

SECONDARY SCHOOL PROFILE IN SCIENCE AND TECHNOLOGY VERSUS THE FIRST YEAR AT THE TECHNICAL UNIVERSITY OF MADRID. CAUSE OF FAILURE OR QUITTING?

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Abstract

The aim of this article focuses on the analysis of the specific branch subjects that allow students in high school to develop a technological profile, which, at the time of enrolment in the technical universities, does not exactly match with the contents of the programs of the engineering degrees, becoming a potential cause of non-attendance, failure or quitting during their studies, after the implementation of the European Higher Education Area.

Keywords: Secondary school, grades, civil engineering.

1 HIGH SCHOOL TEACHING REGULATION

In the Region of Madrid, following the current Education Law Act, secondary education is organized into two years with a set of common subjects; three related to the specific branch and one of free choice. The subjects specific to the branch are sorted based on three different possible paths, Arts which collates plasticity, image, scene and design, music and dance; Human and Social Sciences and the third, our main focus, Science and Technology.

The subjects related to Science and Technology in the first 2 years are:

Table 1: Science and Technology Secondary Education Subjects [1]

First Course	Second Course
Biology and Geology	Biology
Technical Drawing I	Earth Science and Environmental Science
Physics and Chemistry	Technical Drawing II
Mathematics I	Electricity
Industrial Technology	Physics
	Mathematics II
	Chemistry
	Industrial Technology II

As aforementioned, three specific branch topics are to be chosen, plus an additional free choice one, for both years.

2 CIVIL AND TERRITORIAL ENGINEERING TEACHING REGULATION IN THE FIRST YEAR

Taking into consideration the current Curriculum for the School of Civil Engineering and Civil Engineers, Channels and Ports of the Technical University of Madrid, the first year of the degree according to the Bologna plan, is as follows:

Table 2: First year degree subjects (School of Civil Engineering and Civil Engineers) [3]

First Semester	Second Semester
Calculus I	Calculus II
Algebra and Geometry	Statistics and Optimization
Business	Physics of Materials
Computers	Chemistry of Materials
Graphical representation	Graphical Design

In the third and fourth semester, other topics such as Geology and Electricity can be found, which although they exist as subjects in High School, have normally not been taken by students due to the 3 + 1 (specific branch and free choice) constraint presented in the previous section. Many of our students have not studied Chemistry at High School nor Business, or even Graphical Design, founding themselves in their first year at University with this issue that due to its impact on the individual, increases even further their confusion. Is this the reason for non-attendance, failure or quitting among the student community? Statistics from the first two years of the implementation of the new Curriculum adapted to the European Higher Education Area, bring some light to answer such a question.

3 ANALYSIS OF THE NEW DEGREES AT THE POLYTECHNIC UNIVERSITY OF MADRID

Besides the education on, namely, common subjects within the engineering degrees, which refers to Mathematics, Physics and Technical Drawing (three specific branch subjects during High School), to which one more subject is added, the analysis and review of the new degrees adapted to the European Higher Education Area in the Polytechnic University of Madrid, reveals us students with a profile that could lead to non-attendance, quitting or failure due to the lack of studies on those subjects during secondary or high school studies.

The Polytechnic University of Madrid has celebrated its 40th anniversary as University in 2011, although most of their faculties have well over hundred years of existence since they were founded in the XVIII and XIX centuries, and each one remained independent until they were joined into the UPM. It does not seem exaggerated to conclude that big part of the history regarding technology in Spain has happened within the Architecture and Engineering schools, since they were the for a vast number of years the only ones and all the renown characters within the research and teaching community were at a certain point in time either students or professors at those schools.

In these, over forty years of history, the implementation of the EEES (as well known as Bologna Plan) has become a big milestone in the faculties, schools and their degrees, including the set up of forty two adapted degrees to confront the challenges of the XXI century, from the job market, to new technologies, environmental issues and the improvement of the living conditions of the current society. It can be noted that not all the changes have happened at all levels of the educational spectrum, primary, secondary, technical studies and university studies; this situation creates issues and differences in the students that can lead them to quit or change their studies and to seek those ones matching much better their academic profile based on their knowledge gained previously during their studies at lower levels of education.

