

Education for a new generation of scientific researchers

Mieke Boon, Kishore Sivakumar, Luuk Buunk, Gianluca Ambrosi, Leon van der Neut, Angelique Assink

Societal vision

- Our world needs a generation of scientific researchers who understand the complex challenges of our time and are able to create responsible solutions toward a future worth wanting.

Societal mission

- Excellent education for future scientific researchers who have responsible solutions for complex societal problems.



Scientific Research

in professional contexts is the creation of knowledge and understanding about the specific (complex) problem at hand. The research is usually interdisciplinary (IDR) and transdisciplinary (TDR). Academically trained professionals conduct research by using science: its knowledge, methods and thinking strategies.

Vision on educational innovation UT

- Graduates step into a world with complex issues that require trans- and interdisciplinary research.
- Therefore, academic education should train students to conduct scientific research within professional roles.
- Educational paths for excellent students only, should be available to all students.
- Therefore, we need educational innovations aimed at excellent education.

Mission in educational innovation UT

- Excellent PjBL (TOM) and CBL(or CBR/L) education needs effective and evidence-based scaffolding to advance students' personal, professional and academic skills in mono-, inter-, and transdisciplinary research projects.

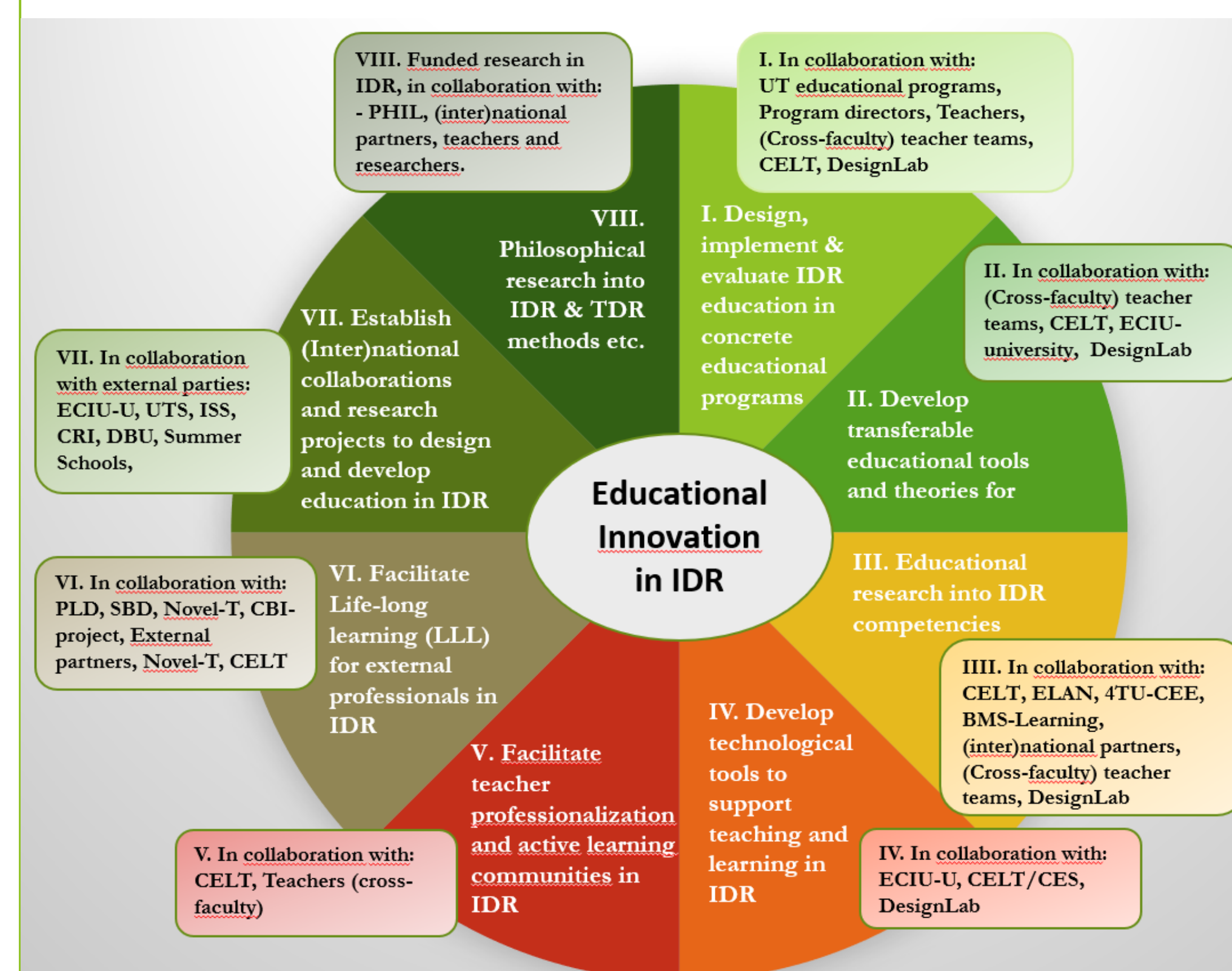
Minor educational objective

Development of a cross-faculty 30 ECTS CBL minor aimed at learning to conduct trans- and interdisciplinary research in complex societal challenges.

