

A Project to Establish a Context for Teaching Innovation at the Faculty of Computer Science of Valencia

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Abstract - From this academic year, the Faculty of Computer Science of the Polytechnic University of Valencia (UPV) is involved in a project which main goal is to create a context for teaching innovation by means of different actions that range from coordination of the syllabi to a reschedule of the students' timetable. This experience is included in the context of a new institutional project to give support to schools and faculties in the spread and implantation of the Bologna Process. In this paper, the actions and experiences programmed for the project will be explained, as well as the expected results and agreements to be achieved in the next academic years.

Index Terms – The Bologna Process, Teaching Innovation, ECTS, Subject's Teaching Guide, Contents Coordination.

THE CONTEXT FOR TEACHING INNOVATION IN THE EU

The Bologna Process [1]-[4] has been repeatedly named as the main initiative carried out during the last years in the field of innovative teaching in the EU area. In this framework, the Spanish universities have been adapting some of their structures, goals and habits in order to create a more dynamic and efficient teaching context. This new context must consider aspects like a new degrees' structure, student and teacher's mobility, use of ECTS, degrees' comparability, or long-life learning.

According to this, there are several involved actions that are focussing a great effort from the side of the different National Quality Agencies and universities:

- The new structure of the academic degrees,
- The use of the ECTS,
- The new role of the student in the teaching/learning process.

For the first two points, different National regulations have been issued in order to facilitate the creation of a new structure for academic degrees, with common European

requirements, and the use of the ECTS as a comparable unit to measure student's dedication.

The definition of new academic degrees, according to these new regulations, is actually under development. For the Spanish case, most of degrees are intended to be of 3 or 4 years of duration. Then, a specialization Master can be done. These specialization Masters would have duration between 1 and 2 years, and are oriented to professional activities or research. According to this new structure, the Spanish National Agency for Quality and Evaluation (ANECA) has promoted a project to elaborate White Papers for each new degree. These White Papers are intended as the main guidelines to establish new degrees, in the new teaching context.

Also, the use of the ECTS as a unit to measure all subjects in the new degrees, in order to have a comparable system that facilitates mobility of students, is included in the new regulations. This is an important and delicate aspect, because while some general aspects for ECTS have been established (equivalence in hours for the student, maximum ECTS per year), it is not clear the practical use of this new measurement unit (how to adapt the current degrees to this new system). In this sense, there have been many efforts in order to adapt classic subject and courses' measurement to ECTS requirements.

On the other side, *active teaching* is one of the most repeated topics to describe a new role for the student in the teaching/learning process. By active teaching we mean that the student became an active actor of the teaching method, introducing new methodologies to motivate the student (collaborative works, coordinated timetables, workgroups...) [5]. But active teaching is not included in any regulation, so the Universities must create a context to facilitate both, teachers and students to carry out new experiences in order to increase the participation of the student in the teaching process.

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TEACHING INNOVATION PROJECTS AT UPV

The Polytechnic University of Valencia (UPV) has been one of the first Spanish universities involved in teaching innovation. From the early project PIE (*Plan de Innovación Educativa*, Plan for Teaching Innovation), carried out during the 80's, until the recent EUROPA project (*Una Enseñanza Orientada al Aprendizaje*, A Learning-Oriented Teaching) [6], or the most recent PAEEES project (*Programa de Adaptación al Espacio Europeo de Educación Superior*, Project to Adapt to the European Higher Education Area) [7], there have been several initiatives to give support to general and individual teaching projects.

From this academic year, the PACE project (*Plan de Acciones para la Convergencia Europea*, Plan of Actions for European Convergence) [8] is the new institutional context where all initiatives for teaching innovations must be concentrated. In the next sections, the guidelines of this project and, in particular, all actions to be carried out in the Faculty of Computer Science will be explained.

One of the main aspects considered in teaching innovation has been active teaching, meaning that the student becomes an active actor in the learning process. This concept implies that the transfer of knowledge from teacher to student should change from traditional models, where the student receives all related information (in most cases by means of a master speech), and prepares the exam; to models where the student should produce actively his own information about the items brought by the teacher.

