PHD FOR INNOVATION

INTERDISCIPLINARY PROBLEM SOLVING AND CREATIVITY

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UNIVERSITY OF BERGEN

Introduction and objectives

We live in a world where rapid and radical changes around us have become the norm. In such a complex and uncertain world, traditional and disciplinary problem-solving methods are not always sufficient. Therefore, it is crucial that we train our PhD candidates to master more collaborative and innovative methods.

The purpose of this course is to equip PhD candidates with problem solving methods that facilitate interdisciplinary collaboration with a strong focus on research impact. This will be achieved by working concretely with challenge-driven innovation related to sustainable development goals (SDGs), in teams consisting of PhD candidates with varied disciplinary backgrounds. The course directly answers to a series of strategic initiatives and calls at the University of Bergen, such as SDG in higher education and handlingsplanen for ph.d.-utdanningen.

By merging methods from fields such as system dynamics and innovation methods and by working directly with societal actors outside the university, the course represents a novel and effective approach to fostering creative problem solving abilities that goes beyond already existing courses.
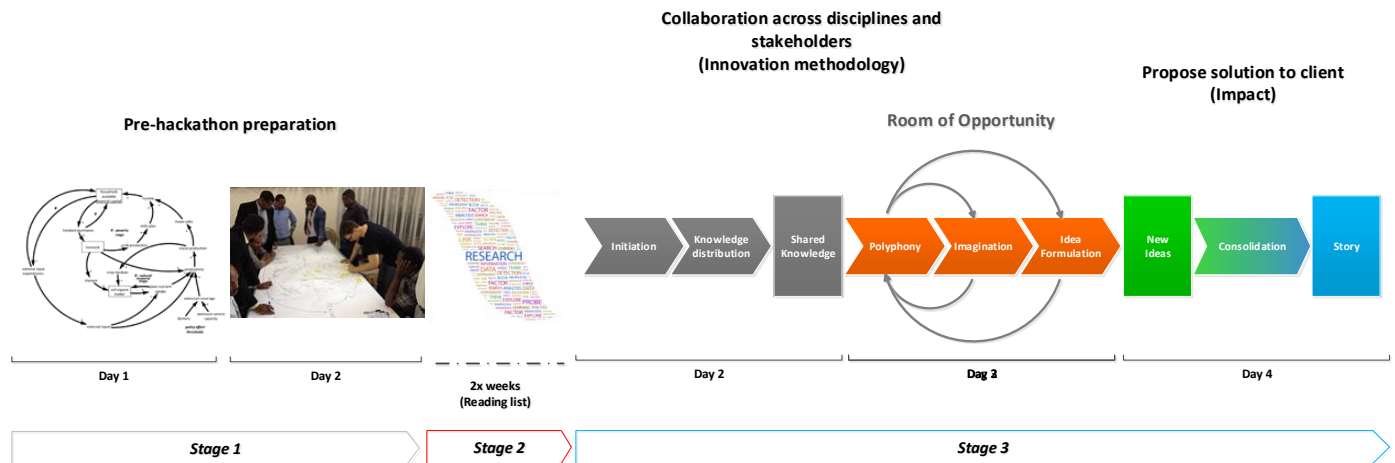
Course contents

In this course, PhD candidates gain theoretical as well as practical experience in methods and ways to solve complex problems that are characteristic for sustainable development challenges. The course works with both, private and public sector institutions (problem owners; possibly varying from one course to the next) who furnish PhD candidates with an applied context and specific sustainable development problems.

PhD candidates receive practical guidance as well as input on theory, methods and techniques in systems thinking and creative problem solving. They apply this knowledge in interdisciplinary groups to explore, generate new thinking and develop solutions for these problems.

Creative problem solving provides an experimental and iterative approach to idea development and the creation of new products and services. Systems thinking helps address the challenge of how to support innovations to enter and actively shape the systems that surround complex sustainable development problems. Taken together, systems and creative problem solving form an integrated and novel basis for achieving the course objectives.

The main activities of the course are organized in the form of a hackathon, that is, a problem solving event where the PhD candidates collaborate over a period of three days to learn and apply early stage design concepts such as empathize, define, ideate, prototype and test. Overall, the course consists of three stages that are illustrated in Figure 1.

