

The University and the Digital Transformation of Society

What Chemical Engineering Education in 2030?

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Abstract

It has always been a major duty of academics to (try to) think ahead. I take 2030 as an adequate horizon for us to think over, to somehow anticipate the dimension and the challenges of the transformations on our way of life that are under progress, within this so-called *Revolution 4.0*, and accordingly to prepare the (present and the) future of Higher Education (HE). Hence, the topic for my conference: ‘what HE, and specifically what Chemical Engineering Education, should we have by 2030?’. I shall provide some answers to this question by addressing the two closely interrelated main faces of this polyhedron of HE: the *academic substance* and the *learning process*.

So, firstly the *substance*, for ages the heart of the educational process, consisting of programmes that aim at preparing (young) people for the profession. In the (not so distant) past such programmes were essentially thought of and expressed in terms of contents. Today, they are designed with reference to learning outcomes expressed by descriptors of knowledge, skills and competences, compatible with qualifications frameworks recognized by all stakeholders [1], of course that (necessarily) supported in and by core scientific, technical and transversal matters. And, further, they are designed to provide flexible educational paths within a conceptual framework of lifelong learning. With this vision I shall revisit the important recommendations of the European Federation of Chemical Engineering for first and second cycle programmes that were approved in 2010 [2]. These recommendations are organized in learning outcomes for Knowledge and Understanding, Engineering Analysis, Engineering Design, Investigations, Engineering Practice and Transferable Skills, including guidelines both for minimum contents of fundamental subjects for the profession, such as thermodynamics, fluid mechanics transport phenomena, separation techniques or reaction engineering, and for the learning methods.

Then and secondly, we have the *learning process*, indeed the main subject at stake when we speak of the need for urgent reforms in HE. Essentially I shall address the issue of how the *digital transformation of the society* absolutely brings in the need for a *global pedagogical innovation* attitude, requiring and calling for institutional vision and investment and individual participation and commitment, in a transformation that includes several interrelated initiatives, aiming at: (i) strengthening the concept of *Education without walls and without borders*, by consolidating this new concept of *classroom* and of *lecture*, indeed a *don't lecture* concept [3]; (ii) promoting a dual academic offer, *on-campus* and *online*, making wide use of digital platforms in a framework of continuous education; (iii) adopting the existing (and those to come) collaborative tools (e.g. Google Apps and MOOCs), in a process of promoting student emancipation and student centred learning, particularly in terms of self-learning between peers; (iv) adopting (and adapting to) existing (and those to come) tools such as the *digital assistants* or the *chatbots*; (v) adapting the physical space of the Campi to meet the needs of this new learning process. Irrespective of the degree structure, the learning methods must be relevant in promoting that the students develop skills, competences and attitudes, further to those more directly associated to the discipline, that are recognized today as absolutely relevant for the student global education, viz. - : a multidisciplinary sense and vision of the phenomena; critical thinking for both academic and social issues; a social sense of multiculturalism; a vision of sustainability; ethical judgement; team versus independent work; self-study capacity; communications ability.

All in all, we should have no doubts that a sweeping revision of education practices is indeed required, both at institutional and individual (teachers/professors) level, to meet the challenges not only of a true technological disruption that is happening, but mainly of the expectations of young people that are growing up with completely new concepts of learning, communication and socialization through networking, indeed new concepts of life.

References

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- [3] J. M. Ferreira, ‘Don't Lecture’, 17 December 2018, available at <http://bit.ly/IRI20181217>