The Faculty of Computer Science (FIV) has been participating in all these teaching projects, on one side, giving support to all initiatives involving isolated courses, and, on the other side, spreading related concepts and facilitating resources for teaching organization. Until the EUROPA project, all actions were focussed on isolated courses (or a reduced set of related courses) involving a teaching project. Lectures re-organization or project-based learning were most of individual projects performed by teachers, with different levels of success for the students.

For individual experiences in innovative teaching, in most cases, the *group size* is the most important factor for the success. In this sense, teaching methods based on projects for the students, seminars, and non-present work, are only bearable when the number of students is small (about 30 students per group) [5].

The EUROPA project promoted the concept of *activities*. The activity was considered as a parameter introduced in education to specify those parts of the course where the student must perform some actions starting from theoretical concepts previously released by the teacher. In most cases, activities were assumed as specific works for the student. This work would be done partially in present classes, and partially at home or libraries. When the work was done during the classes, the teacher was assisting the student and reviewing his improvements.

In order to manage activities, the teacher had to re-organize a subject, introducing seminars and activities as a part of teaching, reducing theoretical lessons in order to

perform a new and different method of information and knowledge transfer.

When the EUROPA project was into effect, schools and faculties at UPV were urged to transmit this concept to the current syllabi of the different degrees. In that context, some schools proposed general projects to convert most of subjects introducing activities in teaching. The experience was partially a success, in the sense that with no changes in the programme, only in the case of a few number of students were registered in a subject, activities could be introduced. Otherwise, the amount of work for the teacher increases according the number of activities and students, so the evaluation becomes impossible due to a lack of time.

During the last two years, the PAEEES Project, promoted from the Rectorate of the Polytechnic University of Valencia, with the help of the ICE (*Instituto de Ciencias de la Educación*, Institute of Teaching Sciences), has been the framework for teaching innovation at UPV. The aim of this teaching project was to develop actions to spread and discuss the process for adapting to the European Higher Education Area (EHEA). Also, preliminary experiences to implant ECTS and new teaching and evaluation methodologies were initiated in that context.

For the case of the FIV, the action promoted was dealing with these next 3 goals [5]:

1. To collect information from other schools and faculties about teaching and ECTS, related to the approach to EHEA.
2. To do a teaching research about methodologies and dedication for teachers and students.
3. To obtain a model compound of well defined criteria for adapting to EHEA the Informatics Engineering degree of the Faculty of Computer Science.

As a result of the teaching project, a final document summarizing all actions and outcomes was presented in a seminar held at the UPV [9].

THE PACE PROJECT

The PACE project (*Plan de Acciones para la Convergencia Europea*, Plan of Actions for European Convergence) [8], is the current framework promoted by the UPV to involve schools and faculties in teaching innovation. The PACE Project integrates all teaching experiences carried out in the context of foregoing projects at UPV.

This project is intended to be a general framework, organized in four main chapters to cover all possible actions in order to promote and enhance the European Convergence in the UPV:

- Analysis and spreading.
- Adaptation.
- Resources and tools.
- Inter-University actions.

Most actions involved in the project must be performed in the schools, so that a program must be defined in this sense to define proper main lines to be carried out. For the case of the

Faculty of Computer Science, these are the main actions included in the program:

- Subject's contents coordination, both at horizontal and vertical levels.
- Use of standardized Subject's Teaching Guides.
- Use of a new web-based teaching platform.
- Review of degree's competences according the White Papers.
- Use of ECTS.
- Individual initiatives involving teaching innovation.

The program on each school is defined by means of a *contract* between the university and the school. In this sense, the school will receive funds according to some objective parameters (number of teachers and students involved in the project, number of degrees...), to carry out a set of actions that must be defined at the beginning of the academic year. The assignment of funds is as follows: a 75% is fixed, and the rest (25%) will depend on the degree of success of the defined objectives.

To accomplish with this actions, a *team* must be established on each school. An Adaptation Manager (*Gestor de Adaptación*, GEA), together with 5 teachers acting as Course's Coordinators (*Coordinadores de Curso para la Adaptación*, COCAs), are the main members of each workgroup. Also, all teachers responsible for all subjects involved in the project, as well as a set of students (selected by means of an scholarship), are the rest of members of the workgroup.

The program is intended, as covered by the global PACE Project, to be of a several years of duration. So, actions to be carried out will help all schools, and the UPV in general, to set up a true framework for new teaching methods, according to the European Convergence.

