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# Innovation of engineering education for knowledge society

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## *Abstract*

*Technology has often been cited as the major Profiving force behind innovation in higher education and for educational reform in a variety of contexts. Modern digital technologies such as computers, telecommunications, and networks are reshaping and eventually revolutionizing both our society and our social and educational institutions. A new society, the knowledge society is thus arising, the elements of which co-existing with the constitutive elements of the industrial and postindustrial society. The most obvious aspect of the new society is the speed of use, application and dissemination of the communication and information technologies, which puts in the shade the fact that there occurs a major transformation of concepts, structures and institutions specific to the previous society. Within the technological context, electrical engineers play a significant role. They develop new design, manufacturing processes and products. They advance and manage communication, transportation, health care devices and energy systems. They adProfess the environmental issues and the make technology work. The electrical engineering activities generate a remarkable potential for the private and the public sectors to develop the national wealth and strength. The chairman of the American National Academy of Engineering noted that "the nation the best engineering talent is in possession of the core ingredient of comparative economic and industrial advantage".*

***Key Words :*** *Engineering Education, Innovation Cycle,*

## I. Introduction

We know, we face a growing list of complex societal and environmental problems. We know, we need a more sophisticated engineering workforce to address these and other challenges.We know that expectations for the knowledge and skills that engineering students willl earn as a part of their college education continue to grow.Higher levels of performance in any field—whether engineering, science, architecture, business, or education are chieved by continual innovation motivatedby the desire to solve important problems. Improvements are addressed systematically based on research and proven practices. Thus, innovation depends on a vibrant community of practitioners and researchers working in collaborationto advance the frontiers of knowledge and practice.Engineering education innovation is a cross-disciplinary endeavor involving at least two disciplines, engineering and education, and often others.Effective educational innovation requires expertise in both content and pedagogy.Educational innovation also includes the introduction of proven ideas, methods, andtechnologies into learning environments where they have not been employed before, aswell as the invention and introduction of new educational ideas, methods, and technologies.

## II . The Innovation cycle of Educational Practice and Research

Educational innovation based on a cycle of educational practice and research will enable the engineering education enterprise to more easily and methodically incorporate research on how people learn into its educational practices. Fig 2.1 will help to systematically build upon prior educational innovations and simultaneously advance the body of knowledge on engineering learning. It will facilitate the transfer of educational innovations among engineering programs because they will be based on practices that work and, more importantly, on the knowledge of *why* they work, i.e., it will facilitate their replication in other learning environments. Finally, it will improve the ability of the enterprise to anticipate and respond to evolving professional and societal trends with more efficient and effective use of increasingly limited resources. Thus, engineering education should be more able to prepare the engineer of 2020.

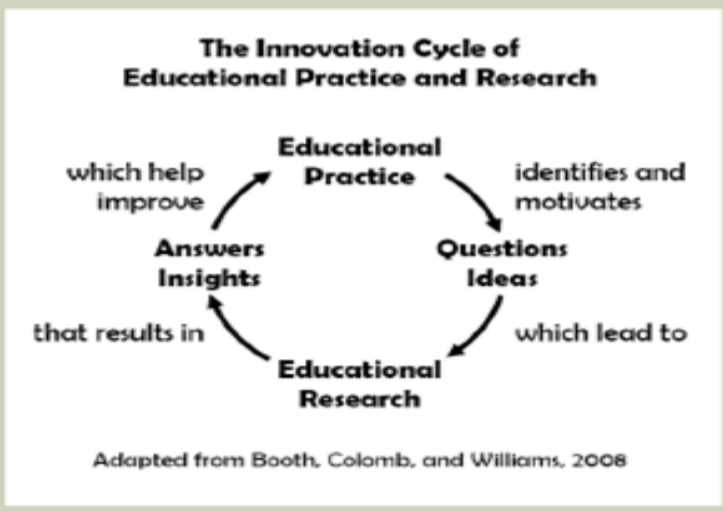


Fig.2.1 The Innovation cycle of Educational Practice and Research

In the engineering world of the future, a sound understanding ofthe theoretical and practical sidesof engineering ethics will be asnecessary to the proper educationof engineers as a knowledge of differentialequations is today, if not more so. While there may have been reasons to neglect engineering ethics or treat it superficially inthe past, those reasons are no longer valid. I support this assertionwith three arguments:

1) Engineering ethics is now amature, practical academic disciplinewhose practitioner's dealprimarily with real engineeringcases, not just abstract philosophicaltheories;

2) Engineering work is now morecomplex than ever, and its ethical, social, and cultural effectscan no longer be dealt with onthe "seat-of-the-pants" basisthat sufficed when engineeredsystems were simpler.

3) While most engineering studentscome to college with aworking understanding of generalethical principles already,they need classroom practice tounderstand and deal with thecomplex and subtle issues ofprofessional responsibility inengineering before theyencounter ethical problems inthe real engineering world.

Nevertheless, it appears that engineering ethics as a subject is treated by some engineering programs in a cursory fashion, if at all. Anecdotal evidence indicates that most of the programs which require students to take engineering ethics are in civil, environmental, mechanical, or chemical engineering. Departments of electrical engineering and computer engineering are less likely than other engineering departments to require anything more than a few classes on ethics in an introductory freshman engineering course.

**III . Use of Internet For Society**

The Internet has transformed the lives of billions of people in areas as diverse as democracy,education, healthcare,entertainment, commerce,finance, and civil infrastructure.It has become the 21st century's fundamental societal infrastructure,comparable to the railwaysof the 1800s and the roadways ofthe 1900s. The Internet and its associated services have helpedtransform the world economy andsociety, catalyzing new forms of communication, collaboration, creativity, and innovation. The Internet deeply affects human communication,and the way humans deal with information and knowledge.

Statistics indicate that the Internet is still growing at exponential rates. According to the last report of the Task Force of the European Commission DG INFSO, Internet connectivity is expanding rapidly in geographical distribution and number of users [1]. Currentlythere are about 1.6 billion Internetusers worldwide (from 360 millionin 2000) and 4 billion mobile users(from 2.7 billion in 2006); 570million Internet-enabled handhelddevices are in use.

The number of people who use mobile phones for web surfing has doubled since2006. It is expected that in 2012 mobile and wireless users will outnumber wired ones. In parallel with user growth, stored information is growing as well. In 1998, Google indexed 26 million web-pages; in2009 it indexed 1 trillion. There are 400 million web pages and 55trillion links between these webpages. The Web is processing 100billion clicks per day, and 2 millionemails and 1 million instant messagesper second. Video traffi c overthe Internet is growing by 60%everyyear and will be multiplied by 1000 over the next 5 to 8 years.Web 2.0 and social networks are attracting more than 125 millionregular users within just 5 years ofexistence. The Internet is an indispensablepart of most businesseswith many business processes having been significantly automated by Internet technologies.The current Internet is the mostimportant infrastructure of the digital society. It is also adapting itself with *ad hoc* technical solutions that help to meet the demands of users, devices, applications, and services,enabling human activities that were not foreseen in the Internet's original design.Thus we know, we live in increasingly globally integrated institutions and communities.

**IV. Conclusion**

The emergence of knowledge society brings in new characteristics of knowledge construction and learning process – technology-bounded, multi-dimensional, unstable, innovative, collaborative and complex. Professional competences and expertise become

progressively more difficult to identify when problems are becoming increasingly illdefined and across-disciplinary with involving a growth of various integrated issues like technology, environment, economy, culture, sustainability and society. This gives rise to challenges to universities, in particular, engineering universities, which traditionally have been playing a role of dissimilating technical discipline focused and stable knowledge based on individual learning.

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