

# Chapter 11

## Integrative Learning toward Social Responsibility in Teaching Engineering

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### ABSTRACT

*Technical University of Madrid, within the Spanish context, has profited of the introduction of a System of Internal Quality Assurance to build a road on the grounds of previous work on the culture of ethics in engineering. This way may drive the students training to incorporate in their curricula instruments leading to the recognition and acquisition of social responsibility. The road is paved with various educational elements, either mandatory such as the Mentoring project (aiming to minimize the gap in the transit between high school and university from a logistical point of view), or optional such a set of three: Monitoring (a system of academic support for improving the performance of in the students in their learning outcomes when face difficulties), Service Learning and Social Entrepreneurship, Ethics and Values in Engineering. This strategy combined with the convergence to the European Higher Education Area allows the selection of students able to integrate in their professional assets the idea and the commitment of making the human development more sustainable.*

### INTRODUCTION

The chapter describes a process of integrative learning in teaching engineering on ethical dimensions to attain social responsibility of the trainees.

This experience has been carried out in the School of Mining and Energy of the Technical University of Madrid (ETSIME).

The authors are aware that the introduction of teaching ethics in engineering lasts since long. As

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a matter of fact, a consultation in Google on this topic carried out in the summer of 2015 reached approximately 50.900.000 hits.

Most of the relevant results concern to experiences in institutions from the United States. The examples of the School of Mining at Boulder in the University of Colorado under the leadership of Carl Mitcham (1989) or the project “Introducing Ethics Case Studies Into Required Undergraduate Studies Engineering Courses” at Texas A&M University as a result of the collaboration of the department of Philosophy and the Department of Mechanical Engineering (NSF Grant Number DIR-9012252) to cite a few are worth to illustrate the model of the United States for these educational programs. Both are characterized by the collaboration between philosophers and engineers and are based essentially in the case studies methodology.

The chapter narrative delineates the trajectory followed in the School of Mining and Energy Engineering (*ETSIME*) of the Technical University of Madrid to achieve an integrative learning process. It begins with a short review of the introduction of the system of quality and accreditation in Europe. It is followed by work carried out at ETSIME by incorporating the teaching of Ethics and Values, a process which has driven to the incorporation of social innovation, social entrepreneurship and service learning as applied instruments of the ethics field. A first appraisal of the results of these interventions is presented.

## **BACKGROUND**

The initiative undertaken by ETSIME a decade ago was originally aimed at following the model of the USA institutions. However the evolution of the teaching ethics program in the School of Mining and Energy of UPM under the Spanish context revealed the need to introduce changes

from the model along the path. The initial proposal was turned out into the integrative learning toward social responsibility for introducing in teaching engineering as illustrated in this chapter.

The reflection on how to build the ETSIME strategy started by looking at the milieu conditions and the essential role played by the System of Internal Quality Assurance (SIQA) under the framework of the European Higher Education Area (EHEA). The axes underlining the evolutionary process of Bologna (1999) since the Sorbonne Declaration (1998) to the London declaration (2007) were aimed at assuming a common strategy for attaining the goal of cooperation and guaranteeing the quality of the process. This strategy was assigned in the London meeting (2007) to the so called Group E4 and it is based on five measures which might influence the elaboration of the future program of studies and hence the shaping of the academic disciplines and titles. These five measures are outlined as follows:

- Development of SIQA in the institutions.
- Elaboration of the suitable common norms, procedures and directives.
- Establishment of a European Register.
- The autonomy of the universities to select the organism for accreditation.
- Recognition of the competence of the Member States for their acceptance of evaluations and extraction of conclusions to enhance their policies in Higher Education.

On the grounds of these measures, a landscape may be drawn in where it is possible to encounter actions at national level as well as actions with international compensations

- Each country will hold accreditation competencies for their universities.

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