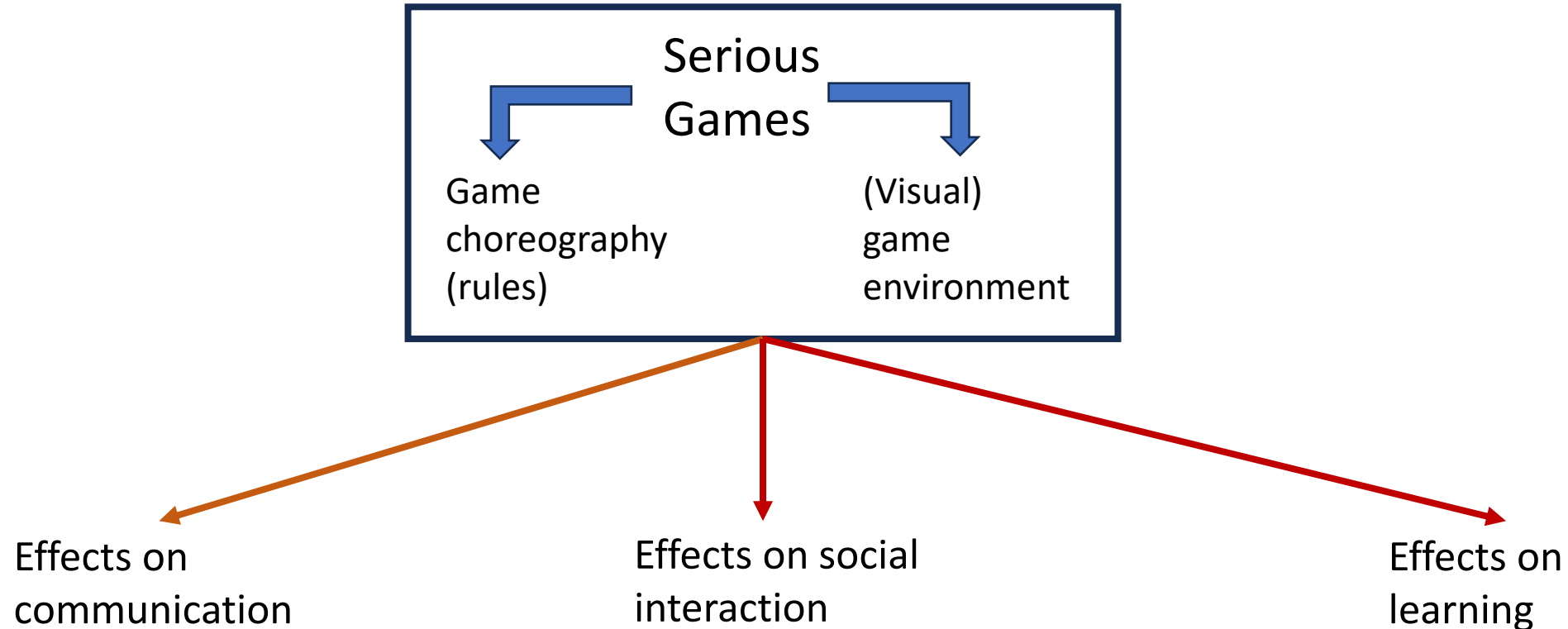
## **Intellectual capacities**

- Absorb and integrate information
- Remember facts
- Find logical relationships
- Critical thinking
- ...

## **Other human capacities**

- Imagination
- Creativity
- Empathy
- Social coordination
- The will to act
- ...

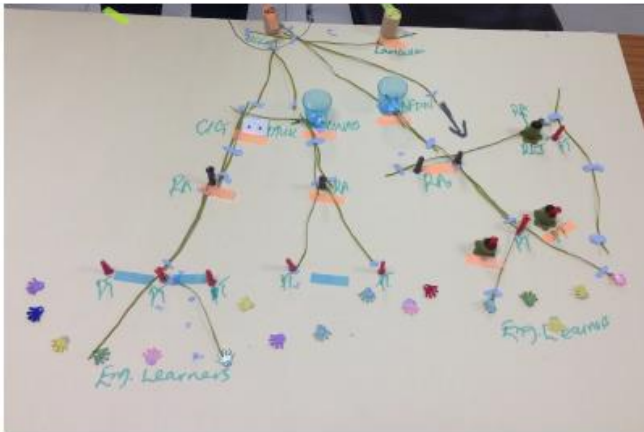
# Tapping untapped capacities through Serious Games



