ECTS evaluation in the Faculty of Computer Science of the Polytechnic University of Valencia

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Abstract - **The Polytechnic University of Valencia has organized the so-called *Action Plan for the European Convergence*. This plan tries to impulse some actions with the objective of improving the higher educational system, from the perspective of both teachers and students, in the context of the European Space for Higher Education. Inside the university, the Faculty of Computer Science of Valencia is participating in several of these actions. One of such actions is the estimation of the student workload of the current subjects in our syllabi in order to be able to measure the current subjects in the new credit system, the European Credit Transfer System (ECTS). In order to do this, the action proposes a voluntary and confidential survey that the students have to fill up throughout the entire academic year for all their registered subjects. This paper presents the current situation of this action at the Faculty of Computer Science of Valencia on the academic year 2006/2007. In addition, different uses of the results of this survey are proposed.**

Index Terms – Bologna process, ECTS, student workload.

INTRODUCTION

The Bologna Process [1] 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 being 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 structure for degrees, student and teacher mobility, subject measurement in ECTS credits, degree comparability, or long-life learning.

According to this, there are several ongoing actions that involve a great effort from the perspective of the different National Quality Agencies and the universities: the new structure of the academic degrees, the use of the ECTS, the new role of the student in the teaching/learning process, the introduction of learning outcomes, etc.

For the Spanish case, the Government has issued some new regulations, according to which the new academic degrees are currently under development. One of the aspects included in such regulations is the use of the ECTS credits as a unit to measure all subjects in the new degrees, in order to

have a comparable system that benefits the mobility of students. This is an important and sensitive aspect, because while some general aspects for ECTS have been officially established (equivalence in hours for the student, maximum ECTS per year), more practical aspects regarding the implantation of this new measurement unit have not been defined (for example, how to adapt the current degrees to the new system). In addition to fulfill the requirements of exchange students, the adaptation of the current degrees to the ECTS has been regarded from the universities' viewpoint as a way of learning how to measure the student dedication to subjects, since the current Spanish credit system only considers *teaching* hours.

In this sense, there have been many efforts in order to adapt the classic subject measurement to ECTS requirements. One of these actions, named *Evaluation ECTS action*, is included in the *Action Plan for the European Convergence* of the Polytechnic University of Valencia (UPV). In the following sections we describe this action and present its current situation at the Faculty of Computer Science of Valencia (FIV) on the academic year 2006/2007.

THE PACE PROJECT

The *Action Plan for the European Convergence* (PACE Project) [2] is the current framework promoted by the UPV to involve schools and faculties in teaching innovation since the 2005/2006 academic year. The PACE Project integrates all teaching experiences carried out in the context of different previous projects at the 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 are defined in such a way that they must be performed inside the schools and faculties. So, each school must define a particular program to establish the main lines to be carried out in its own context.

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The programs inside the schools, along with the global PACE Project, are intended to be of several years of duration. The long-term goal of this is to set up a solid framework for new teaching methodologies according to the European Convergence, but also appropriate for the peculiarities of each school/degree.

In the case of the Faculty of Computer Science, the main actions included in the program of the 2006/2007 academic year [6] are the following:

- Coordination of subjects' contents, both at horizontal (same year) and vertical (consecutive years) 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*.
- ECTS evaluation.
- Individual initiatives involving teaching innovation.

Among them, this paper describes the current status of the "ECTS evaluation" action at the FIV.

FROM THE SPANISH CREDIT SYSTEM TO THE ECTS

Ever since the introduction of the ECTS credit system in the Bologna process, Spanish universities have been required to estimate subjects in ECTS for exchange students, joint (international) degrees, etc. However, the syllabi in the current Spanish system measure subjects in *teaching*, not in *learning*, credits. In all the syllabi officially published so far in Spain, subjects are measured in credits, with each credit corresponding to 10 hours of actual teaching. Thus, the measuring system only considers *on-site activities*, that is, activities in which the teacher is present, including lectures, lab sessions, seminars, etc. *Evaluation activities* and *autonomous activities*, that is, any other learning activities independently carried out by students are, by definition, excluded from the subject measurement.

In this sense, the translation from Spanish credits to ECTS credits is not direct, as it is in other countries where the internal credit system is already based on student effort (as it is in Finland, for instance). The Spanish Ministry of Education has published what an ECTS credit is and the amount of learning hours that it implies [3], hence allowing universities to use it officially. However, it has not established (nor recommended) how a translation between the current system and the ECTS should be done, completely leaving this task to every institution (university, center, department). This translation can be performed in three different ways [4]:

1. *Multiplying by a constant factor*
2. *Considering the type of subject*
3. *Considering each subject independently*

The first solution considers a constant multiplying factor and uses it to convert all subjects. This factor is the relation between the maximum ECTS credits per academic year and the maximum credits per academic year of the current system: If an academic year comprises a maximum of 75 Spanish credits and a maximum of 60 ECTS credits, then the compatibility factor should be: 60 / 75 = 0.8. This is a very simple solution that keeps the proportion among all subjects defined in the syllabus, but it assumes that the student effort is independent from the subject.