Developing the CBR/L minor: *Intelligence, Creativity, and Responsible Technological Innovation in Societal Transformations (ICR&TIST)*

Phases in this project towards ICR&TIST minor:

- Meetings with vice-deans, education directors, teachers, CELT, SBD, colleagues in philosophy, etc. to share, develop, discuss the educational vision, and create support.
- Developing the vision and writing a plan for this CBL minor.
- Aligning with *UT Shaping 2030* (including CBL).
- Attracting teachers and creating a team of 12 teachers.
- Writing ECIU-University funding proposals for 7 micro-modules (1 EC each), and the development of the minor (total 85.000 euros). Awarded in Dec 2021.
- A winning Comenius Senior project to develop scaffolding of transdisciplinary research (100.000 euros), together with KlaasJan Visscher, Deger Ozkaramanli and Cristina Zaga.
- Request for support (0.2 fte) CELT: Angelique Assink, (project manager), Luuk Buunk (advisor CBL) and 3 teaching assistants.
- Developing 7 micro-modules with a team of 10 teachers and CELT: 4 working days and individual coaching of each teacher.
- Submission of proposal to VAC, approved minor in May 2022.
- Recruitment of students for the minor.
- Developing the minor program: Learning objectives; Program for students' learning journey; Assessment plan; Roster; Rooms; Planning with teachers; etc.
- Attracting challenge-providers.