# What characterises games?

holistic (cognitive and emotional)

memorable



non-threatening

inclusive



engaging (attention)

multi-sensory and multimodal



# Example 1

## Indo-German Dialogue on Green (Urban) Practices

IGD	Indian	German	Non-academic organisation	Academic organisation	Total
1 <sup>st</sup>	25	15	18	7	40
2 <sup>nd</sup>	20	19	27	12	39
3 <sup>rd</sup>	20	12	15	17	32
4 <sup>th</sup>	22	31	26	26	53



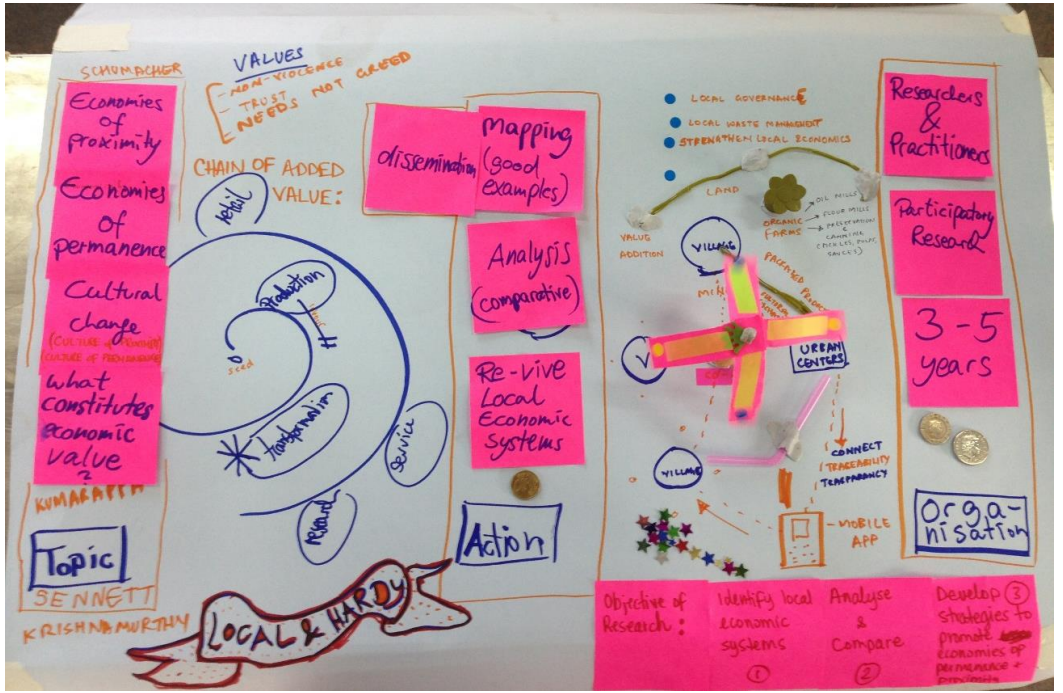
Woiwode, Ch. et al. (2022) Indo-German cross-cultural collaboration: Sharing experience and cocreating knowledge for sustainable urban livelihoods design. In Melles, G.B. (ed.) *Designing Social Innovation for Sustainable Livelihoods*, pp. 107-132. Singapore: Springer Nature Singapore.

“It was a great collaboration – a good synergy of ideas.”  
 “And I liked how we started putting our ideas together and through everyone’s input it just sort of evolved into this beautiful drawing.”  
 “... with a lot of colour and fun.”  
 “We basically had a small group, and that was one of the key success factors. We didn’t have to shout. We could talk and discuss.”

Brainstorming:  
*Turntable*

Sense-making and  
 categorising: *Wall of X*

Project planning:  
*Living Diagram*





# Example 2

## Regen-D: A templatic game

Each game is a case studies of a regenerative initiative (Regen-D stands for “regenerative design”).

Core component: a collection of multimedia files about the initiative, accessed using QR-codes that are printed on one side of wooden disks (the other side has placeholder pictures).

