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INTERNATIONAL DESIGN PROJECT SEMESTER

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ABSTRACT
Sustainability and Internationalization are key factors within educational programmes and institutions nowadays. Offering programmes which focus on these factors at undergraduate level has been a priority at the School of Engineering of Vilanova i la Geltrú (EPSEVG) since the introduction of the European Project Semester (EPS) in 2008. In line with its policy to increase Internationalization and Sustainability in its programmes, the School of Engineering of Vilanova i la Geltrú (EPSEVG) has designed and coordinated a new Erasmus mobility programme, the International Design Project Semester (IDPS), which started in February 2012.
IDPS trains engineering students by applying Project Based Learning in intercultural groups. The working language is English and the programme is designed for degree students in their 7th or 8th semester. The IDPS programme offered at the EPSEVG emphasises the introduction of competences in sustainability and human technology.
The main objective of the IDPS is to improve the learning outcomes and competences of industrial design engineering students especially in areas of sustainability. It is divided into two parts. One part covers four three (ECTS) credit core courses in specialist fields of study such as Eco Design , Human Centred Design , Sustainable Value Design and Visual Language and Grammar and the second part involves working on a project (worth 18 ECTS. Additional seminars and workshops compliment the courses and vary from programme to programme. The projects are proposed by local companies and research groups. This paper shows the design methodology used in the IDPS programme its structure and the sustainability competences to be achieved by the students.

Keywords: Design, sustainability, internationalization, project based learning, blended learning

1 INTRODUCTION

We need a fundamental, transformative shift in thinking, values and action by all society's leaders, professionals and the general population if we are to follow a path of sustainable development. To quote Albert Einstein [1]: "The significant problems we face cannot be solved at the same level of thinking we were at when we created them".
Society needs scientists, engineers, managers and politicians who can shape the systems of our society in a way that sustains, rather than degrades the natural environment and enhances human health and well-being [2]. In this context higher education institutions have the responsibility to produce graduates that have achieved both the moral vision and the necessary technical knowledge to assure the quality of life for future generations. Sustainable development therefore, must be the framework in which higher education has to focus its mission [3].
Since 1991, the Technical University of Catalonia, Barcelona Tech (UPC) has aimed to introduce Sustainability Education in all its engineering and architectural programmes through two environmental plans (1996-2000, 2000-2005), and currently through the UPC Sustainable 2015 plan [4]. Under this framework, and following the success of the European Project Semester (EPS) programme [5], the school of Engineering of Vilanova i la Geltrú (EPSEVG) has designed and coordinated a new Erasmus mobility programme, the International Design Project Semester (IDPS).
IDPS trains engineering students applying Project Based Learning (PBL) and Blended Learning (BL) in intercultural groups. The working language is English and it is designed for degree students in their 7thor 8th semester. The IDPS programme offered at the EPSEVG emphasises the introduction of competences in sustainability [6], eco design and human technology.

There are many documents referring to the competences in sustainability that students should have when graduating in higher education institutions ([7], [8], [9], [10], [11],[12], [13]). Within the field of engineering there is a reference document which includes the Barcelona declaration [14] approved during the celebration of the Engineering Education in Sustainable Development (EESD) conference in 2004 which declares 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.
- Understand the contribution of their work in different cultural, social and political contexts and take those differences into account.
- 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 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

2 IDPS AT UPC BARCELONA TECH UNIVERSITY

Design Semesters have been popular in many Higher Education Institutions for some time; Delft Technical University, in The Netherlands offers a minor in sustainable design for master students [15] and IHK in Denmark offers International Design programmes [16] at bachelor level. However, it was felt (at the EPSEVG) that a keener focus on sustainability in bachelor programmes was needed and would more adequately provide students with the competences required of them by our current society. The IDPS is a unique programme in this respect, is totally adapted to the European Higher Education Area and is suited to Industrial Design Engineering students in their 7th /8th semester. In brief, the programme has the following characteristics:

- It is international and multicultural;
- It is for Industrial Design Engineering students;
- English is the working language;
- It addresses the real needs of companies;
- It is an intensive, one-semester programme;
- It is worth 30 ECTS credits;
- It works out the Sustainability competences.
- It combines both presential and non presential teaching methods (blended learning).

Table 1. Courses and Project

Core Courses	**ECTS**
Sustainable Value Design	3
Eco Design	3
Human Centred Design	3
Visual Grammar and Language	3
Project	
Smart Kitchen Storage Utensils	18
TOTAL	**30**

The IDPS has two complementary parts:

Part one - Project (18 ECTS): During the semester and under the guidance of an academic tutor, an international team of four to six students works on a real-life project for a company. The teams are made up of students from an Industrial Design Engineering background. Individual and group tutorials are offered during the semester.

