

MEETING CHALLENGES WITH CHALLENGE-BASED LEARNING A CDIO-CONTEXT

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OVERVIEW OF WORKSHOP

In this workshop we want to explore and discuss challenge-based learning (CBL) as a pedagogical method, more specific, how it can strengthen teachers and our university educations in accordance with the CDIO framework.

To equip our engineering students with skills and abilities to become “engineers that can engineer” (Crawley et al., 2011), they need authentic learning situations. In cooperation with actors from industry and businesses they can meet and learn of real challenges, i.e. situations they are expected to handle in their coming working life. Applying CBL within courses and programmes is one way to meet these needs.

To apply challenge-based learning in education is however a challenge in itself. For example, to support teachers with competence and confidence to shoulder the facilitator-role, to find efficient and effective forms of collaboration with industry and businesses, and to assess students working in teams in valid and reliable way.

The workshop will be performed in accordance with a challenge-based learning approach, i.e. exploring authentic challenges with CBL at universities, moderated by workshop facilitators. Initial, an educational development and research initiative (UPGRADE) will be presented, which is a collaboration between three universities in Sweden.

KEYWORDS

Challenge-based learning, CBL, Experiential learning, Standards: 1, 5, 7, 8, 10 & 11

DURATION

The workshop will last for 120 minutes.

ACTIVITIES

- Introduction of the workshop, CBL and the development and research initiative (10 min)
- Presentation of the workshop-design, i.e. how we will explore and learn together through a challenge-based learning approach, including facilitation (10 min)
- Workshop initiation and creation of CBL-groups, starting with a short presentation of the participants within each group (10 min)
- Exploration through a process of different steps according to an overall CBL-approach (60 min)
 - Agreement on the working approach
 - What is the challenge/s? Different perspectives
 - What do we know and what do we need to know?
 - How do we find information?
 - What solutions can be found and how create impact?
 - How present our findings?

The workshop organizers will interact with the groups during the process, in the roles of facilitators and challenge providers.

- Presentation and discussion of findings (20 min)
- Summary, what to do next, and closure of the workshop (10 min)

The workshop includes a coffee break.

TARGET AUDIENCE

Target audience is teachers, course and program coordinators, and industry representatives, with interest of CBL and related experiential educational methods.

OUTCOMES

The participants will learn about 1) CBL as a relevant concept in the CDIO framework, 2) challenges to make CBL work in practice, and 3) ideas and concrete measures to meet these challenges.

SPECIAL REQUIREMENTS

N/A

BIOGRAPHICAL INFORMATION

Fredrik Backlund is associated professor in quality engineering at Luleå University of Technology. Project and process management is his main interests in teaching and research. Currently he is an educational developer at the Centre for Educational Development, giving courses in problem-based and project-oriented learning, course design and program development. Fredrik teach at both bachelor, master and doctoral level, as well for the college, and various forms of commissioned education and MOOCs.

Jeanette Engzell is a lecturer in industrial organization at Linköping University. Jeanette's research is about entrepreneurship in already established companies, i.e. intrapreneurship. Her thesis is about which factors in a business environment promote and hinder initiation of new products and services. Current research focuses on entrepreneurial behavior in the academic environment, e.g. initiating new research centers. Another area of interest is entrepreneurial ecosystems in the pursuit of circular solutions. Jeanette has a great passion for teaching and actively drives the development of project management and entrepreneurship courses at Linköping University.

Svante Gunnarsson is professor of control technology at the Department of Automation at Linköping University. Svante's research interests include modeling, identification, control and diagnosis of industrial robots. The research activities are connected to among others other VINNOVA competence center LINK-SIC. He is a representative for Linköping University within the international network "The CDIO Initiative" for the development of engineering courses.

Erik Hulthén is associate professor in product development at the Department of Industrial and Materials Science at Chalmers University of Technology. Current research focuses on tools to integrate environmental impact in simulations and optimization in the rock materials industry. Hulthén is program manager for both the civil engineering program and university engineering program in mechanical engineering, where he also teaches product development. Hulthén actively drives the development of both programs and courses in order to become more modern and better address the needs of industry and society at the same time as it benefits the individual student.

Malin Kjellberg is a lecturer at engineering education science at Chalmers University of Technology. Malin has many years of experience in running large multidisciplinary design-build-test courses at Chalmers. With a background at Koenigsegg where a small team designed, built and sold super sports cars, during the years at Chalmers, Malin has switched focus from student projects to the teacher's perspective within project- and challenge-based learning. Malin provides a course for teachers in project-based teaching and also teaches at the high school teacher program in project management and leadership through challenge-based learning projects.

Cia Lundvall is a trained high school teacher and ICT-educator with main employment at Almi East Sweden AB, a subsidiary of Almi Företagspartner i Östergötland AB. She is also active at Linköping University as a teamcher (organizer and facilitator) in it a cross-disciplinary project course (ingenious). Cia has many years of teaching experience and passion for developing teaching in order to activate and engage students and promote inclusion. Furthermore, she works to promote innovation and sustainable thinking among companies in Östergötland and helping companies to approach the academy.

Johan Malmqvist is professor of product development at the Department of Industrial and Materials Science at Chalmers University of Technology. His research deals with development methodology and IT-support for the product development process (PLM). Current research

focuses on methods and tools for the development of product-based services, for product configuration and for strategic development of PLM-solutions. A second area of interest is engineering education. Malmqvist was one of the founders of and is active in the international CDIO Initiative. The engineering education model developed by the CDIO-initiative is used by a large number of universities worldwide.

Charlotte Norrman is senior associated professor of industrial organization at Linköping University. Her research focuses on innovation and early-stage entrepreneurship development in smaller companies, innovation system and policy for innovation and entrepreneurship in various industries. Charlotte is also passionate about educational development, has a solid teaching experience, not least of methods such as challenge-driven learning. She also works with questions about how higher education, research and business can work together to strengthen the regional innovation system, create new companies and contribute to lifelong learning.

Marcus Strömbäck Hjärne is educational developer at Luleå University of Technology. He is a strategic advisor in educational matters and develop university-wide course for colleagues. Marcus develops methods for digital assessment in higher education in Sweden. Among other things, he has researched the university entrance examination as a selection instrument for broader recruitment through adaptations and increased inclusion.

Christian Stöhr is associate professor at engineering education science at Chalmers University of Technology. He conducts research on both formal and informal aspects of learning, especially technology-enhanced learning, lifelong learning and science communication. Part of his present research focuses on studying Massive Open Online Courses (MOOCs), their pedagogy, impact and relationship to society, distance learning and models for flipped and blended learning.

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