Chapter 15
Effect of Accreditation on Quality of Teaching and Learning and Multi-Disciplinary Collaboration: Case Study

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ABSTRACT

Usually, so far, formal education mostly focuses on treating only strictly separated and specialized topic areas, called disciplines. However, as the need for cooperation between professionals oriented from different disciplines grows, the need for a multidisciplinary educational approach becomes more and more important. For a technical education to be completed, it is no longer enough to train scientists and engineers solely in technical areas. In development and implementation of technology-driven applications, multidisciplinary issues should be properly addressed in the academic sense. The College of Engineering at Sultan Qaboos University (SQU) has addressed this issue of multidisciplinary education by developing and offering interdisciplinary programs such as Mechatronics program, which is jointly offered by the Department of Electrical and Computer Engineering (ECE) and Department of Mechanical and Industrial Engineering (MIE), and also transdisciplinary programs such as a specialization in biomedical signals and medical devices (approved, but not yet offered at the time of writing this book chapter, 2016) and a program in agricultural engineering. Also, to make engineering graduates capable of working effectively in multidisciplinary teams, final-year projects (FYP) of multidisciplinary nature has been defined and implemented by the students under the supervision of faculty members.

DOI: 10.4018/978-1-5225-3878-3.ch015

INTRODUCTION

Education should have two objectives: 1) give definite knowledge; 2) create those mental habits which will enable people to acquire knowledge and form sound judgements (Ertas, Maxwell, Rainey, & Tanik, 2003). Most university teachers adopt a classical teaching style, although these formal teaching approaches may not be suitable for concrete transitional thinkers (Cinquepalmi, Dell'Aquila, Fogli-Mu-Ciaccia, Picciarelli, Stella, & Verrone, 1985). In order to be able to operate better in an environment of rapid change of technology, transdisciplinary approach in education is necessary. Transdisciplinary approach is a way of curriculum integration which dissolves the boundaries between the conventional disciplines and organizes teaching and learning around the construction of meaning in the context of real-world problems or themes. A multidisciplinary curriculum is one in which the same topic is studied from the viewpoint of more than one discipline. Frequently multidisciplinary and crossdisciplinary are used as synonyms describing the aim to cross boundaries between disciplines. In the 21st century, an engineer must be able to deal with a rapid pace of technological change, a highly interconnected world, and complex problems that require multidisciplinary approaches and the effective use of human and natural resources (Tafa, Rakocevic, Mihailovic, & Milutinovic, 2011). In fact, effective development of products is an interdisciplinary process (Eppinger & Kressy, 2002). Interdisciplinary education allows the student to learn by making connections between ideas and concepts across different disciplinary boundaries. Students learning in this way are able to apply the knowledge gained in one discipline to another different discipline as a way to deepen the learning experience. The most effective approach to interdisciplinary study enables students to build their own interdisciplinary pathway by choosing courses which make sense to them.

George Kometsky defines transdisciplinary education as the notion of the integrated use of the tools, techniques, and methods from various disciplines (Kozmetsky, 1997). A particular area of study can be called a discipline provided that it has unified tools, techniques, and methods, and a well-developed jargon. Disciplines develop into self-contained hard shells, which tends to minimize interaction with other disciplines. The longer a discipline evolves, the longer its shell becomes (Ertas, Tanik, & Maxwell, 2000). In spite of these hard shells, the graduates of modern educational institutes need to tackle multidisciplinary problems. They need skills in their own discipline, but also need basic understanding of other disciplines, and the ability to apply the skills in one discipline to the problems of another. For example, Roberts (2011) talks about the challenges of multidisciplinary education in computer science (CS). It states that modern training in computer science needs to prepare students to work in other disciplines or to work on multidisciplinary problems. The paper, then, describes successful examples of multidisciplinary education at the interface between CS and the biological sciences, as well as other examples involving CS and security, CS and sustainability, and CS and the social and economic sciences.

Organizations who are responsible for the accreditation of engineering and science programs, or perhaps in other disciplines too, have emphasized the need for multidisciplinary education. The Accreditation Board for Engineering and Technology (ABET) establishes criteria for accrediting educational programs in applied science, computing, engineering, and engineering technology. In its Engineering Criteria, Engineering Accreditation Commission (EAC) of ABET established a set of student outcomes. For the set of student outcomes, each program must have processes that demonstrate that (1) program performance with respect to its outcomes is being assessed, (2) results of program evaluation are being used to develop and improve the program, and (3) results and processes are being documented. Criterion 3 of the ABET Engineering Criteria requires "(d) an ability to function on multidisciplinary teams"