BEST PRACTICE 2019

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“Thinking by doing”: making as a vital part of engineering education

The engineer of the 21st century is expected to possess a broad range of skills and abilities. Besides more traditional technical knowledge and engineering skills, interpersonal skills, critical thinking, creativity and design makes its way into the curriculum of our engineering education. At the department of mechanical engineering, the underlying pedagogical approach to teaching engineering design is based on constructivism. Research has shown that a very good way for students to “construct” their knowledge is to design, build and publicly share artifacts. Consequently, we are aiming to make design and prototyping an integral part of our engineering education. This align well with the CDIO initiative of which BTH is part since 2013.

In practice this is done in project form in a problem-based setting. Empowered by previously acquired knowledge and skills as well as our engineering workspaces and laboratories that supports and encourages hands-on learning, students tackle open-ended design-build-test (DBT) projects. These DBT projects are introduced already in the introductory course and reoccur with increasing difficulty and span in ordinary courses and cornerstone projects finishing with the final year capstone project, promoting a progress in design abilities.

One example of this is the machine elements course taught to second year mechanical engineering students. This course has traditionally emphasized on analysis and the student’s ability to model and assess behavior of commonly used machine elements. In recent years a DBT-project more focused on machine design has been introduced in the course. This type of projects plays a key role as it augment the student’s theoretical knowledge by linking theory covered in the traditional class room setting and practical real-world design problems. Furthermore, engineering students learns to produce technically (in the best of worlds also economically) feasible concepts and solutions. In this setting, the physical prototype becomes an aid of thought enabling adjustment of potentially erroneous parts of the student’s mental models. Not the least it also helps the students understand the iterative nature of design.

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