

# STEP, a new Program for Excellence in Sustainability at the Technical University of Catalonia UPC



**Antoni Grau and Yolanda Bolea**

*Technical University of Catalonia, antoni.grau@upc.edu, yolanda.bolea@upc.edu*

Nowadays, society needs a change of paradigm towards a sustainable society. It is an urgent change that requires a commitment by all the involved agents. To achieve this change, higher education plays an important role and, specifically, scientific and technological education has a huge responsibility with its transformative role. Graduates in technology must contribute with effective solutions to the present environmental problems and with new means of production to cover present and future needs for humankind, means that allow to reach and to maintain a fair and sustainable society [1].

The scenario and methodologies that inspired the Bologna Process in Higher Education should present a deep renovation: the integration of transversal competences together with the generic competences, as well as to advocate for an education focused on the student's autonomy. Regarding the European Higher Education Area (EHEA) and in front of the environmental crisis, the Technical University of Catalonia, UPC, has included in all the Engineering Degrees' curricula the competence of "Sustainability and Social Commitment". In fact, in the frame of the 2nd International Conference on Engineering Education in Sustainable Development, held in Barcelona in 2004, experts in education, faculty, researchers and students that attended the conference approved the 'Declaration of Barcelona' [2], that enhances the importance of sustainable development in Technological Education and, at the same time, stimulates Higher Education institutions in the engineering field to progressively adopt its objectives for sustainable development in concrete actions.

In a fragment of the "Declaration of Barcelona" it is stated that today's engineers must be able to:

- Understand how their work interacts with society and the environment, locally and globally, in order to identify potential challenges, risks and impacts.
- Work in multidisciplinary teams, in order to adapt current technology to the demands imposed by sustainable lifestyles, resource efficiency, pollution prevention and waste management.
- Apply a holistic and systemic approach to solving problems and the ability to move beyond the tradition of breaking reality down into disconnected parts.
- Participate actively in the discussion and definition of economic, social and technological policies, to

---

**"The scenario and methodologies that inspired the Bologna Process in Higher Education should present a deep renovation: the integration of transversal competences together with the generic competences, as well as to advocate for an education focused on the student's autonomy."**

---

help redirect society towards more sustainable development.

- Apply professional knowledge according to deontological principles and universal values and ethics.
- Listen closely to the demands of citizens and other stakeholders and let them have a say in the development of new technologies and infrastructures.

In view of the need of educating engineers with this profile of excellence in sustainability, the UPC established the Sustainable Plan 2015 [3]. This plan has two main objectives: first, a new approach to a sustainable University administration (campus life, education and research) and, second, the need to reinforce the sustainable role of the University. This strategy was oriented towards a deadline, year 2015, the same year that the United Nations had set to achieve the Millennium Development Goals, as well as the end of the UN Decade on ESD (2005-2014). It allowed a long enough time period to introduce deep changes in education, but it was also short enough to bear witness to the results. In order to include Sustainability and Social Commitment competence in faculties' organizational forms (master classes, practices, autonomous students work...), some pedagogical resources had to be provided.

Embedding sustainability within the curriculum does not only mean including new content. If engineers are

to contribute truly to Sustainable Development (SD), sustainability must become part of their paradigm and affect everyday thinking. This, on the other hand, can only be achieved if SD becomes an integral part of engineering education programs, not a mere 'add-on' to the 'core' parts of the curriculum.

There are many drivers and barriers identified [4] when trying to embed sustainability within the curriculum, and many attempts have been carried out at technological universities in order to achieve this goal. There are mainly four strategies applied: First, a compulsory course for all graduates at the 1<sup>st</sup> Cycle (Bachelor) level. Second, a minor or track on SD in both the 1<sup>st</sup> and 2<sup>nd</sup> Cycle studies; assuring the introduction of SD in the final thesis project of graduation and finally, and most challenging, intertwining sustainability in all the subjects/courses of the curriculum.

Despite all these barriers, UPC Sustainable 2015 Plan, seeks for the excellence in sustainability education in its degrees, and a new program has been developed: Sustainable Technology Excellence Program 2015 "STEP 2015". This program is supported by the strong commitment from the university board in Sustainability education (a new competence in "Sustainability and Social Commitment" is compulsory to all degrees at UPC), and takes advantage of the great opportunity that the "European Higher Education Area" framework offers (all courses must be redesigned in order to fulfil the EHEA requirements).

The STEP 2015 main goals were:

- To design compulsory courses in each degree.
- To develop the conceptual base and identify reference models in sustainability for all specialties at UPC.
- To create an internal interdisciplinary network of faculty and students from all the schools.
- To initiate new transdisciplinary research activities in technology-sustainability-education.
- To spread the practical knowledge attained.
- To achieve international scientific excellence

in technology-sustainability-education and to graduate the first engineers/architects of the new EHEA bachelors with sustainability as a generic competence.

The STEP program had four phases: design (2009), pilot plan (2010), spreading phase (2011-2013) and consolidation (2014-2015). To design such a program, first the situation in the university was analysed in order to identify the internal drivers and barriers, and the abovementioned objectives were set for the program. There would be a Coordination team responsible for stimulating and encouraging the network, to ensure coherence of actions promoted and always have an overview of context, both internal and external, that allows evaluating the progress of the program based on the goals previously established. The members are the Vice-rector of Sustainability, and four experts on engineering and sustainability education, one leading the team. Then, the goal of the STEP network is to generate a critical mass of people interested and qualified, who can positively influence the consolidation of knowledge networks, to stimulate the intellectual capacity and to promote interdisciplinary dialogue. In this network each school is represented by two members, one from the school board and the other an interested and qualified teacher/professor. They would be responsible for stimulating, promoting, and/or organising activities within their school. Moreover, two interns would support the activities and open possibilities of active participation of the students of the school.