QR-code disks or other task disks (*evaluating, linking,...*) are determined by spinning a selector wheel.

Players build up a diagram turn by turn.



## Templatic games:

- Drastically reduce game development and prototyping time.
- Enable grassroots people to become game authors.
- Enable learners to quickly design their own game.



A person with a backpack is walking away from the camera on a dirt path that winds through a field of tall, green grass. The sky is blue with scattered white clouds. The overall scene is bright and open.

Exploring  
different  
approaches to  
transdisciplinary  
learning with the  
tdAcademy

Jillian Student  
WIMEK & ENP  
Wageningen University and Research

# Wageningen University and Research



**Climate action**



**Managing our future biosphere**



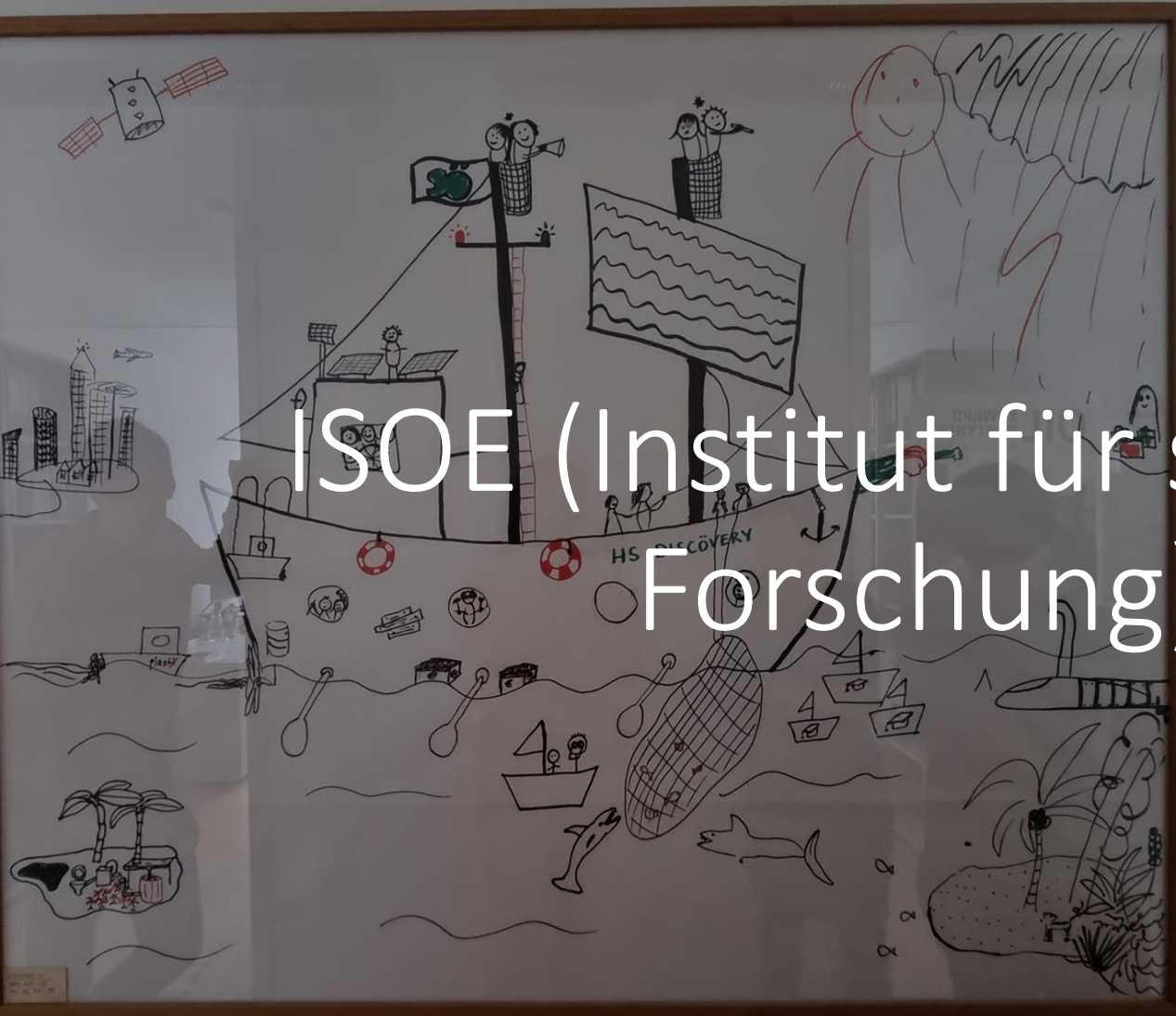
**Advancing circular systems**

A night photograph of two women smiling in front of a large, illuminated model of a town. The woman on the left has dark hair and wears glasses and a grey scarf. The woman on the right has long brown hair and wears a black beanie with a white pattern and a green scarf. The background shows a detailed model of a town with many windows lit up, situated on a hillside overlooking a body of water. The text 'Leuphana University of Lüneburg' is overlaid on the left side of the image.

