Chapter 5
Impact of Accreditation on Engineering Education

Tayeb Brahimi
Effat University, Saudi Arabia

Akila Sarirete
Effat University, Saudi Arabia

Sajid Khalifa
Effat University, Saudi Arabia

ABSTRACT

The objective of this study is to investigate the impact of accreditation on engineering education including student learning outcomes and innovation based on two accreditation bodies the NCAAA in KSA, and the ABET in USA. The article explores the approach of constructionism with emphasis to makerspace by delivering engineering and design courses with opportunities for innovation, creativity, and the ability to design a system, component, or process to meet desired needs. This innovative approach shifts the active learning strategies from Do-It-Yourself to Do-It-With-Others culture. Makerspace is one of the integral parts of modern education system that brings together and facilitates the community of interdisciplinary individuals. Results from courses in engineering and design shows the benefit of the accreditation in terms of enhancing the overall program quality and the importance of re-evaluating strategies and methodologies of learning which help in delivering innovative solutions and educating tomorrow's leaders to address the most pressing issues facing our societies.

INTRODUCTION

The development and easy access to new technology continue to have an impact on teaching and learning methodologies, in particular in engineering education. Universities moved from the traditional approach focusing on education to the second generation universities focusing on education and research, and now to the third generation universities focusing on learning, innovation, and entrepreneurship. In the context of the third generation universities, accreditation supports innovation in both the delivery and the content,

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and there is a continuous call to support innovation in engineering education and how to deal with the challenge of contemporary engineering design problems. Today, education is rapidly changing into a global activity that is reached by millions of people as reported at the IMF-World Bank Spring Meetings Symposium "Learning for All Symposium, Investing in a Brighter Future," in April 2014 (http://live.worldbank.org/learning-for-all). With the rapid increase use of information technologies educational institutions is changing the way faculty and students learn, work, and establish collaboration (Beetham et al., 2013, Clough, 2004). The learning cycle is an ongoing process that is designed to improve the quality of, as well as collaboration among learners especially when considering a non-traditional form of learning. In the traditional transfer learning model the instructor serves as the repository and transmitter of knowledge, however, in the distributed transfer learning environment the learner interacts with other students, peers, and has flexible access to all information and resources around him (Sarirete, 2009). In this context, accreditation is considered as the primary process for assuring and improving the quality of higher education institutions to boost their ongoing performance efforts for the benefit of their students and the society. Each college or university student wants to ensure that the selected institution is "accredited" and students will have the assurance of receiving the quality of education needed by employers or by other institution to pursue research (US Department, 2005). As reported by Fredericks et al. (2007), throughout the history of the accreditation, accreditation bodies have acted in response to academic and non-academic pressure to modify and improve their accreditation process however they were rarely visible to the students and the public in general. Today, accreditation bodies expect evidence from institution regarding student learning outcomes including innovation by implementing a continuous improvement process and engaging in quality assurance through internal and external review (http://www.abet.org/, http://www.ncaaa.org.sa/). All regional or international accreditation bodies have similar processes and practices: i) a self-review by the institution or program, ii) an on-site visit by external peer experts reviewers, and finally iii) a decision by the accrediting body to award or deny the accreditation. The review is actually repeated every three to ten years, in this process all accreditation bodies expect learning outcomes to be "well defined, articulated, assessed, verified, and used as a guide for future improvement" as reported by ABET. The accreditation process requires from institutions not only to critically evaluate their vision, mission, and strategies but also how well all these educational elements work together to meet the needs of all students. This is considered as "essential to the future of nations, their well-being, and the world economy" as reported by different organizations such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), the World Bank, the Organization for Economic Co-operation and Development (OECD), and the Council for Higher Education Accreditation (CHEA, http://www.chea.org). According to UNESCO's 2009 World Conference (goo.gl/ZN7gK1) there is a considerable focus on the importance of student achievement with an important trend towards quality evaluation since institutions are now evaluated against their own self-defined mission and vision not against an institution model as previously required. Another trend reported by UNESCO is that "government agencies are now focusing more on whether institutions have adequate mechanisms in operation to support this dynamic process." In this paper two accreditation bodies and their impact on student outcomes will be discussed: The National Commission for Academic Accreditation and Assessment (NCAAA) established by the Higher Council of Education in Saudi Arabia (http://www.ncaaa.org.sa/), and the Accreditation Board for Engineering and Technology Inc. (ABET) (http://www.abet.org/), a US non-profit and non-governmental accrediting agency for academic programs in the disciplines of applied science, computing, engineering, and engineering technology. Today, researchers recognize that learning has three essential components: knowledge, skills, and understanding. According to the learning