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# INTRODUCING THE STUDENT COMPETENCY PORTFOLIO IN THE CASTELLDEFELS SCHOOL OF TECHNOLOGY (EPSC)

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## **Abstract**

The Castelldefels School of Technology (EPSC) of the Technical University of Catalonia (UPC) has made significant steps toward the adaptation of their telecommunication studies and subjects to the new student-centred paradigm of learning proposed by the European Higher Education Area (EHEA). Among other initiatives, the introduction of the EPSC student competency portfolio, which in the end will adopt the appearance of a personal web page hosted by the school, represents a remarkable and worthy experience we want to report.

The EPSC student competency portfolio consists in an structured collection of samples and study materials to show explicitly that our students have acquired practice during their career in the following transversal abilities: 1) working in teams; 2) working in projects; 3) oral and written effective communication; and 4) autonomous or self-directed learning. In addition, they also must show ability in: 5) scheduling and managing their studies with efficiency. Therefore, the student e-portfolio will be both, a tool which will help them to think and reflect about their own learning and how to improve it, and a tool to accredit to future employers the professional skills embedded within the degree.

## **Conception of the student competency portfolio**

The Castelldefels School of Technology (EPSC) has led many initiatives toward the adaptation to the EHEA and has a reputation for excellence in teaching innovation and quality as reported in our web site [1]. One of the most challenging ideas is the implementation of the student competency portfolio from preliminary pilot experiences that are under way since 2005 [2]. We plan to introduce the portfolio in the next reform of the study plan programmed for the year 2008, as a compulsory activity that has to be accomplished by all our students before graduation. Our own judgement from the experiences and the literature review on the subject [3, 4] shows that the portfolio, and specifically, the electronic portfolio, will become a remarkable tool to express what has been learned in the career.

From the professional point of view, the portfolio will demonstrate the ability of our students to:

1. Work in teams: organize and pilot meetings effectively; produce creative and feasible ideas; group conflict solving; active listening; arrange and carry out working plans for the group; assess group behaviour; establish norms; and decision making.
2. Work by projects: Establish project objectives and development plans; project time management; project tracking; use project management software; assess project results; produce creative and feasible ideas; group conflict solving; and active listening.
3. Communicate effectively (oral and written): Write scientific and technical texts, papers, communications, technical reports and product datasheets using a clear and effective language; make good oral presentations using the blackboard, multimedia software tools, pictures and graphics and nonverbal communication (posture, gesture, facial expression, eye contact); synthesize introductions and conclusions, ideas, and express them efficiently depending on the space and time availability.
4. Learn autonomously: Determine what has to be learned and establish clear goals; search, classify and select relevant information in papers, books, web sites, databases, etc.; assess the

weak and strong points of the own self-directed learning process; self-assess the own work and comply with deliverable deadlines while managing study time.

In addition to the four previous skills, the student must include another competency related to the way he or she is scheduling their studies and managing their study-time, involving considerations such as the number of subjects taken and passed per year:

5. Ability to plan effectively their studies: Identify with precision the causes of a good or bad academic progression; select the number and type of subjects to enrol in a given semester, attending the own capabilities and personal circumstances.

Indeed, such a portfolio could not be considered in any way, if a traditional teacher- centred learning system based exclusively in lecturing were the norm in our school. If such were the case, you would be able to collect only proofs of individual technical knowledge, normally using the results of examinations. Our competency portfolio pretends to go far beyond. So, obviously, in order to facilitate the harvesting of learning evidences related to the five skills, a major change in learning methodologies has to be planned in practically every subject of the career. Such was the main aim of the pilot plan for convergence towards the EHEA: the systematic introduction and development of student-centred learning methodologies [1]. The five aptitudes to be learned are transversal to all the subjects and, therefore, are not linked to a particular matter or course. The idea of concentrating the portfolio development in a few subjects, creating for example specific courses such as: “oral and written communication techniques” is not a good proceeding. We plan, instead, to distribute for basically all the core and elective courses the transversal learning objectives that will demonstrate ability in some particular point to be collected in the future in the portfolio.

### **The new student-centred subject curriculum**

The approach that will make possible to produce data and facts that would show student competency in some of the transversal skills, will consist in programming every core subject of the studies with some embedded transversal learning objective in addition to the more specific ones. Our idea is that the inclusion of one or several transversal objectives in a conventional subject will make room for more active and student-centred learning methodologies in the classroom, such as: cooperative learning [5], problem and project based learning (case study approach) [6], etc. We already count on the remarkable experience of a PBL-organized master of science in telecommunication engineering and management.

