Abstract - Universities in Spain have launched one of the most ambitious and significant changes in their history through the adoption of the so-called Bologna Process. The European Higher Education Area (EHEA) to be established by this effort aims at promoting mobility and internationally comparable degree programs within European Union (EU). This paper presents an implementation experience at Carlos III University, with a focus on their Engineering School. The objectives of this study are two-fold: (i) to share the implementation experience so that other Spanish universities may be able to adopt any success factors from the case study, and (ii) to inform other higher educational institutes around the world about significant changes taking place in their counterparts in Spain. In addition, a data collection system is being developed so that the effectiveness of the new system can objectively be measured and analyzed. Experiences with EC2000 changes initiated by Accreditation Board for Engineering and Technology (ABET) in USA will also be compared with the Spanish experience.

Index Terms – ABET, Bologna Process, European Higher Education Area, Spanish Universities

INTRODUCTION

The higher educational institutes in Spain have launched one of the most ambitious and significant changes in their history [1]. Spain joined other EU members in pursuing "the convergence towards the Common European Higher Education Space" by adopting the so-called Bologna Process [2]. This Process aims at making academic degrees and quality standards more equivalent throughout the EU. Even though the Bologna declaration was made in 1999, its detail contents had to be developed, clarified and refined through numerous meetings and discussions. Only recently, the progress has reached a point where actual implementation projects can begin.

Carlos III University in Madrid (UC3M) is a forerunner in Spain in implementing the Bologna Process. This paper shares the university's experience in initiating, designing, implementing, and assessing new degree programs. The authors' experience with their Engineering School will be the focus of this paper. Still, it presents general discussion for the change processes involved in the overall university and in the nation. In addition to documenting major change processes, a data collection system is being developed so that the effectiveness of the new system can be measured and analyzed.

The collected data will be used for other purposes too. In recent years, engineering colleges in USA have gone through major changes themselves by implementing EC2000 criteria as required by ABET [3]. We are analyzing any similarities between these two transformations and preparing a report.

TRANSFORMATION AT CARLOS III UNIVERSITY

The transformation occurring at UC3M can be summarized into two categories: (i) changes in degrees and (ii) changes in pedagogy.

I. Changes in Degree Structure

The most visible set of changes involves: (i) the adoption of a unified cycle structure for undergraduate, master, and doctoral degrees, and (ii) the adoption of a single unit of measurement, called the ECTS (European Credit Transfer Systems) credit. Each ECTS credit is equivalent to 25-30 hours of total effort by a student, while one credit under the old system was equivalent to 10 contact hours between a student and an instructor.

While these changes require government approval that could be a lengthy process, new Ministry for Education who was installed in 2006 and new Rector of UC3M in 2007 made several decisions to enable UC3M to propose new degree programs in a relatively short period of time. The new law regulating these new degree programs was not approved until October 29, 2007, while the target date set for starting new degree programs in UC3M was September 2008. Therefore, UC3M had to start working with drafts of the law in order to meet the target date. The specifics of the finally approved law include: (i) each undergraduate degree requires 240 ECTC credits, (ii) each master degree requires between 60 and 120 ECTS credits, and (iii) each doctoral degree requires an original doctoral dissertation.

For undergraduate degrees, 5 broad “branches” were defined: Arts and Humanities, Natural Sciences, Social Sciences and Law, Health Sciences, and Engineering/Architecture. Each undergraduate degree needs...
to belong to one of these branches, and include at least 60 ECTS of "basic" courses. At least 36 ECTS of these "basic" courses should be on the topics listed for the degree's branch. For example, any Engineering/Architecture degree should include at least 36 ECTS credits from physics, mathematics, computer science, business administration, graphical expression (i.e. technical drawing), and chemistry. No content guidelines were specified for master's level degrees in order to encourage universities to foster their unique specializations.

Special degrees such as Medicine (which is not offered in the UC3M) will be regulated separately from other degrees. Those degrees requiring certification for professional licenses such as engineering will have additional content guidelines. But these additional guidelines are not prescribed in the current law.

On June 20, 2007, the UC3M's governing body approved that new degrees replace all the existing degrees, effective on September 2008. However, only the new degrees derived directly from existing degrees will be offered to the first year students in September 2008. For example, in the engineering school, seven existing 3-year engineering degrees will migrate into seven new 4-year undergraduate degrees. Three existing 5-year engineering degrees will migrate into three new 4-year undergraduate degrees plus three new 2-year master degrees. The proposals for all these changes had to be approved by various units within UC3M (including a one-month period of public disclosure for any questions). On January 31, 2008, they were sent to the government for approval and are currently going through an approval process (as of May 2008).

Existing master degrees (initiated under the now derogated 2006 law), as well as doctoral degrees, will continue unaltered during the 2008-09 academic year. UC3M will start working on proposals for new degrees, discontinuation of degrees, and new framework for master degrees. The target date for implementing these additional changes is September 2009.

II. Changes in Pedagogy

Another set of changes is addressing a significant shift from instructor-centred "teaching" to student-centred "active learning." This involves methodological changes such as implementing continuous evaluation schemes, de-emphasizing theory-only lectures, developing assignments and class projects, and encouraging hands-on experiences. It also allows the students to design their own curricula with a higher level of flexibility.

In the last few years, the UC3M has been experimenting, learning and paving for these pedagogical changes while the legal framework was being finalized. Numerous initiatives have been launched to support these changes. Some groups were created for testing purposes and some degrees were designated so that the new methodologies can be extensively tested out. The UC3M has funded a number of methodology adaptation projects and faculty training. New metrics for evaluating the faculty performances and a support infrastructure for the new pedagogical approaches have been developed. New degrees are expected to incorporate these new pedagogical approaches. However, actually making that happen is likely to be one of the toughest challenges in the implementation process.

DATA COLLECTION AND COMPARISON STUDIES

As the old system will co-exist with new system during next few years' of transition, Carlos III University is in a unique position of collecting valuable data for various analyses. The collected data can be used for: (i) assessing the effectiveness of the new degree programs and pedagogical approach at Carlos III University, (ii) assessing the effectiveness of new educational system in Spain, and (iii) comparing with other similar transformation experiences in higher education such as EC2000 implementations in USA [4, 5].

A set of questionnaires is being designed to collect data from current students, faculty, graduates, employers, and other constituents for Carlos III University. Efforts will be made to collect both data before and data after the transformation occurs.

DISCUSSION AND FUTURE PLANS

Spanish Universities are currently undergoing a most comprehensive and significiation reformation in their history. In this paper, we share experiences in the first public university in Spain who went to the implementation of the new system in full speed. The transformation will make significant impacts on the students, the faculty, the university administrators, the employers, the society, the educational philosophy, just to name a few. Such changes are also important for countries not only in the EU but also in other parts of the world, as the education in a global context is increasingly becoming important [6].

REFERENCES