The second solution performs a broad classification of the subjects in some different types, with each type having a particular amount of student effort (e.g. theoretical course, applied course, etc.). The advantage of this approach is that the student effort is better acquainted for than in the previous solution and hence the ECTS estimation is closer to reality. The possible disadvantages of this solution are first, that different universities teaching the same degree can elaborate different classifications, and second, that the proportion of credits of the subjects in the syllabus is not maintained.

The third solution is to consider each subject independently, as the best way of considering the particular student effort of each course. The problem with this approach is that the student workload of a particular subject depends on several different aspects (such as the knowledge/skills the students have before the course, the difficulty of the subject, the teaching and assessment methodologies used by teachers in class, etc.). So, it is necessary to perform a detailed study of all the subjects. For this reason, our University is starting a teaching innovation action that aims at evaluating ECTS.

ECTS EVALUATION ACTION AT UPV

The *ECTS Evaluation Action* is one of the actions promoted by the PACE program of the UPV [2]. In the previous academic year 2005/06, the action was carried out as a pilot experience for a short number of faculties and schools. In the current academic course, the action has been integrated in the program of all the faculties and schools of the University.

The purpose of this action inside the University is to get some feedback on the amount of effort our students devote to each subject, with the objective that this will help us in dimensioning the subjects of the new degrees (that will be expressed in ECTS credits only).

The action consists of a great-scale survey among teachers and students in order to register the student workload for each subject. The revision in detail of the actual student workload in the context of each subject will help us to propose an estimation of the ECTS credits of the subject. In addition, this study will allow us to find out potential differences between the real workload of a subject and the one estimated by the subject's teachers, to compare the workload of different subjects in the same course, to compare the workload of *similar* subjects, to establish correlations between the student effort and its academic performance, etc.

SAGAD

In order to tackle the evaluation of the student workload, the UPV has developed a web-based tool called SAGAD (*Sistema Automatizado de Gestión de la Actividad Discente*, Automatic System for Learning Activity Management) [5]. This application has been tested in some schools and our Faculty has begun to use it the current academic year. This tool is composed by three modules:

- Survey module: by means of this module, the students fill up the workload of their registered subjects on a weekly basis.
- Data module: it is used by the tool manager to perform a detailed follow-up of the surveys.
- Statistics module: it shows the statistics obtained from the data introduced by the students.

The *survey module* helps the students to fill up the workload of their subjects by means of a table (student record) that shows the status of the survey for each subject and week. The rows correspond to the registered subjects, while the columns correspond to the weeks in the semester (different colors in the columns distinguish between active and expired weeks). In each cell, a red point indicates that the survey for a certain subject/week has not been filled up yet (while completed subject/weeks are marked in green).

FIGURE 1
STUDENT RECORD SCREEN IN THE SAGAD WEB-BASED TOOL.

The weekly workload of each subject is further divided into several specific learning activities which belong to three different aspects:
- *On-site activities*: lectures, lab practices, informatics practices, field practices, seminars, tutorials, and other on-site learning activities.
- *Autonomous activities*: personal learning (exam preparation, library work, problem solving, etc.), preparation of reports, and auxiliary activities (clean up notes, library tasks, photocopies, others)
- *Evaluation activities*: report presentation, written or oral exams.

ECTS EVALUATION AT THE FIV

The scope of the ECTS Evaluation survey at our Faculty is the following:
- It is addressed to all the students registered in the two degrees of the FIV: Computer Science Engineering (CSE) and Information Science (IS).
- It tries to cover all the subjects of both degrees, including the three types of subjects in Spanish degrees: compulsory, optional and elective subjects.
- It is performed throughout the entire academic year: first semester subjects, second semester subjects and annual subjects.

The survey is confidential and the participation of the students is voluntary. In order to achieve a significant estimation of the workload of the students it is very important to get a high participation of the students in this action. To do that, the Faculty started during the first weeks of the academic year an information campaign. The aim of this campaign was to inform the students about the purposes of this innovation program, the process of European Convergence, the characteristics of the survey and the procedure to fill up it. This campaign consisted of information talks in all the groups of both degrees. The campaign was reinforced with informative emails and posters, and the talks were repeated in those groups with an initial low participation.

