

Engineering Education: Beyond Technical Skills

Successful engineering professionals depend on basic engineering knowledge, skills and abilities, such as: a profound knowledge of mathematics, physics and technology, in order to identify, model and solve engineering problems. This requires the application of systematic working methods to design systems, components and processes, considering economic, environmental, social and human dimensions, together with the usual technical related issues; and an overall understanding of the advanced technological resources from their specific fields of dedication. However these basic engineering skills are not the only key to professional development, particularly as engineering problems are becoming more and more complex and multifaceted, hence requiring the implementation of larger multidisciplinary teams, in many cases working in an international context and in a continuously evolving environment. Therefore other outcomes or competencies (sometimes called “soft” skills, although professional or transversal is more adequate) are also necessary for our students, as most universities are already aware.

Among these competencies, some play a special role, including: the ability to work in multidisciplinary teams, the capability of efficient (oral and written) communication, life-long learning, creative thinking, the acquisition of ethical principles and the capability of applying them in a changing world. The acquisition of such professional competencies has traditionally been linked to project-based learning activities and to the involvement of students in their final degree theses or projects or even considered a minor subject linked to students’ first job and initial years in the industrial world. Nevertheless, in a competitive industry and with the increase of engineering universities and degrees, providing students with both basic engineering knowledge and professional competencies is nowadays essential.

Integrating professional competencies into the curriculum, in a more controlled and adequate way, is a complex task with some uncertainties not yet solved, mainly linked to pedagogical difficulties when facing how to teach these extra subjective matters. There is a need to find a balance between teaching technical and professional skills. Therefore, it is important to methodically analyze the difficulties and challenges linked to the progressive incorporation of professional skills into engineering curricula, from the detection of teaching needs, to the final assessment of the actuaciones tackled, so as to promote their advantages, reinforce some lacking aspects and limit the possible negative effects.

This Special Issue on Engineering Education: Beyond Technical Skills aims to present and promote exchange of ideas of teaching-learning experiences and focuses in depth on aspects such as: methodologies for promoting professional skills and their incorporation into the curriculum, integral actuaciones linked to complete program implementation, case studies linked to the promotion of specific professional skills, assessment of generic professional competencies, comparative performance of graduates from programs with and without special focuses on these outcomes, future directions and proposals for improvement.

This Special Issue is divided into two main parts, due to the outstanding response and the number of papers finally accepted. The first one (November-December 2014 issue) includes 22 remarkable studies linked to Engineering education beyond technical skills: Lessons learned, good practices and assessment methods, and the second one (January-February 2014 issue) with 27 papers describing Engineering education beyond technical skills: Case studies linked to the promotion of specific technical skills in the fields of: aeronautics, architecture, biomedical engineering, civil engineering, energy, materials science, mechanical engineering & manufacturing and information and communication technologies. The 49 papers have been selected, after a comprehensive peer-review process, from more than 100 received extended abstracts detailing teaching-learning experiences from 27 countries and 52 universities, this highlights the relevance and universality of the topics covered.

Personally, we are truly grateful to authors for their support to this Special Issue and for their patience during the review processes which was extended due to the number of submissions received. We have also enlisted the help of an international team of reviewers covering several engineering disciplines and we are grateful indeed for their assistance. We truly hope that final results will be according to authors’ expectations and, of course, of interest for the readers of the International Journal of Engineering Education. Finally, we would also like to acknowledge the support and continued confidence of the Editor-in-Chief Ahmad

Ibrahim, whose advice with improving proposals have been a source of inspiration, hoping for future collaborations.

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