Leuphana  
University of  
Lüneburg

# Leuphana university

- Time required to start knowing what we can share
- Every student has interdisciplinarity in the first year
- Challenge of dependency on a few people
- Reflections on what does it mean to do transdisciplinary research and learning in different contexts? What are the implications and contexts? What can be transferred?



# ISOE (Institut für sozial-ökologische Forschung), Frankfurt



# ISOE (Frankfurt)

- Challenge of a transdisciplinary profile in Germany, typically only disciplinary professorships
- Normalizing learning about transdisciplinarity

## Burning questions:

- Who can apply for funding?
- Who are the reviewers and how are they selected?
- What are integration methods? How is progress evaluated?



# Öko-Institut, Freiburg



# OKO instituut (Freiburg)

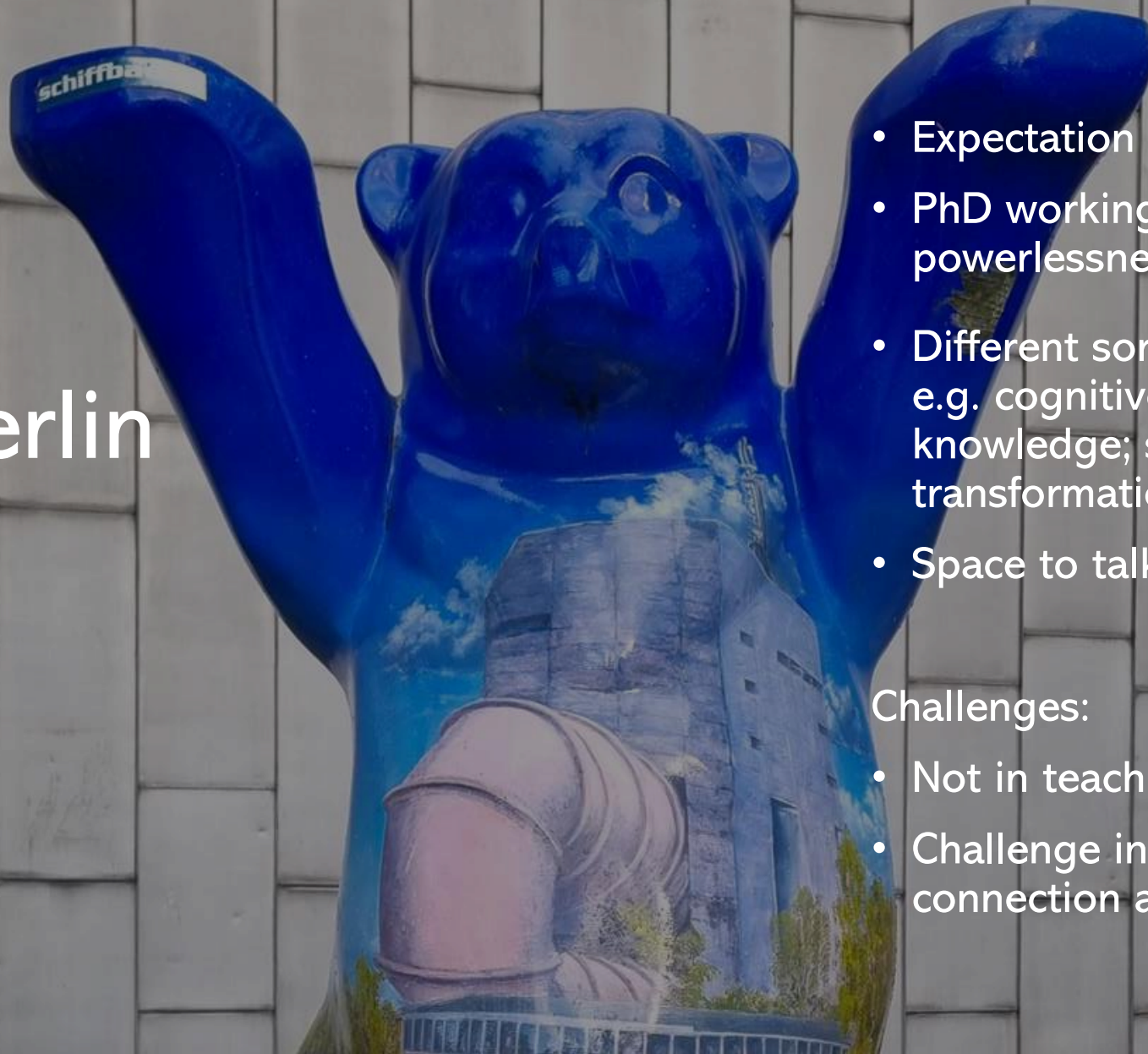
- Not limited to research outputs, but do need everything to be tied to the project
- Meet regularly on topics, but sometimes hard to find each other if not on the same topic
- At Freiburg University, not as many resources; teaching not done in TD; ID is done for teaching for student; depends on people, not a structural force beyond.
- Often people are interested in, but don't have the capacity and resources