- Stage 1 - Understanding the problem: Research including workshops with problem owners to drive understanding of the problem to be solved. Problem understanding involves appreciating factors such as power dynamics, competing incentives and cultural norms, and comprehensively mapping the system that should be changed.
- Stage 2 - Literature study
- Stage 3 - Creating and preparing for impact (hackathon day 1-3)

Figure 1: The course consists of 3 stages: 1) understanding a problem, 2) Literature study, and 3) Creating and preparing for impact (Modified from Ness, 2018; Kopainsky et al. 2017; Stave et al. 2017; by Hiwa Målen)

Ness, I.J. (2018): Researching creativity in multidisciplinary groups working with developing innovative ideas. *In Handbook of Re/Searching the Social in Creativity Research: Methods, Studies, and Reflections'.* Palgrave Macmillan book series 'Creativity and Culture'.

Kopainsky B., Ledermann S.T., Tribaldos T. 2017. A food systems perspective for food and nutrition security beyond the post-2015 development agenda. Systems Research and Behavioral Science. DOI 10.1002/sres.2458.

Stave K., Kopainsky B., Anteneh M. , Ameha Mengistu A., Yibeltal Sebhat M., Aynalem S., Tefera B., Wassie A., Aragaw C., Getnet B., Beyene B.S., Abebe A., Goshu G., Tilahun Tadesse A., Mesfin Ayenew M. 2017. Participatory system dynamics mapping for collaboration and socioecological integration in the Lake Tana region. In: Stave K., Yemer G.G., Aynalem S. (eds.). Social and Ecological System Dynamics. Characteristics, Trends, and Integration in the Lake Tana Basin, Ethiopia. Springer, New York et al. Chapter 34: 615-630. ISBN 978-3-319-45753-6. DOI 10.1007/978-3-319-45755-0.

Learning outcomes

Upon successful completion of this course the participants should be able to:

1. Express knowledge and understanding:

- PhD candidates have an overview of the most frequently used methods in systems thinking and creative problem solving.

2. Apply knowledge and understanding:

- PhD candidates can apply those tools from systems thinking and creative problem solving that are appropriate for the specific sustainable development challenge.
- PhD can candidates identify appropriate boundaries for the problem at hand.

3. Communicate:

- PhD candidates can adopt a problem owner's perspective to effectively summarize the problem, describe the methods for solving that problem and the implications of the proposed solutions.

- PhD candidates can translate technical information into language that problem owners understand and resonate with.

4. Learning skills:

This course has a strong focus on communication and collaboration skills. In particular, PhD candidates should be able to

- organize efficient and effective communication with the problem owners;
- organize efficient and effective communication within interdisciplinary teams;
- engage in the co-creation process with a high degree of independence, responsibility, and reliability;
- function as a constructive member of a team;
- write and speak effectively about their work and relevant issues;
- adjust the way they write and speak to their target audience and their respective roles in the problem-solving process.

Course program

Stage 1: Understanding the problem

Reading prior to day 1: sustainable development and innovation; systems thinking and participatory systems mapping.

Day 1 – May 07, 2019

- Introduction to the course.
- Background on participatory systems mapping and approaches to build, verify and refine systems maps individually or in groups.
- Hands-on group work to experience systems mapping.
- Observation of and reflection on mapping process and group dynamics during map construction.
- Preparation of day 2 (systems mapping with the problem owner).

Day 2 – May 08, 2019

- Presentation by problem owner.
- Participatory systems mapping with problem owner to construct a shared map of the issue at hand that integrates different perspectives.
- Explanation of the remaining course activities: reading about the problem as well as hackathon preparation.
- Formation of interdisciplinary groups.

Stage 2: Literature study

Cf. Reading list (creative problem solving; from problem solving to business models) and specific literature for the sustainable development challenge at hand.

Stage 3: Hackathon

Day 3 – May 21, 2019

- On day 3, the PhD candidates start the creative problem solving process. The point of departure for the PhD candidates is the challenge identified during stage 1.
- The PhD candidates first enter the **Initiation phase**. In this phase they introduce themselves to each other and get to know each other. They will reflect on how to conduct the interdisciplinary collaboration based on the activities during stage 1 and their individual preparation from reading literature during stage 2.
- The next phase is the Knowledge distribution phase. The PhD candidates share their individual knowledge, expertise and experiences on the task/challenge and in this way their distributed expertise gets visible for the rest of the group. This shared knowledge base will function as the input to the most creative part of the process.