In view of this circumstance and reviewing the most relevant schools of our University, it can be concluded with regards to the possible causes for failure at University due to the low quality of the education prior to University, since it is assumed that all students enrolling at University have studied as main subjects Graphical representation, Physics and Mathematics (Algebra and Calculus).

The gaps that have been identified in the main school and their Curriculums are as follows:

Table 3: Gaps identified in the main Schools at UPM (Technical University of Madrid) [2]

SCHOOL/DEGREE	SUBJECT THAT COULD LEAD TO FAILURE
<i>School of Aeronautical Engineering</i> Aeronautical Engineer	Chemistry or Economy
<i>School of Agricultural Engineering</i> Food technology Engineer	Chemistry, Biology, Geology, Economy and Electricity
<i>School of Architecture</i> Architect Degree	There are no issues
<i>School of Civil Engineering</i> Civil and Territorial Engineer	Computers, Economy, Chemistry, Geology and Electricity
<i>School of Industrial Engineering</i> Chemical Engineer	Chemistry, Electricity, Economy
<i>School of Mining Engineering</i> Mining Engineer	Computers, Economy, Chemistry, Geology and Electricity
<i>School of Naval Engineering</i> Naval Engineer	Computers, Economy, Chemistry, and Electricity
<i>School of Telecommunications Engineering</i> Telecommunications Engineer	Business, There are no issues
<i>School of Topography, Geodesy and Astronomy Engineering</i> Geodetic and Topography Engineer	Computers, Economy, Geology and Electricity
<i>Computer Science Faculty</i> Bachelor of Computer Science	There are no issues
<i>School of Forests and Environment Engineering</i> Forests engineer	Chemistry, Biology, Business and Electricity
<i>Sport Faculty</i> Bachelor of Sport Science	There are no issues
<i>EU Public Construction Engineering</i> Public construction Engineer	Computers, Economy, Chemistry, Geology and Electricity
<i>EU Architecture</i> Bachelor of Building Engineer	Chemistry, Geology, Business, and Electricity

As can be shown, there are various subjects that could be chosen in the second year of High School such as if they were compulsory to be taken by students, the effectiveness and results of our university students in the first semesters would definitely be increased.

4 FIRST CONCLUSIONS

Given the analysis of the different Curriculum studies and their comparison with the existing subjects at High school for Science and technology students, both for the first and second year, it can be presented some findings, considerations and proposals. From those the following can be highlighted:

The first finding can be found at the Architecture Schools where studies on various graphical topics such as graphical design or Plasticity Arts, are covered at High School, including studies on Physics and Mathematics, therefore no issues can be found for them.

The second finding, can be found on the main Schools (Aeronautic studies, Agricultural Engineers, Civil Engineers, Industrial Engineers, Telecommunication Engineers, etc.) where students having only one free choice subject, besides the 3 common ones, has issues with topics such as Chemistry, Economy, Computer Science, Geology, leading to frustration and therefore to non-attendance or potentially to quitting their studies.

The third finding comes from the need to be able to review altogether the High School, Architecture and Engineering studies, in order to improve the level of the people that enrol the schools and faculties of our University every year.

The fourth finding is a reflection over the specific subject matters. Mathematics can be studied in depth during secondary studies but there are lacks on statistics, optimization, integration methods, computer science, excel and CAD programs.

The faculties of Computer Science and Sport Science are too specific, falling out the scope of this analysis and the current research strand.

The Innovation Education Group (ICUGMIC), of which the authors of this article are members of, is really interested in defining the specific causes that lead to non-attendance and quitting the studies of our students.

Currently, the data related to students from the academic year 2010-2011 that have not enrolled in the academic year 2011-2012 are being analysed, in order to understand the reasons among those students within the University.

There are several different cases and the process is slow and complex, and there are no sufficient data to extract further conclusive findings than the ones already presented. Prior to the set up of the Congress and depending on the data available, some of these ideas, that as professors and researchers are of concern due to the personal, social and economic cost they represent, could be further expanded.

REFERENCES

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