Table 1 shows some statistics about the participation index. The Faculty has achieved a very high initial participation, especially in the CSE degree. A total of 467 students decided to participate in the program: 31 students of the IS degree (15% of the total) and 436 of the CSE degree (39% of the total). The majority of the subjects of the degrees are taken into account in the survey. In the CSE degree, the average of participant students for compulsory subjects is 99. These statistics make us think that the results of the survey will be significant, because they can gather data from students with different particularities.

TABLE I
STUDENT PARTICIPATION IN ECTS EVALUATION AT FIV (2006/2007)

	CSE	IS
Total number of students at the degree	1,120	207
Number of participants (%)	436 (39%)	31 (15%)
Total number of subjects at the degree	118	43
Number of surveyed subjects (%)	114 (97%)	30 (70%)
Average of students per subject	38	9
Average of students per compulsory subject	99	15

The students have the agreement of completing the entire survey, that is, they have to fill up the workload for all their registered subjects during all the weeks of the academic year, including the teaching period, the evaluation periods and non-teaching period. As compensation, the Faculty will recognize this dedication as the equivalent to 2 credits[5].

The procedure to fill up the survey is the following. By means of the survey module of the SAGAD tool, the student has to introduce the workload for the subjects that are "active" in the application. That is, all the subjects in which the student is currently registered and which the student has not yet passed. As mentioned above, this is done in a weekly basis. The deadline to record the workload data for a certain week is 21 days after this week. This deadline corresponds to the teaching period, while it is extended to 35 days during evaluation or non-teaching periods, in order to facilitate the filling up of the survey. The students receive a weekly email that reminds them the next deadline.

By means of the *data module,* the SAGAD manager can perform a follow-up of the student surveys. Weekly, the

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[5] In the current Spanish syllabus, the students have to complete their curricula with a limited number of credits of elective activities and/or subjects.

students that have some incomplete (expired) weeks receive a email to remind them to fill up the missing information. Moreover, the application detects potentially wrong data: students that systematically fill up their survey with total hours equal to zero, too much hours per week, too much teaching hours, etc.

The aim of this close monitoring is preventing the students to give up the program. At the end of the first semester, only 30 students have given up. About a 70% of the students that remain in the program usually complete their weekly workload before the deadlines.

PRELIMINARY RESULTS

At the moment of writing this paper, we only have partial statistics of the first semester subjects until the exam date. You can take into account that the students that have not passed the exam must keep on filling up the survey for the corresponding subjects until they are passed. Hence, the results and conclusions we will present here should be considered as preliminary.

In Table II, it can be observed that the mean of surveyed students per subject is quite high, particularly for CSE degree. For example, the mean of surveyed students per compulsory subject achieves a 50% in relation to the registered students. Due to the fact that, at present time, the participation is more significant in CSE than in IS, from here on we will only show the results for the CSE degree.

TABLE II
STUDENT PARTICIPATION PER SUBJECT IN THE FIRST SEMESTER

		CS	OS	ES	All
CSE	Number of surveyed subjects	10	40	8	58
	Average of participant students per subject	90	13	8	26
	Average of registered students per subject	178	40	27	64
IS	Number of surveyed subjects	7	6	2	15
	Average of participant students per subject	13	7	2	9
	Average of registered students per subject	47	22	2	34

The first part of our analysis is the mean workload in relation of the type of subject (Figures 2, 3 y 4). Please notice that these charts summarize subjects with different on-site workload[6]. It can be observed that the workload of compulsory and optional subjects is distributed in a similar way. The student approximately devotes the same time to on-site than to autonomous activities. It could be conclude that, on average, the student devotes an hour of autonomous work for every teaching hour. Elective subjects require less effort by the student, maybe because the evaluation of these subjects uses to be performed by means of writing reports, usually performed in student groups, and so the student devotes less time to individual study.

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[6] In our syllabi, semestral subjects normally have 6 credits (60 on-site hours) or 4.5 credits (45 on-site hours). The weekly schedule of subjects supposes a 15-week semester. However, in practice, all hours can not be scheduled along the semester (because of holidays, for instance). As an example, the first semester of the current academic has only included 13 real weeks, which means that a 6-credit subject can have a maximum of 52 teaching hours.
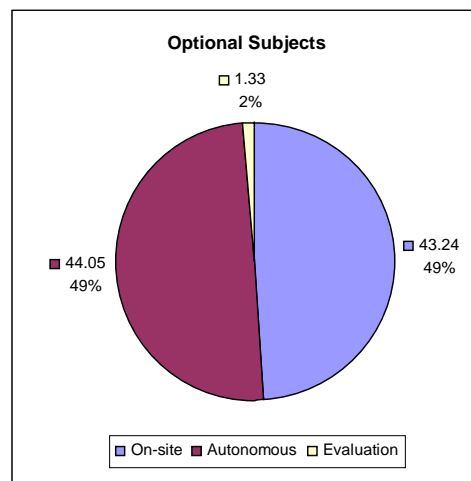

