

Chapter 3

Adapting Engineering Education to the New Century

A.K. Haghi

University of Guilan, Iran

B. Noroozi

University of Guilan, Iran & University of Cincinnati, USA

ABSTRACT

In this book chapter, the authors summarize their retrospections as engineering educators for more than 20 years. Consideration is given to a number of educational developments to which the authors have contributed during their career in academia and the contribution made to engineering and technological education. Increasing emphasis is being placed on establishing teaching and learning centers at the institutional level with the stated objective of improving the quality of teaching and education. The results of this study provide information for the revision of engineering curricula, the pedagogical training of engineering faculty and the preparation of engineering students for the academic challenges of higher education in the field. The book chapter provides an in-depth review of a range of critical factors liable to have a significant effect and impact on the sustainability of engineering as a discipline. Issues such as learning and teaching methodologies and the effect of E-development; and the importance of communications are discussed.

INTRODUCTION

Ernest Boyer (Boyer, 1990) states that:

“...scholarship means engaging in original research, it also means stepping back from one’s investigation, looking for connections, building

bridges between theory and practice, and communicating one’s knowledge effectively to students”.

Therefore, the scholarship of teaching engineering, seeks to find effective ways to communicate knowledge to students. The realization that traditional instructional methods will not be adequate to equip engineering graduates with the knowledge, skills, and attitudes they will need to

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meet the demands likely to be placed on them in the coming decades, while alternative methods that have been extensively tested offer good prospects of doing so (Rugarcia, et al., 2000).

Engineering is the profession in which knowledge of the mathematical and natural sciences gained by study, experience and practices are applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind. Engineering is a unique profession since it is inherently connected to providing solutions to some expressed demand of society with heavy emphasis on exploiting scientific knowledge. In the real world, engineers must respond to sudden changes. The engineers of today, and in the decades ahead, also must be able to function in a team environment, often international, and be able to relate their technical expertise to societal needs and impacts. Yet we start at making transformative changes in our educational system. Our educational challenge is itself a design challenge—making the “right” engineers for our nation’s future. The basis for the reform of engineering education is made up of unique experiences, traditions and everlasting values of specialist training at universities. Engineering educators have to focus on market demand and stop defending the obsolescent and obsolete programs. In order to prepare engineers to meet these new challenges, engineering training and education must be revised and modernized. Today’s engineer cannot be merely a technician who is able to design the perfect bridge or the sleek skyscraper.

Today’s engineer must not only have a breadth and depth of expertise, but must be able to communicate effectively, provide creative solutions with vision, and adapt to ever-changing demands. Today’s engineer, like any other modern professional, must be someone who can see the big picture

1. INTEGRATING “WHAT” INTO “WHY” IN ENGINEERING EDUCATION

A professional needs to recognize the “why” dimension as well as the “what” in order to provide a wisdom and understanding. Also, for the profession to attract students there needs to be an enhanced community respect for engineering. This can be assisted if we integrate a person-centered and nature-respecting ethic into engineering education (Hinchcliff, 2000).

The urgent need to change the teaching method of the current engineering education system was the reason for which the author launched to a new plan. The new plan envisaged changes in the curriculum to meet the demands of the industry, now facing strong competition as a consequence of the recent technological changes. With this aim, the authors developed the courses considering following issues:

1. **“Why”** not try replacing one quarter of the lectures with an online resource? As part of online resources, lecture-based courses are taught at many institutions using videotaped lectures, live compressed video, television broadcasts or radio broadcasts (CSU, 2004; Forks, 2009; UI, 2004). The student can have an easier time communicating online as opposed to in a full classroom (Purcell-Roberston & Purcell, 2000). In addition, student is at the center of his or her information resources. The content information is not delivered as a lecture for the students to hear but rather as information for the students to use. Students are free to explore and learn through their successes and sometimes failures. Instead of the lecture, students could spend time over a month working through some online materials complete with self-tests, interactions, mini-project or whatever.

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