Our proposal is to establish per semester, and throughout each academic year, from freshmen to senior, a variety of teaching methodologies for sustaining a harvest of evidences for each one of the 5 skills to be included in the portfolio. For example, looking at the first semester (1A) of the telecommunications engineering career, some of the subjects can be structured generically as follows:

- Fundamentals of Physics: Cooperative learning. Base groups of three students to carry out the main tasks of the course instead of attending classic lecturers. Oral presentation using slides of some exercises. Write down some selected solutions using quality rubrics.  
(Oral and writing skills, team work)
- Components and Circuits. Cooperative learning. Problem-based learning based on real applications. Solving problems including simulation and laboratory verification. Video recording of an oral presentation. Group portfolio to classify and present the subject learning materials and deliverables as well as reflective thinking about the course.  
(Team work, oral skills, self-reflexion)
- Introduction to Computers. Case study. Puzzle for learning the basic programming theory and language. Structuring and programming a real application using commercial software.  
(Self-directed learning, work by projects)

Materials (finished or unfinished samples of writing, videos, photographs, application projects and slide presentations, peer or teacher assessed deliverables, self-assessment sheets, reflective thinking,

etc.) from all the three subjects can be selected at the end of semester as elements to be included in the student portfolio. Each student will be responsible for keeping their most interesting materials and rationally relate each one to any of the four professional oriented skills.

Another example of active learning can be found in [7] and [8], where the 1B-semester Digital Electronics subject is described in detail. In this course, a cooperative and problem-based learning approach is running since year 2002, and many active methodologies and techniques have been experimented: real-world oriented problems; design of a final application; puzzles to learn theory and discuss critical points; continuous formative assessment without final exams; content and language (English) integrated learning; and a group portfolio. As in other similar subjects, students collect in this course meaningful material and gain experience towards the achievement of their final competency e-portfolio.

The final fifth competency, the ability to plan effectively the career will be in charge of the students' academic advisors or tutors. They will ask the students for: group meeting and one-on-one interview records, questionnaires about academic progress and other considerations related to subjects.

### **The portfolio structure and assessment**

The portfolio will be built throughout the studies and delivered in three revisions:

- Revision 1: After completion the selective phase or the firsts two semesters
- Revision 2: After completion of all core and obligatory subjects
- Revision 3: Before graduating after the oral presentation of the diploma thesis

The student's academic advisor will be the teacher in charge to assess each revision and suggest feedback to improve it when necessary. Students will receive free elective credits after finishing portfolio revisions. A set of guides, templates and rubrics [9] must to be prepared for developing and (self-)assessing the portfolio. The common elements for the first's two revisions will be, fundamentally:

- A two-pages length written report which will include:
  - What has been learned and in which way, with reference to the competency
  - What has to be improved and in which way to produce better results for the next revision
- A set of representative materials and evidences to document what has been said in the report for each one of the competencies.
- A control sheet where to annotate the major points or changes discussed with the advisor

### **Electronic implementation as a web page**

For the third and last revision which is the most important one, the main focus will be to generate an electronic portfolio following when possible the same structure, pedagogy and assessment as the paper portfolio [4] developed in the previous revisions. Our aim is to convert the student "learning portfolio" into a "showcase e-portfolio", which students can use when applying for employment. Therefore, some decisions have to be made in several directions:

- Which will be the software to produce the final version of the e-portfolio? We have to decide whether open source software is more convenient than commercial tools.
- Where will be the student e-portfolio located? School technicians and computers will support the project, but, how long our former students will need our support for hosting and updating their e-portfolio?
- Will all our students use the same template and style guide, or instead, everyone will be free to decide their own style? In which way such decision can affect the final e-portfolio assessment or for example the student's creativity?

- By which means can we evaluate the success of the student e-portfolio once running and used by former students and their employers? Which is the way to get feedback?
- In which way can we instruct our former students to readdress their learning-oriented portfolio into a lifelong career and professional e-portfolio?

At that point, one can see the need to make further research on the subject and locate which similar initiatives are under way in other technical universities around the world. For example, we belong to the “Network on e-portfolio” led by the Universitat Oberta de Catalunya (UOC) [10] which is interested in the investigation and the practice of e-portfolios in Spain. In our university, the UPC, we pretend to develop and promote a “hot topic of interest” around the feasibility of embedding the e-portfolio into our student’s curriculum. This is the main aim of the "Student Portfolio Group (GPoE)" [11], recently funded by the Catalan Government and led by ourselves.

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