The pilot plan relied on creating internal networks of sustainability education at the schools, which deal with the short term goals of the program. At this stage it was decided to reduce the number of participating schools in the program in order to have a closer supervision and assessment of the process. A call to all UPC schools was made and finally there were five schools selected taking into account their application and trying to have a diverse spectrum of schools from UPC (our University has 17 schools and 6 associate schools with similar degrees but placed in different cities).

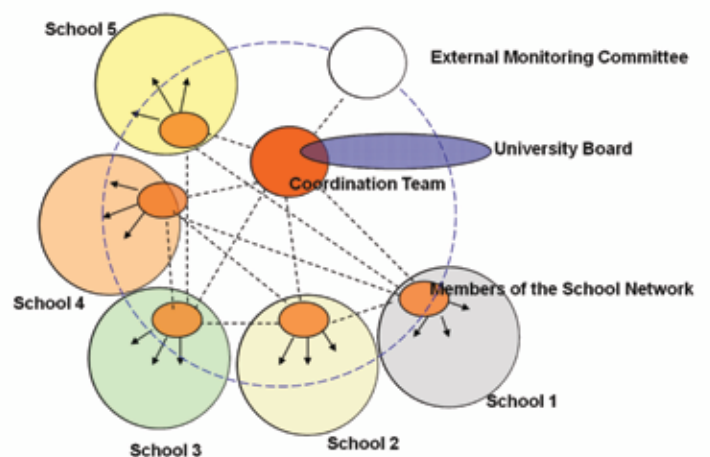
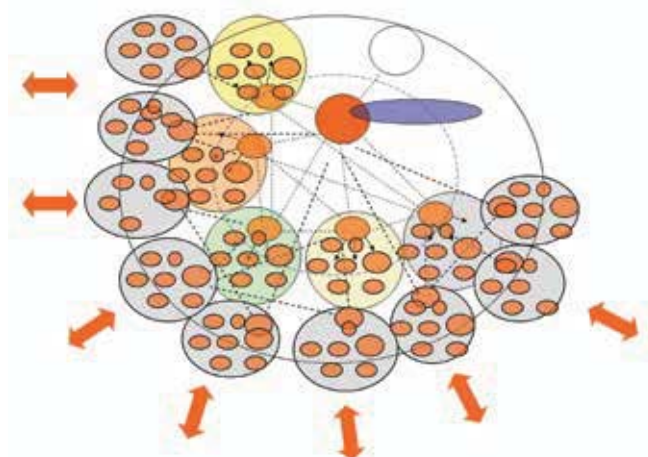


Fig 1. Initial structure of schools in the STEP pilot phase 1 (Left) and consolidated structure of schools in phase 3 (right).

From the lessons learnt in the five pilot schools, during the upcoming phases all the know-how attained in the process would be spread out to all schools in order to ensure that all UPC graduates acquire the competence in sustainability and social commitment. The expansion phase started in January 2011 selecting new schools to participate in the program while keeping the pilot phase schools. In total in this phase there were ten schools. Finally, in the consolidation stage all 26 UPC schools are involved. Figure 1 shows the internal structure of the network and the relationship among Schools and the Coordination team: at the pilot phase (left) and at the consolidation phase (right).

The STEP program itself is finished but the actions are developing [5]. After the consolidation phase, we are currently increasing and correcting the know-how developed within all the University schools of engineering and architecture. From the conclusions collected from each school some lessons learn can be stated:

- Leadership from the university board is necessary to support and to fund this kind of program.
- Leadership at each school has shown to be very important in order to involve faculty in the networks.
- The strategy of not applying a top-down approach and let the schools to organise themselves and propose their own activities proved successful (once a school was engaged it never gave up the program).
- The creation of internal networks linked to an overall network has facilitated the communication and spread of information.
- Students get really involved in the program, creating their own programs.
- At all the schools there were already some faculties teaching sustainability concepts, although basically

related to soft sustainability: environment protection and energy efficiency.

- Some faculty would find the program very interesting and were eager to participate: The main barrier is to involve the non-interested faculty, due to lack of incentives.
- There is still a lack of transdisciplinarity within the schools to be overcome in future actions.

The STEP program has been very successful in terms of making sustainability comprehensive to the faculty and to catalyze the introduction of the compulsory competence of Sustainability and Social Commitment to all UPC degrees.

## References

Blaze, P. et al., "Introduction: Higher education for sustainable development", Higher education Policy, 2002.

Declaration of Barcelona, 2004, <https://www.upc.edu/eesd-observatory/who/declaration-of-barcelona>

The Plan Sustainable UPC 2015. Available at: [http://www.upc.edu/sostenible2015/upc-sustainable-2015/upc-sustainable-plan-2015?set\\_language=en&cl=en](http://www.upc.edu/sostenible2015/upc-sustainable-2015/upc-sustainable-plan-2015?set_language=en&cl=en) <accessed 7th June 2011>

Holmberg J., and Samuelsson B. (Eds.), Drivers and Barriers for Implementing Sustainable Development in Higher Education, UNESCO, Paris.

STEP program, <http://www.upc.edu/sostenible2015/step> <accessed February 2016, in catalan>