Day 4 – May 22, 2019

- On day 4, the PhD candidates will enter The Room of Opportunity and engage in creative dialogues based on the previously shared knowledge.
- They enter the **Polyphony phase** with discussions and exploration of the different perspectives in the groups. This exploration will be furthered in the **Imagination phase** with scenario thinking and here the PhD candidates will begin to imagine various ideas for solutions which will be formulated in the **Idea formulation phase.**

Day 5 – May 23, 2019

- On the fifth day, the PhD candidates will further refine the ideas and solutions and consolidate these in the **Consolidation phase.**
- The fifth day ends with presentations by each group.

Course administration

Course responsible

The course responsible at the Faculty of Social Sciences is professor Birgit Kopainsky. The course will be facilitated by a core team including Hiwa Målen, Susan Johnsen, Ingunn Johanne Ness and Anne-Kathrin Thomassen.

Time and place

Place: to be confirmed

Time: May 7&8 2019; May 21-23 2019

ECTS

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Participants

The course is open to interested PhD candidates at the University of Bergen and other Norwegian universities. The maximum number of participants in 20. Interested PhD candidates are asked to send in a brief letter of motivation (maximum 400 words). Participants will be selected based on this letter and a consideration of their (disciplinary) backgrounds to ensure maximum diversity of skills and expertise.

Evaluation

Assessment is based on oral presentation of outcomes of group work as well as on a written self-reflection log.

The groups will present their project in front of all course participants, the problem owner and the evaluation committee (Birgit Kopainsky, Ingunn Johanne Ness, Hiwa Målen). In addition, all PhD candidates will submit an individual self-reflection log that documents their learning process. This will be assessed by the same evaluation committee. The log should be approximately 2500 words.

All components are graded with «passed/not passed».

The requirement for «passed» corresponds to the grade B. The course is approved if all two elements are passed.

Reading list

Sustainable development and innovation

Leach, M., Rockström, J., Raskin, P., Scoones, I., Stirling, A. C., Smith, A., . . . Olsson, P. (2012). Transforming innovation for sustainability. *Ecology and Society, 17*(2). doi: 10.5751/ES-04933-170211

van den Bergh, J. C. J. M., van Leeuwen, E. S., Oosterhuis, F. H., Rietveld, P., & Verhoef, E. T. (2007). Social learning by doing in sustainable transport innovations: Ex-post analysis of common factors behind successes and failures. *Research Policy, 36*(2), 247-259. doi: https://doi.org/10.1016/j.respol.2006.11.001

Systems thinking and participatory systems mapping

Allender, S., Owen, B., Kuhlberg, J., Lowe, J., Nagorcka-Smith, P., Whelan, J., & Bell, C. (2015). A community based systems diagram of obesity causes. *PLOS ONE*, 10(7), e0129683. doi: 10.1371/journal.pone.0129683

Hovmand, P. S., Andersen, D. F., Rouwette, E. A. J. A., Richardson, G. P., Rux, K., & Calhoun, A. (2012). Group model-building 'Scripts' as a collaborative planning tool. *Systems Research and Behavioral Science*, 29(2), 179-193. doi: 10.1002/sres.2105

Videira N., Antunes P., Santos R. (2017) Engaging Stakeholders in Environmental and Sustainability Decisions with Participatory System Dynamics Modeling. In: Gray S., Paolisso M., Jordan R., Gray S. (eds) Environmental Modeling with Stakeholders. Springer, Cham

Creative problem solving

Brown, Tim (2009). Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation.

Ness, I. J., & Søreide, G. E. (2014). The Room of Opportunity: Understanding phases of creative knowledge processes in innovation. *Journal of Workplace Learning, 26*(8), 545-560. doi:http://dx.doi.org/10.1108/JWL-10-2013-0077

Ness, I. J., & Riese, H. (2015). Openness, curiosity and respect: Underlying conditions for developing innovative knowledge and ideas between disciplines. *Learning, Culture and Social Interaction,* 6(September 2015), 29-39. doi:http://dx.doi.org/10.1016/j.lcsi.2015.03.001

Ness, I. J. (2017). Polyphonic Orchestration: Understanding how leaders facilitate creative knowledge processes in interdisciplinary groups working with innovation. *European Journal of Innovation Management.*

Sawyer, R. K., & DeZutter, S. (2009). Distributed creativity: *How collective creations emerge from collaboration. Psychology of Aesthetics, Creativity, and the Arts*, 3(2), 81-92.

From problem solving to business models

Boons, F., & Lüdeke-Freund, F. (2013). Business models for sustainable innovation: state-of-the-art and steps towards a research agenda. *Journal of Cleaner Production*, 45, 9-19. doi: https://doi.org/10.1016/j.jclepro.2012.07.007