O-CDIO

HOW TO BUILD INTERDISCIPLINARY ENGINEERING EDUCATION?
Building universities is fun..

.. and meaningful as well.

**VILLE TAAJAMAA: CV**

Paper & printing engineer 2003 (TKK)

Entrepreneur 2004 (->)

Aalto Design Factory 2008 (->)

Aalto-Tongji Shanghai Design Factory 2010

University of Turku – reform 2011 - >

Fudan University 2013 - >

Fulbright Grantee 2014
Observe + CDIO = O-CDIO

O = *human centered* approach, need finding, design thinking *methods* and *practices*
Conceive

Design

Operate

Implement
ARGUMENT

Adding human centered practices to the engineering curriculum and learning methods in both BSc and MSc phases helps to create better engineers.
Strategic Thematic Profiles
- Prof. Tapio Salakoski
- Dr. Jouni Smed
- Dr. Seppo Virtanen
- Dr. Tomi Westerlund
- Prof. Aulis Tuominen
- Ville Taajamaa

IT Core Competencies
- Prof. Hannu Tenhunen
- Prof. Jouni Isoaho
- Prof. Ville Leppänen
- Ville Taajamaa

CDIO
- Dr. Mikko Laakso
- Dr. Risto Punkkinen
- Dr. Juha Plosila
- Antero Järvi
- Ville Taajamaa
- Matti Vähä-Heikkilä, student

Work-life readiness
- Prof. Jouni Isoaho
- Dr. Mikko Laakso
- Dr. Arho Suominen
- Petri Sainio
- Johanna Isoaho
- Ville Taajamaa
- Student

Study Plan
- Dr. Seppo Virtanen
- Dr. Pasi Liljeberg
- Päivi Rastas
- Dr. Jouni Smed
- Dr. Esa Tjukanoff
- Ville Taajamaa
- Marlo Ekberg, student
No major revisions needed in technical competence

Need for improved preparedness for working life

Desire for more hands-on learning
PROTOTYPES
INTRODUCTION TO ENGINEERING
The fourth week: Capstone Bootcamp in Seili island

The Capstone Bootcamp was orchestrated by the teaching team: Coach Ville Taajamaa, Alexa Guo and Kun Yang. It was noteworthy that the teaching team was able to adjust and re-schedule the programs according to the daily learning outcomes achieved by the students. In addition, the arrival of Mr. Timo Vasankari (the manager for Capstone projects) and Markus Vuorio (the Finnish student of the dual degree program) and their participation in students’ final presentations on Capstone Project Designing were of great significance in recognizing students’ efforts and work. As a teacher, Timo provided very constructive comments in terms of students’ presentations and their learning progress. As a project manager, he made students a commitment to arrange good capstone projects in the coming semester. Meanwhile, Markus shared his experience of doing presentations, learning and working as a classmate as well as an entrepreneur.
RAPID PROTOTYPING
PROJECT MANAGEMENT
Have we learned anything?

... sure, the more senior the more O-based it can be.
First Evolution of the Introduction to Engineering course - Case Study from the University of Turku

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ABSTRACT
Engineering education in the Department of Information Technology at the University of Turku is an ongoing process, focused on developing an engineering education program that will attract and retain students. The course in this context is an important part of the education process. The purpose of the course is to introduce engineering education to students interested in the field. The course covers a range of topics, from the history of engineering education to current trends in the field. The course is designed to be a practical and hands-on experience, with opportunities for students to learn and apply engineering concepts and skills. The course is taught by experienced faculty members with expertise in engineering education. The course is also supported by a well-equipped laboratory and access to state-of-the-art facilities. The course aims to provide students with a solid foundation in engineering education and prepare them for a successful career in the field.

Commencing Studies with a Project

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Abstract
Project-based learning was on the rise from 2009 to 2012 in a group of universities, according to a study published in 2016. The study found that the number of undergraduate students participating in project-based learning increased by 51% over the period from 2009 to 2012. This rise in project-based learning was attributed to the changing educational landscape, as universities sought to better prepare students for the workforce. Project-based learning is a teaching method that involves students working on projects that are designed to solve real-world problems. The learning experience is designed to be collaborative, with students working in teams to complete the project. The projects are often interdisciplinary, incorporating knowledge and skills from multiple fields.

Introduction to Engineering - Course [1] was one of the new courses created in the engineering education reform in the University of Turku, Finland. The course focuses both on a curriculum development as well as on improving teaching and learning methods [2][3][4]. We have developed a course that focuses on the development of engineering education, with a special emphasis on the role of project-based learning. The course is designed to be a practical and hands-on experience, with opportunities for students to learn and apply engineering concepts and skills. The course is taught by experienced faculty members with expertise in engineering education. The course is also supported by a well-equipped laboratory and access to state-of-the-art facilities. The course aims to provide students with a solid foundation in engineering education and prepare them for a successful career in the field.

Conference Key Areas: Industry and engineering education. New learning concepts for engineering education. Student as key actor in change process of engineering education.

Keywords: Engineering Education, Project-based learning, Interdisciplinary learning

1 INTRODUCTION

This paper presents the planning process, structure and first results of an international and interdisciplinary master's level Capstone -project course carried out in collaboration with University of Turku, Finland (UTU), Linköping University (EUPE) and Halmstad University (HUMA). The project course is designed to provide students with an opportunity to apply their knowledge and skills to a real-world project, as well as to develop their professional and personal skills. The project course is also designed to foster collaboration and teamwork among students from different universities. The project course is taught by experienced faculty members with expertise in engineering education. The course is also supported by a well-equipped laboratory and access to state-of-the-art facilities. The course aims to provide students with a solid foundation in engineering education and prepare them for a successful career in the field.
FRAMEWORK

**Epistemology**: Social constructionism

**Mixed methods / triangulation**

**Data**: semi-structured theme interviews, questionnaires, observation,

**Data points**: UTU, AALTO, FDU, ME310, MIT-SUTD

**Underlying question**: how to make better engineering education happen – courses act as test points
FINDINGS –

VERY PRELIMINARY..
5 levels of commitment

1) Society level policy making (EU, US, CHINA)
2) University level leadership
3) Faculty and department level leadership – CRITICAL
4) Teacher – student interaction
5) The student – seems to be very against active learning methods in the beginning and then appreciating them afterwards
One last point..
TEACHING METHODS

“I expect you all to be independent, innovative, critical thinkers who will do exactly as I say!”
APPROACH

Teaching methods:
Active learning
ProblemBL,
ChallengeBL
DesignThinkingBL,
PassionBL,
ProOrienProbBL,
Learning-by-doing,
Hands-on-learning,
And so on…
IT ALL BOILS DOWN TO...

reality and knowledge creation is a socially constructed continuous process – everything was invented even before Hippies [50’s & 60’s]
.. or you can just call it **Socratic / Confucian approach.**

Much before hippies. [2400-2500 years old teaching method]
Engineering teaching – status quo
Engineering learning enhancement– where we need to be
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