Part two - Core courses (12 ECTS): Four courses are offered (Table 1). Students are awarded 3 ECTS for each of them.
Moreover some short intensive practical workshops on topics related to sustainability, advertising, product system services etc. are also offered to broaden the students' vision on sustainability and to enhance the work related to the project. These complementary workshops help students develop their communication and cooperation skills. Optional courses in Spanish and Catalan language are available.
The projects are real-life projects proposed by companies. The project proposals from the companies must meet the following criteria:

- Sustainable in focus
- Complexity: final year Bachelor students should be able to carry out the project
- Difficulty: the project can be completed in 15 weeks
- Supervisor: the company has to provide a supervisor and facilitate all the information needed to carry out the project in English.

The programme lasts 15 weeks and the final week, week 16, is given over to evaluations, examinations and oral presentations: students deliver their assignments for the courses, submit their final report –scientific paper- and a poster on the project and present their conclusions orally in front of a scientific evaluation committee.
The courses are split into two main blocks; one at the beginning of the semester and the other towards the end of the programme. The interim period allows students time to continue developing the project, attend the additional workshops and seminars and interact with the course teachers using any of the virtual platforms available- the digital campus, Skype and Wikis etc.

3 IDPS 2012. PILOT EXPERIENCE

The EPSEVG has previous experience in organizing project semesters. The EPS started 5 years ago is now highly successful with over 70 foreign students from 13 different institutions having participated in it. The organizational skills involved in designing and creating the EPS were put to good use in the design and implementation of this new programme, the IDPS.
Another success of EPS was the participation from the university community as a whole. This participation has been consolidated and extended with the IDPS. Not only have over 50 PDI and PAS been involved in the design and implantation of the project, it has also reinforced our commitment to internationalize the school with an increased number of lecturers from partner universities involved in IDPS 2012 (table 2 and 3). Like the EPS, the IDPS is run entirely in English, which emphasises its international focus.

Table 2. Core courses offered by teaching staff from partner universities in IDPS 2012

Home Institution	**Course**
Artesis University , Antwerp , Belgium	Sustainable Value Design
Ideal & Co, Delft, The Netherlands	Eco Design
Nottingham Trent University, UK	Visual Language and Grammar

Table 3. Workshops and Seminars by teaching staff from partner universities in IDPS 2012

Home Institution	**Seminar/ workshop**
Hochschool Groningen, The Netherlands	Conceptualization and Design

The IDPS has been introduced to coincide with students currently studying Industrial Design Engineering and Product Development at the EPSEVG. The IDPS will give these students the opportunity to complete an International programme either at the EPSEVG or at one of the partner universities offering similar study plans.
The EPSEVG ran its first IDPS programme in spring 2012. Five Industrial Design Engineering students from three different nationalities participated and a further 6 members of the teaching staff at EPSEVG benefitted from attending the courses.

4 RESULTS

The IDPS has been created and designed and the inaugural programme started in February 2012. The webpage [17] and course book have been designed and objectives have been met in terms of student registration and collaboration with partner universities. An essential objective of the inaugural programme was to equip EPSEVG teachers with the skills required to teach the core courses in the future. This has been done by ensuring participation from experts in the fields of eco design, sustainable value design and visual language and by offering specialized CLIL (Content and Language Integrated learning) language courses.

Participating students were asked to complete questionnaires to provide the EPSEVG with feedback on the course and to show where improvements could be made. The questionnaire used is the Students' Evaluations of Educational Quality (SEEQ) questionnaire [18]. It measures nine distinct components of teaching effectiveness that have been identified in both student ratings and faculty self evaluations of their own teaching.