FIGURE 2
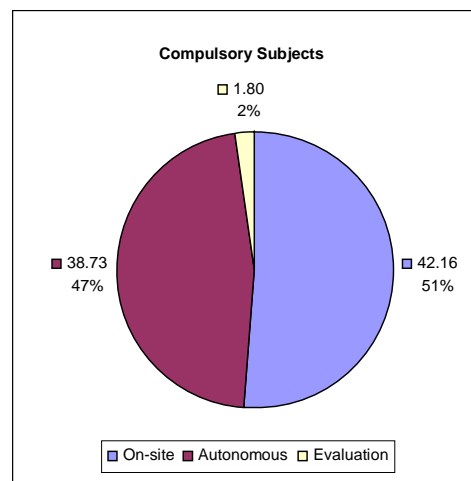HOUR DISTRIBUTION PER *OPTIONAL* SUBJECT.

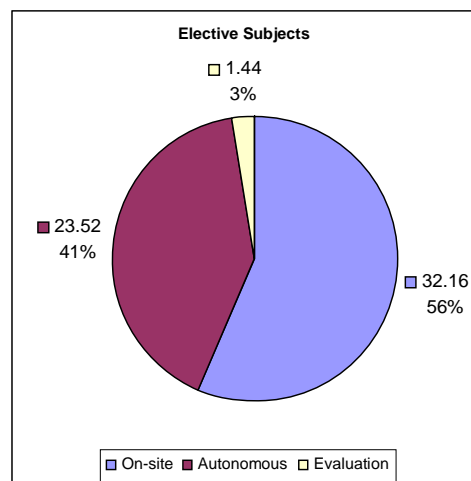FIGURE 3
HOUR DISTRIBUTION PER *COMPULSORY* SUBJECT.

FIGURE 4
HOUR DISTRIBUTION PER *ELECTIVE* SUBJECT.

The second part of our analysis is to study the workload distribution per year. The results, presented in Figure 5, suggest that the two last years in the degree present a significant difference when compared with the first three

years[7]. This difference lies in the autonomous workload, and, maybe it is caused because the last subjects in the degree use to include more practical issues.
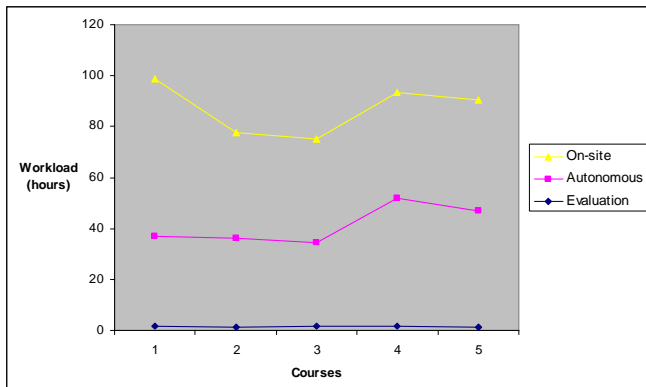

FIGURE 5
HOURS PER SUBJECT IN COMPUTER SCIENCE DEGREE.

The third part of our analysis is centered in detecting the subjects that require the students to devote more effort. Figure 6 shows the ratio between autonomous and on-site activities per subject. The mean ratio is 0.97 with a standard deviation of 0.31, which is close to the results presented in the previous charts. Nevertheless, in some particular subjects, the autonomous workload doubles the on-site one. This can be because to several reasons that the Faculty should analyze: it could be that the subject is presenting a significant difficulty for students, or that teachers are demanding too much practical works or report preparation to their students.
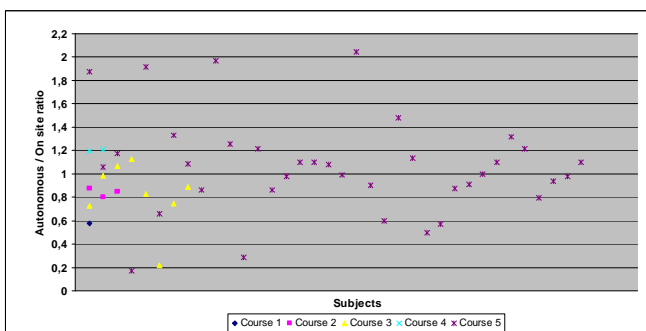

