

## **Authors**

Dr Oscar van Vliet, D-USYS, Climate Policy

Dr Urs Brändle, D-USYS, Educational Developer

## **A model for modeling**

Our teaching project aims to build a more coherent curriculum for modeling. We help rationalize learning objectives for modeling between courses, and follow student skills' development with a novel concept inventory.

We are interviewing lecturers and students to create an evidence-based modeling curriculum for environmental sciences students at ETH. To monitor our progress we are building and testing a modeling competence inventory (MCI) to track students' progress.

Modelling is a technique used in almost every field of natural science and many fields in social science, and our students' academic and professional work requires that they understand models even if they do not use them. Modelling uses multiple skills, including epistemology, programming, mathematics, domain knowledge, and common sense. Teaching this requires a curriculum-wide plan, and coordination between many lecturers and professors.

Knowing which of students' skills need improvement, and when, requires a systematic assessment of students' modeling competencies. Competence inventories use a combination of true and plausible false answers (distractors) to tease out gaps in students understanding. Competence inventories have been developed for several practical scientific activities but not yet for abstract activities like modeling. We describe our efforts using crowd-sourced misconceptions, and present the MCI that we have developed for field-testing.

The interviews with lecturers and professors, and subsequent discussion in a workshop, have already pointed to aspects of the environmental sciences bachelor programme that can be improved. After introducing the MCI to a large body of students, we will use the results from the MCI to better integrate the courses that teach modeling into a coherent curriculum, reduce unneeded repetition and increasing time spent on skills that need more development for practical use.