Burning question:

- How to consider limited resources?
- How to focus on practitioners' needs (often focused on aims of collaboration and impact)?



# TU Berlin



- Expectation management
- PhD working with outside; feeling of powerlessness; need embedded knowledge
- Different sort of knowledge integration-> e.g. cognitive, institutional, types of knowledge; system; target and transformational
- Space to talk openly about TD

## Challenges:

- Not in teaching in the why, but the how
- Challenge inter- and transdisciplinary connection at project level



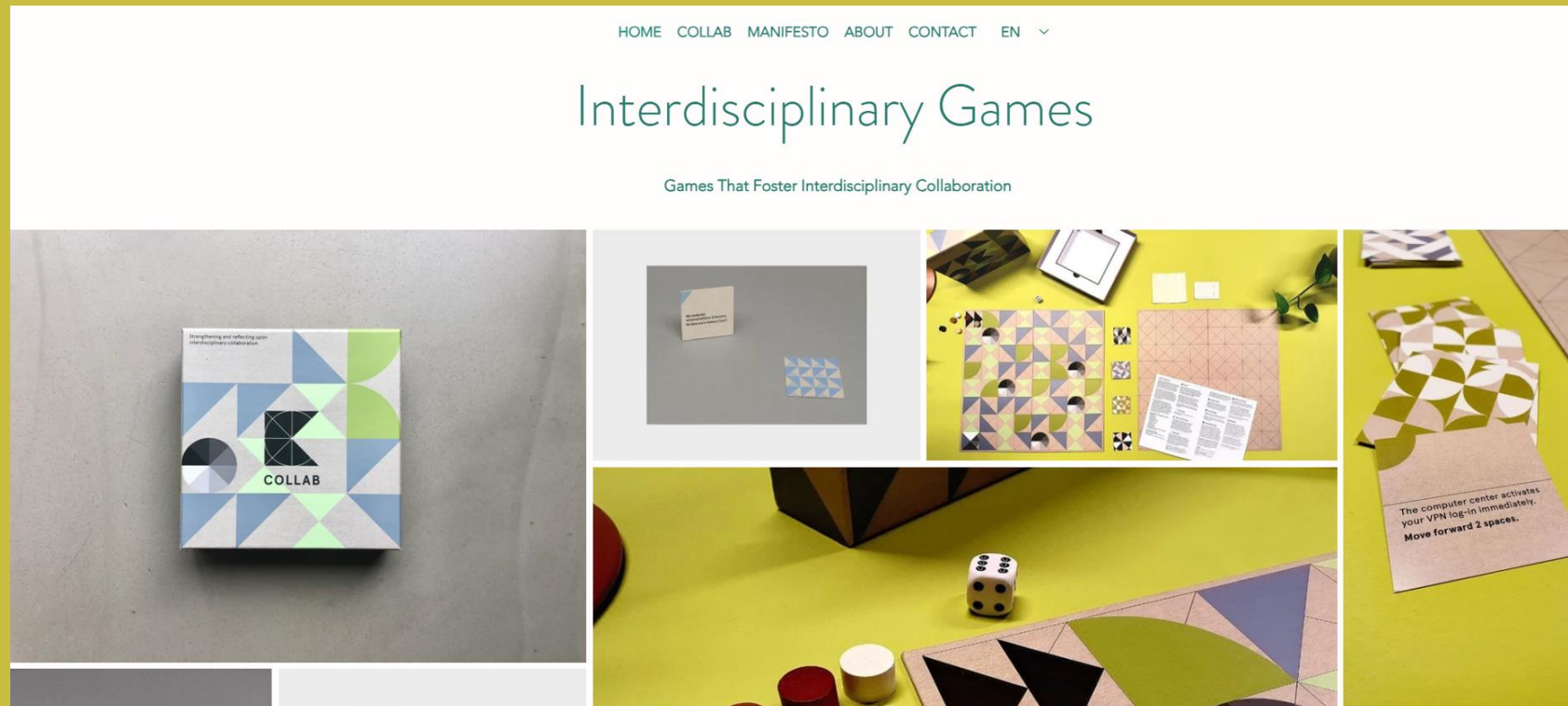
BUA (Berlin University Alliance)