In the next section, all main actions for the Faculty of Computer Science are explained, as well as the expected results, in order to generate for teachers and students a new context for the teaching/learning process.

A CONTEXT FOR TEACHING INNOVATION AT FIV

The participation of the Faculty of Computer Science in the PACE Project has a main goal: to establish a real context for teaching innovation in the process for European Convergence. According to all foregoing teaching projects carried out during the last years, a set of actions has been defined to be developed not only during this academic year 2005-2006, but also in the next years.

We can split the project in 2 main lines: (1) general actions that involves subjects for most courses, and (2) individual projects in the context of isolated subjects. Although the global project promoted by the UPV enhances the idea to push general actions, involving most of subjects of a degree, at the Faculty of Computer Science, individual experiences have been considered in order to be included in the project. The reason around it is to cover all teaching experiences in the program, allowing teachers the use of all resources included in the Faculty project.

Next, all main actions in development at the Faculty of Computer Science are detailed.

I. Subject's contents coordination

By means of several reunions, the Coordinators will recruit all information about the subjects for each course. In these meetings, all responsible teachers, as well as the coordinators of the other courses are participating. Every responsible teacher must present the contents and the way of teaching for each subject. Then, a discussion about related shared topics must solve possible problems of concordance. The expected results for this action are:

- Re-organization of the timetable for the student, providing free time to be dedicate to autonomous work.
- Detection of concordance problems among related subjects.
- To develop collaborative teaching activities between related subjects.
- Coordination of non-present teaching effort for the student.

A diagram about all relationships among subjects in a course will summarize the work carried out in this point. This diagram will help teachers and students for teaching organization.

II. Use of standardized Subject's Teaching Guides

The UPV is promoting the use of a new standardized Subject's Teaching Guide for all subjects, according to a model (template). The Subject's Teaching Guide will include sections about the contents of the subject (theoretical and practical lessons, material and books, objectives), as well as learning outcomes, acquired competences, or teaching methodologies. By means of a new web-based platform, all responsible teachers will be in charge to describe each subject according to this model.

The Adaptation Manager and all Coordinators will promote and help all participating teachers in the use of the Subject's Teaching Guide.

III. Use of a new web-based teaching platform

During the last years, the UPV has being providing a web-based resource to help teachers and students for subject's organization. This resource, named *subject's micro-web*, contains all basic information of a subject, as main objectives and contents. Also, it is intended as a site for information about the subject, including forums and facilities, as e-mail to the students.

From this year, a new web-based resource, according to open source developments, is going to be issued. This new resource will substitute all current micro-webs, providing more facilities for the teacher, as well as to promote personal study of the students. Also, the Subject's Teaching Guide will be integrated into the new platform.

The UPV is very interested in the use of new technologies, as the new web-based platform, in order to facilitate the transfer of knowledge to all students. The goal, in

this sense, is to have a minimum of 5% of subjects accessible via intranet at the end of this academic year. In the context of the Faculty of Computer Science, it is estimated that all subjects involved in the teaching projects will use and try all facilities of the new platform during this academic year.

IV. Review of Degree's competences according the White Papers

As described previously, the White Papers will become the guide to establish new degrees according to the model promoted in the European Convergence. All White Papers include a set of general and specific competences for each degree.

The PACE Project includes as a possible action, reviewing of competences of current degrees according to the White Papers. This action will help to adapt current degrees to the new framework. For the case of the Faculty of Computer Science, a general review of the competences proposed in the White Papers of both current degrees, Computer Science Engineering and the Degree on Documentation, is being carried out. The result of this action will be a set of general and specific competences for each degree, which will help teachers in the definition of each Subject's Teaching Guide.

V. Use of ECTS

The use of ECTS credits as a unit to measure teaching organization of a subject is implicated in the definition of each Subject's Teaching Guide. So, new descriptions of all subjects will ensure comparability with other degrees, facilitating mobility of students.

But, while general rules for the use of ECTS are well defined, for instance, the number of hours for the student per ECTS, it is difficult to manage the current degrees with this new measurement unit. In fact, all subjects in current degrees are measured only according present hours of the student in the university (theoretical and practical lessons), while ECTS is measuring all teaching dedication for the student, including the needed time for studying and all non-present work.

