Exploring the dual nature of engineering education

Opportunities and challenges in integrating the academic and professional aspects in the curriculum

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Abstract

Engineering education is both academic, emphasising theory in a range of subjects, and professional, preparing students for engineering practice. Ideally, these aspects are also in a meaningful relationship in the curriculum, but the dual nature ideal is simultaneously a source of tensions. This theme is explored in the context of engineering education development, represented by the CDIO (Conceive, Design, Implement, Operate) approach. Cases on programme and course level illustrate how the dual nature ideal is pursued in the integrated curriculum. CDIO is also compared with PBL (problem/project-based learning), and opportunities to further emphasise research in the CDIO community are explored.

Two critical accounts suggest widening the perspective from curriculum development per se, to the organisational conditions. First, the views of Carl Richard Söderberg (1895-1979) are compared with CDIO, showing considerable similarities in ideals, arguments, and strategies. This leads to a critique of the swinging pendulum metaphor. Then, experiences of unsustainable change leads to a model called organisational gravity, explaining the stability of programmes and implying two change strategies, with different availability, risks, resource demands, and sustainability of results.

Refuting a rationalist view on organisation, an institutional logics perspective is used to analyse the tensions within engineering education. It is suggested that the logics of the academic profession dominates over the logics of the engineering profession, hence favouring “teaching theory” over “teaching professionals”. The integrated curriculum strategy is contingent on educators’ ability to unite theoretical and professional aspects in courses, and on the collegial capacity for coordination. Finally, the CDIO initiative is conceptualised as a field-level driver of institutional innovation, identifying some strategies for legitimacy.

Key Words

engineering education, professional education, dual nature, engineering education development, CDIO Initiative, CDIO approach, CDIO Standards, PBL, engineering education research, Carl Richard Söderberg, organisational gravity, institutional logics