Shared spaces with society

# Transformational leadership postdoc programme

- Involvement of different universities
- Challenges of funding longevity





# Eberswalde University for Sustainable Development (Hochschule für nachhaltige Entwicklung Eberswalde)

- Training with students from 1<sup>st</sup> semester from the beginning
- Unseen work before you make things happen
- Working with everyone with region as opposed to just the frontrunners
- sustainability problems at entry point for communication
- students as icebreakers between university and society
- Think unusual to behave unusual

Submit a Manuscript to the Journal

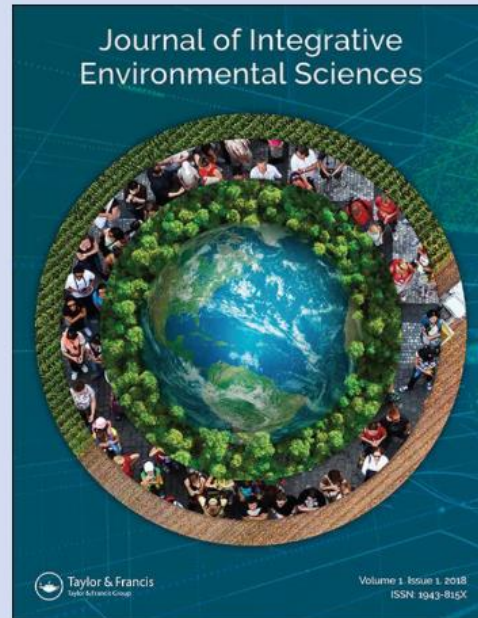
## Journal of Integrative Environmental Sciences

For an Article Collection on

Co-Creating Transdisciplinary Research and Learning for Transformative Socio-Environmental Change

**Manuscript deadline**  
30 June 2024

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### Article collection guest advisor(s)

Dr. Jillian Student, *Wageningen University & Research, the Netherlands*  
[jies@wur.nl](mailto:jies@wur.nl)

Dr. Annisa Triyanti, *Utrecht University, the Netherlands*

Dr. Melanie Kryst, *Technische Universität Berlin, Germany*

Nadin Gaasch, *Technische Universität Berlin, Germany*

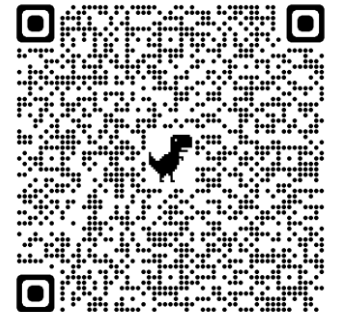
Prof. Mark Lemon, *De Montfort University, United Kingdom*

Dr. Wim Lambrechts, *Open Universiteit, the Netherlands*

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Thank you.

What are your thoughts?