To help the Faculty and teachers with the use of ECTS, a study about the dedication of the students to all subjects is being done at the Faculty of Computer Science. This study is carried out by means of a student's poll. For most subjects, a student's poll was taken last academic year, in order to get relevant information about student's non-present dedication to each subject. This academic year, the study will be completed with a student's poll for all subjects in the last year of the Computer Science Engineering. Also, all extracted data from the poll will be evaluated in order to get relevant information about different types of subjects.

As an example of relevant information derived from last year's poll, Figure 1 and Figure 2 shows some results related to the student's dedication to mandatory subjects.

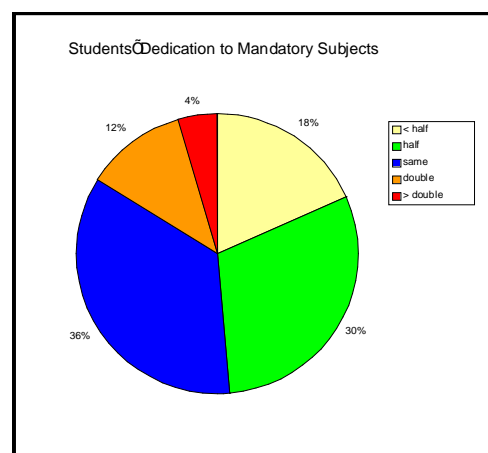


FIGURE 1
STUDENTS' DEDICATION TO MANDATORY SUBJECTS

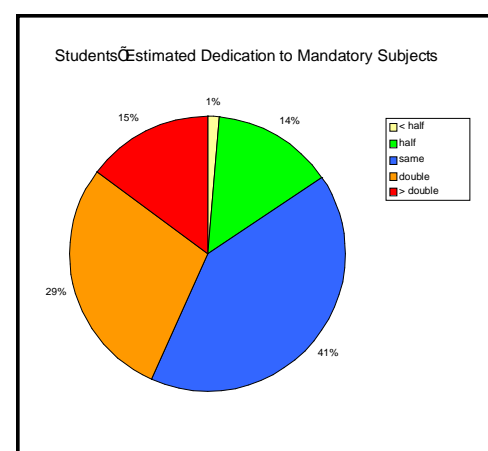


FIGURE 2
STUDENTS' ESTIMATED DEDICATION TO MANDATORY SUBJECTS

In both figures, we can see that in general, the students think that they should dedicate more time for non-present work (about 1.5 and 2 times more).

Most universities are establishing some fixed criteria in order to manage ECTS with current degrees, for instance, a pre-defined number of present hours of the student per ECTS, a number of maximum non-present hours, or a conversion factor. The study about the dedication of the students to the subjects would help to the use of ECTS, in the sense that the results can be exploited to get different types of subjects, according to the student's dedication. In our opinion, a correct conversion must be done taking into account the type of subject, according to the student's dedication.

VI. Individual initiatives involving teaching innovation

In the Faculty of Computer Science, the PACE project is helping teachers to perform experiences in the context of several subjects. In these experiences, teachers are introducing new innovative teaching techniques focussed on active methodologies, such as:

- Cooperative working
- Seminars
- Case study
- Project based learning
- Autonomous work of the students

These techniques will be evaluated at the end of the academic year by means of a final report that the responsible teacher must provide to the Faculty. This final report must include relevant information about the experience, as the number of students involved, the estimated dedication of the students according the teaching methodology, or the academic results (marks).

Also, new evaluation and assessment methods have being introduced, as continuous evaluation, or auto-evaluation.

CONCLUSIONS

As a natural continuation of all different teaching projects carried out during the last years, a context for teaching innovation is being established in the Faculty of Computer Science (FIV) of the Polytechnic University of Valencia. From this academic year, the PACE Project is setting up conditions and requirements to develop defined programs in each School, including a set of actions according to the European Convergence.

For the case of the FIV, the context for teaching innovation is being developed by means of general actions and individual experiences. General actions involve the use of ECTS, new standardized models of Subject's Teaching Guides, the use of a new web-based teaching platform, a review of the competences of the degrees, and the coordination of contents of the subjects.

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