Foundations for a new type of design-engineers – experiences from DTU meeting the CDIO concept - DTU Orbit (10/08/2019)

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Since 2002 a new design-engineering education has been in operation at the Technical University of Denmark. It fulfils the requirements in the CDIO concept but builds in addition on a change in what is considered core disciplines in engineering. Three fields of knowledge are represented almost equally in the curriculum: natural and technical sciences, design synthesis and socio-technical analysis, which adds to the dominant focus in engineering on natural and technical sciences. Combined with the integration and coordination of disciplines, a series of projects providing a progression of challenges to the students learning, and a focus on the outcomes of the learning processes of competences needed in design engineering, the curriculum represents a radical innovation in engineering curriculum. The paper describe the foundational elements of this educational program and present an assessment of the key factors that has made this program attract new groups of students to engineering including an almost equal recruitment of male and female students. In outcome and performance terms the educational program at the same time has delivered a quite efficient study environment for students. Since 2007 graduates have finished every year and an evaluation of the education based on the graduates and their employers experiences supports the visions build into the curriculum and adds important components to what might be needed to carry out reforms in engineering education. The paper presents a critical comparison of the CDIO basic standards and principles with the learning content and experiences from the design-education at DTU and raise three questions to whether the advice provided by the CDIO syllabus satisfies the stated principles. The critique points to the following: (a) conceiving not being taken serious in the CDIO syllabus, (b) a too narrow view of engineering knowledge ignoring socio-technical insights, (c) the importance of engineering practices and competences in creating authentic assignments, (d) to reverse the hierarchy of topics and disciplines, and (e) a need for mechanisms to coordinate curriculum and cross-disciplinary cooperation. The creation of successful reforms in engineering education does not alone result from introducing project or problem based learning in the classroom. There is a need to focus on the objectives and disciplinary support for project assignments understanding the scattered character of technical disciplines. There is also a need for introducing measures that support teams building and continued cooperation among teachers to overcome the isolation.

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