

Keynote lecture

Workshop on Scientific & Technical Education, Quality Assurance and the Bologna Process

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Technical Education - from London 2007 to Leuven/Louvain-La-Neuve 2009... and beyond

S. Feyo de Azevedo

*^aDepartamento de Engenharia Química, Faculdade de Engenharia, Universidade do Porto, Portugal
Rua Dr. Roberto Frias, S/N 4200-465 Porto, Portugal, sfeyo@fe.up.pt*

1. Summary

Winds of changes have been blowing in the European Higher Education Area (EHEA) over the past years, with visible effects. In these notes and in the lecture I shall identify and examine both some of the 'high pressures sources' that are responsible for such 'winds' and the changes that are occurring. Technical Education, more specifically engineering education, can for sure benefit from the reforms that are being enforced. I shall comment and give my views on changing paradigms of Engineering Education, on some of the main tasks ahead for the building of the European Higher Education Area and on some specific implications in methods and curricula in the engineering area.

Keywords: Bologna Process, qualifications framework, quality assurance; paradigms of engineering education.

2. Extended abstract

The Bologna Process has to be understood as one of the major components of a model for European development, in the historical background of progress in science and technology, of societal and political changes that took place on the last quarter of the 20th Century. The commitment is to develop a competitive economy based on a knowledge society, a model for growth and jobs. This requires increasing mobility and trans-national co-operation. Such can only be based on TRUST, which is only achieved with readable national qualification frameworks and degree systems and with transparent quality assurance systems. The Bologna Process should thus be seen on a dual environment of related, but different, academic and political issues.

A tremendous effort is being made by academia and professional societies to respond to these challenge of reform: (i) the degree system is being harmonised; (ii) a new directive of professional recognition has been approved in close agreement with the

proposed degree system; (iii) the BFUG is committed to promote decisively national qualifications frameworks in the period up to 2009; (iv) the Register for quality assurance has been approved in the London meeting of May 2007; (v) the EUR-ACE quality label was launched in November 2006; (vi) The initiatives of the E4 and of the CDIO groups propose sets of competences related to contents in all engineering areas; (vii) at a lower, specific, level, but serving as example, the European project CHEMEPASS – Chemical Engineering Mobility Tools, in progress, represents a serious effort towards this goal of mutual improved understanding of qualifications; (viii) also, as another example at the same level, in chemical engineering, the WPE-EFCE proposed in 2005 a set of recommendations for a core curriculum, both for first and second cycles

We can question whether we are going through a change of paradigm that should influence the design and offer of new engineering programs. In practical terms, the objective of the exercise is to finally choose (decide) the (appropriate) answers to two main questions: (i) what role and distinction of education at the tertiary stage (University education)? (ii) what should be the structure and the core content of engineering curricula for the different qualifications recognised in the engineering profession (as set in the European Directive for Recognition of Professional Qualifications)? What, what depth, when, how, which teaching aids?

Finally, fuzzy as the shape may still be, we recognize a number of major lines of reference in the changes taking place. Prospectively, for sure that in 2020 such shift will be crystal clear:

- Our individual and local universe is larger and larger.
- Time and space concepts and dimensions have changed dramatically.
- The reference of whatever (quality, competition, etc.) is now Europe and the World, not our City or our Country.
- Standards must be high, inflexibly high, attitude holistic, mind flexible.
- The need is clear for a reference qualifications framework and for international recognition of quality assurance standards and procedures,
- A core group of disciplines, concerning basics and engineering, and of skills and competencies, should be recognized by consensus and implemented.
- A complementary group of elective advanced curricular modules should lead the student to work on frontier topics of engineering.
- External training, more practical ‘hands-on’ training is required for first-degree level. If possible in another Country.
- There must be an understanding that it is essential that Academia and Industry, in the European Space, co-operate offering each other aided-value, by accepting students for training (the Industry), by jointly designing pilot case studies, by providing theoretical background through courses (the Academia).
- Lifelong learning is the key concept to have the edge.

If this is not a paradigm shift, it is at least a serious set of reforming steps of Engineering Education, which will have visible implications in the engineering practice.