FIGURE 6
AUTONOMOUS / ON-SITE RATIO PER SUBJECT AND YEAR

The fourth and final aspect of our analysis is to detect differences of student workload (and hence, of total workload) in subjects which are equally defined in terms of Spanish credits, in order to find out the best way to translate these credits to ECTS credits. As we mention above, the simplest solution for this translation is by multiplying the Spanish credits of subject by a constant factor (0.8). At first glance, Figure 6 shows that this is not a suitable solution, because there are subjects that require much more effort than others. In order to be precise, this comparison has to be done with "similar" subjects. Below we present a pair of specific cases concerning subjects of the same type, with the same

amount of credits in our syllabus and with a similar number of participants (in the survey).

Figure 7 shows the comparison between two compulsory subjects of 6 credits (60 teaching hours): subject C2 almost doubles the workload of subject C1. On the other hand, Figure 8 compares the workload of two optional subjects of the same course. In this case the difference lies basically in the autonomous workload dedication. O1 and O2 subjects have 6 credits in our current syllabus that correspond to 4.8 ECTS credits, if we apply the conversion factor mentioned above. Assuming a ratio of 25 hours per ECTS credit, the workload estimated by the students is 5.2 ECTS for O1 and 1.98 ECTS for O2[8]. These examples show that this direct translation does not reflect the particularities of every subject.
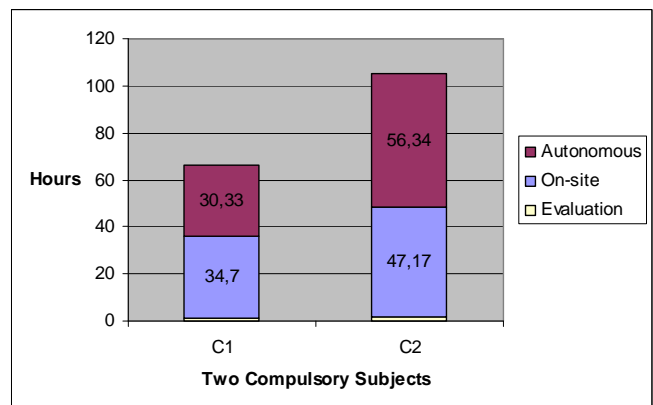

FIGURE 7
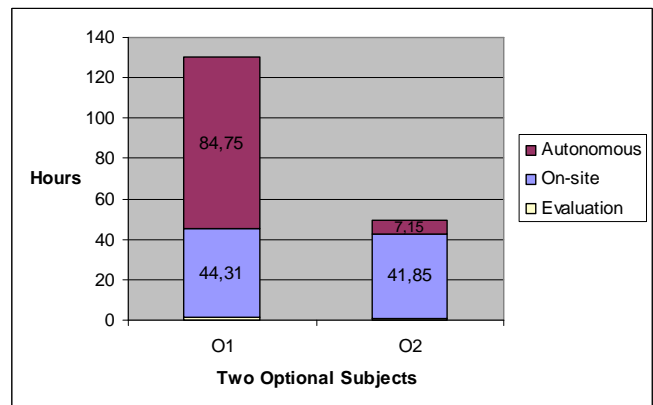COMPARISON BETWEEN TWO COMPULSORY SUBJECTS.

FIGURE 8
COMPARISON BETWEEN TWO OPTIONAL SUBJECTS.

CONCLUSIONS

We think that a detailed study of the workload survey that has been preliminary presented in this paper can help us at the FIV in several ways.

First, Spanish universities, and UPV in particular, have not yet enough experience in the definition of ECTS-based syllabus. So the ECTS estimation can be very useful in the designing of the new degrees. Not only to measure the subjects in ECTS, but also to schedule the subjects

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[7] The result for the first course is not significant because only a subject was surveyed at the moment, and it was a subject with 9 credits (90 hours).

[8] Remember that these are preliminary results. We would have to sum up the autonomous dedication along the second semester of the students that fail the first exam of the subject.

throughout the syllabus. For instance, if subjects in a certain semester are clearly overloaded, the syllabus can be rearranged in order to balance the workload along the academic year.

Second, teachers can better understand ECTS, and so they could define teaching activities taking into account the real workload of their students.

Third, this study will allow us to find out potential differences among similar subjects. That is, subjects with the same theoretical and practice teaching hours should need similar autonomous dedication. The Faculty could perform specific actions or recommendations to the subjects with a significant deviation.

And fourth, from the student perspective, they can compare their dedication in each subject along the year with the rest of students. This can help them to find out which activities should be reinforced and to better organize their individual dedication.

ACKNOWLEDGMENT

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