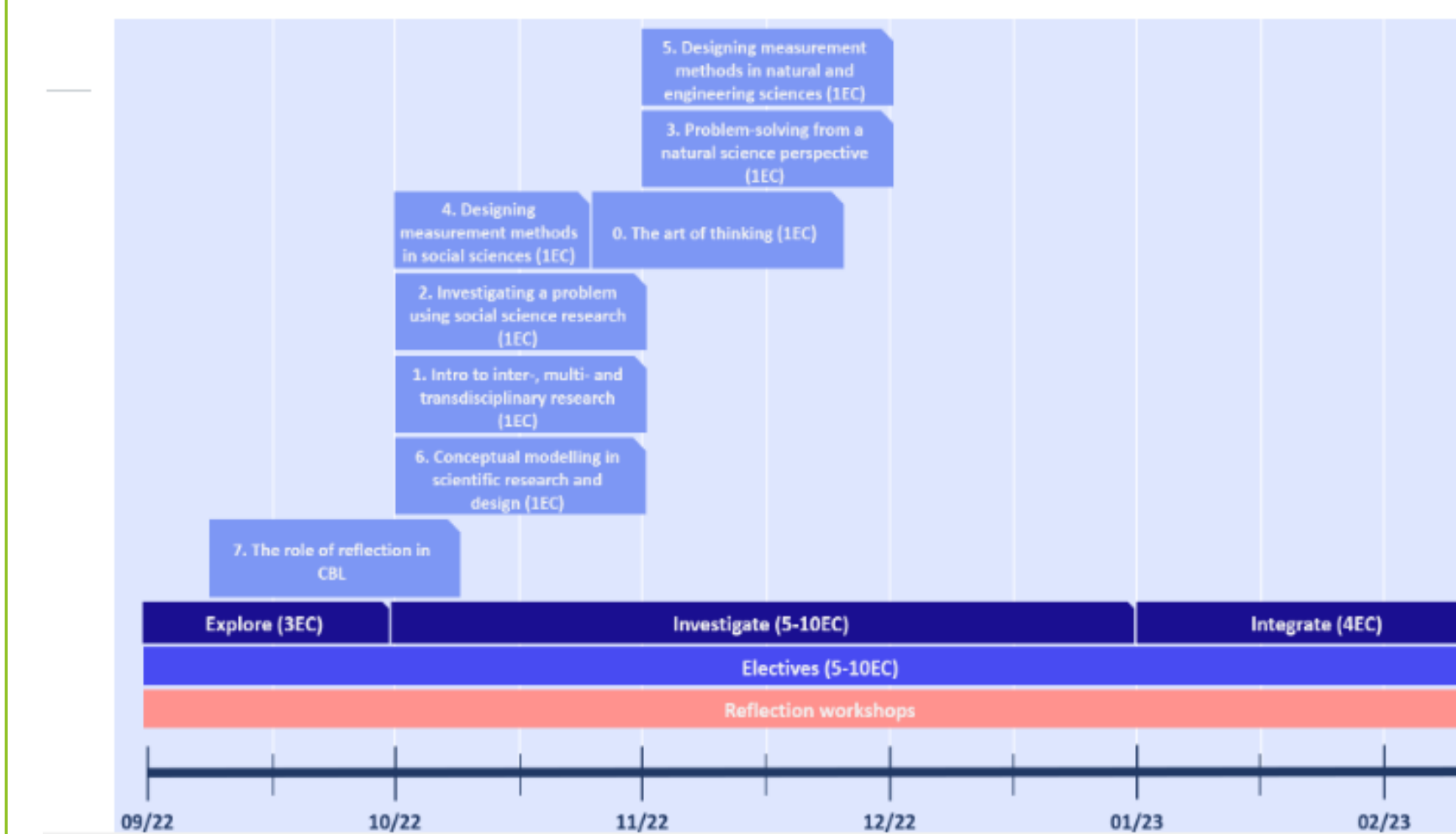


Welcome

Welcome to one of the most innovative real-world learning programs in the world ICR&TIST. This minor is designed to help you find your way in inter-transdisciplinary research paradigms and prepare you with future proof research skills to excel in science and technology-oriented careers.

Intelligence, Creativity, Critical thinking, and innovation are highly valued and nurtured through this program. We encourage you to question and explore your interests in this highly empowering learning environment. The goal of the HTHT-minor is to illuminate specific societal challenges for which the UT develops High Tech Human Touch solutions. You will create these solutions by conducting high-quality research in a multidisciplinary environment which will shape your mindset as a student and professional. You will be exposed to diverse ways of teaching and learning. In addition to courses and workshops, you will have the opportunity to learn how to tackle real-world complex socio-technological issues by doing projects with companies, and to interact with researchers, experts, and various stakeholders on pressing transdisciplinary research topics.

The Minor adopts a Challenge-Based Research and Learning (CBRL) approach meaning you will be engaged in research and learning while contributing to solving real-world challenges. In this Minor, you will engage in a CBRL collaborative project characterized by three phases (Explore, Investigate, and Integrate) along with eight micromodules, one or two electives at the UT, and Reflection workshops as mandatory academic activities.



ICR&TIST CBR/L minor

8 ECTS micromodules, 4 workshops, 4 hours each

- MM0. The art of thinking
- MM1. Introduction to inter-, multi-, transdisciplinary research
- MM2. Research methods in the social sciences - Problem-solving from a social science perspective
- MM3. Research methods in the natural and engineering sciences - Problem-solving from a natural and engineering science perspective
- MM4. Designing measurement methods in the social sciences
- MM5. Designing measurement methods in the natural sciences
- MM6. Conceptual modeling in Scientific Research and Design
- MM7. The role of reflection in CBL

2 ECTS workshops to support learning and conduct CBL project: Socializing activities, teamwork, project-management, academic advising and personal development plan, stakeholder analysis, theatrical technology assessment, frame creation

5 or 10 ECTS Electives/Capita Selecta on topic of challenge
2 ECTS Personal development plan (PDP) and report (PDR)
8-13 ECTS CBL project

CBR/L minor: Intelligence, Creativity, and Responsible Technological Innovation in Societal Transformations (ICR&TIST)

- Starting date pilot: 5 September 2022
- 11 Students, 9 Micro-module teachers, 1 module coordinator and 1 project-leader
- Challenge: The energy transition
- 2 Challenge providers: Regie-organ energieovergang Twente (RES) & Sustainability officer Gemeente Enschede.
- 3 Educational Researchers (including CELT)
- 30 ECTS program
- Three Phases (20 weeks): 1. ANALYZE & INVESTIGATE, 2. INTEGRATE & EVALUATE, 3. EXPLORE & ENGAGE
- Educational Research

ICR&TIST pilot: main findings

Our overarching goal is to develop effective scaffolding of students' research thinking skills in the CBL context. The enthusiastic cross-faculty team of teachers and CELT colleagues has jointly developed a package of eight micro-modules that target different aspects of research thinking skills in several educational design meetings. The pilot shows that these micromodule clearly support students in developing the targeted skills and allows us to see how these micro-modules can be further fine-tuned, aligned, and be actively exercised in the students' research projects. In the next round, we will drop the elective courses (10 ECTS) because they are organizationally cumbersome and, moreover, disrupt contact hours and social cohesion of our learning-community. The hours released can be used to explore a subject in depth, or for empirical or ethnographic research in the field. We also found that peer-learning is very effective but needs to be actively scaffolded throughout the process. The social environment amongst teachers and students was highly appreciated and appears to be an important factor in motivating students (and teachers) to get the best out of themselves. In future, we want to keep-up this spirit, which will be challenging with larger number of students. We are currently conducting educational research with the data obtained from the pilot to deepen our understanding of the intended learning objectives and their scaffolding. Also, we are having inspiring design meetings of the team to evaluate the pilot and further develop this CBL education for the next round.