

## NEW TRENDS IN ENGINEERING EDUCATION: MEGA PROJECTS AND GLOBALIZATION



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There is a need for new engineering competences within green innovation. During the 1990s, lifelong learning and new competencies such as project management were identified as new requirements for higher education. During the same period, employability was on the agenda—the graduates and universities had to be more directed towards the labour market, and increased co-operation with industry was emphasised. Recently, a triple helix approach has formed the strategy for innovation based on close collaboration among government, businesses and higher education. This approach slowly saturates the development of higher education in general and engineering education in particular. The Europe 2020 strategy including the seven flagships witnesses an overall European strategy for closer collaboration among all of the stakeholders and especially for the development of sustainable innovation (Europe 2020). Also the Bologna Process in Europe stresses in particular that the important objective for engineering education is to improve graduates' competences in innovation and entrepreneurship. Furthermore, there is a clear aim for more student-centred learning, and the global trend towards formulating learning outcomes also points in this direction (Leuven Communiqué, 2009).

Innovation is not based on individual knowledge, but on collaborative knowledge and based on global knowledge sharing and networks. With the rapid change of technology, boundaries of professions have become progressively more difficult to identify. Problems are becoming increasingly ill-

defined and complex, involving a growth of various issues like culture, sustainability and society. In this circumstance, knowledge is progressively regarded to be complex, interdisciplinary, uncertain, and collaborative.

Also the approach to learning has changed. Learning is not only knowledge acquisition or participation in a social community; it is also about knowledge creation. To look at learning as a creation process provides a new way of thinking about the genesis of new knowledge as well as providing an approach for examining learning in terms of creating social structures and collaborative processes that support knowledge advancement and innovation.

Problem-Based and Project-Based Learning (PBL) is one of the innovative learning methods that higher education all over the world has implemented and PBL can be regarded as higher engineering education's response strategy to requirements from society. Especially in technology and science, research has shown that PBL has turned out to be an efficient method for students to achieve new types of process skills (such as collaboration, project management, innovation, creativity, and communication), and increase students' motivation for learning, entrepreneurship, and collaboration with society and regional development.

However, PBL is not just one model or practice. The first generation of PBL are the start of PBL universities in the late 1960s and early 1970s, research on the PBL-practice has shown that the PBL models have developed incredibly since the traditional Danish PBL-models and Maastricht and McMaster models in medicine. A second generation of mixed models have also been developed according to cultural diversity and subject areas.

From the requirements of globalisation, we are now approaching a third generation of PBL based on global collaboration among countries and changes in higher education in emerging economies. The third generation of PBL is therefore based on close cooperation between higher education and the region it is located in, the use of new ICT tools, international and intercultural collaboration, and the use of new business models.

This presentation will address the needs for new competences and the trends in engineering education going from a first generation of PBL towards interdisciplinary and global green innovation projects.