Table 4. Components of the SEEQ questionnaire

LEARNING / ACADEMIC VALUE
You found the class intellectually challenging and stimulating.
You have learned something which you considered valuable.
Your interest in the subject has increased as a consequence of this class.
You have learned and understood the subject materials in this class.
STAFF MEMBER'S ENTHUSIASM
Staff member was enthusiastic about teaching the class.
Staff member was dynamic and energetic in conducting the class.
Staff member enhanced presentations with the use of humour.
Staff member's style of presentation held your interest during class.
ORGANISATION / CLARITY
Staff member's explanations were clear.
Class materials were well prepared and carefully explained.
Proposed objectives agreed with those actually taught so you knew where the class was going.
Staff member gave presentations that facilitated taking notes.
GROUP INTERACTION
Students were encouraged to participate in class discussions.
Students were invited to share their ideas and knowledge.
Students were encouraged to ask questions and were given meaningful answers.
Students were encouraged to express their own ideas and / or question the teacher.
INDIVIDUAL RAPPORT
Staff member was friendly towards individual students.
Staff member had a genuine interest in individual students.
Staff member made students feel welcome in seeking help / advice in or outside of class.
Staff member was adequately accessible to students during office hours or after class.
BREADTH OF COVERAGE
Staff member contrasted the implications of various theories.
Staff member presented the background or origin of ideas / concepts developed in class.
Staff member presented points of view other than his / her own when appropriate.
Staff member adequately discussed current developments in the field.
EXAMINATIONS / GRADING
Feedback on assessments / graded material was valuable.
Methods of assessing student work were fair and appropriate.
Assessments / Examinations tested units' content as emphasised by staff member.
ASSIGMENTS / READINGS
Required readings/texts were valuable.
Readings, assignments, etc. contributed to appreciation and understanding of the unit.
BACKGROUND UNIT / CLASS CHARACTERISTICS

Unit difficulty, relative to other units, was hard
Unit workload, relative to other units, was hard
Unit pace was fast
Average number of hours per week required outside class: (time<5 hours = 1) (5 ≤ time < 10 = 2) (10 ≤ time < 15 = 3) (15 ≤ time <20 = 4) (20 ≤ time = 5)

Figure 1 illustrates the results from these questionnaires, where we can see the high level of satisfaction of student for all courses.

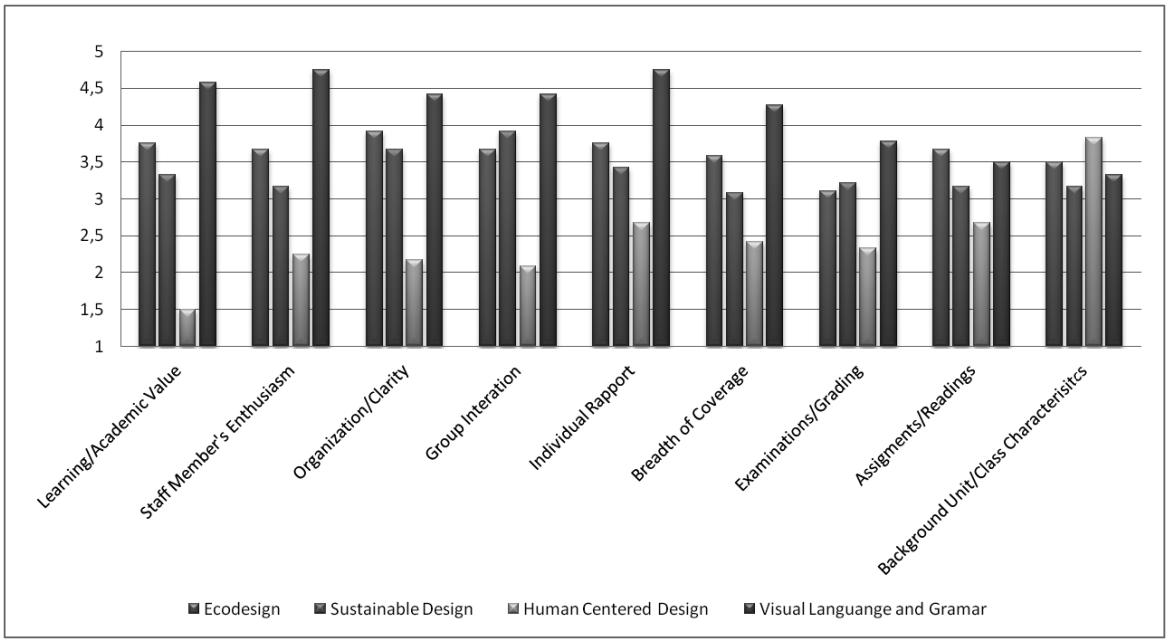

Figure 1. Courses evaluation by students (1-Totally disagree; 5-Totally agree)

5 CONCLUSIONS

Encouraged by the success of EPS, the EPSEVG designed, implemented and coordinated the IDPS and in doing so not only increased the international projection of the school but also reinforced its commitment to Sustainability throughout its educational programmes. Implementing such a programme in the current adverse economic climate was a challenge, but thanks to the involvement of actors from many different areas (students, faculty, administrative staff, the university board and the business sector) the programme has been a success. Goals have been set for the 2013 programme and include increasing student intake and creating a more equal balance of teachers from the school and abroad. We are confident these objectives will be met.

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