

Introducing development education in technical universities. Successful experiences in Spain.

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Abstract

This paper presents and analyzes main characteristics of successful experiences of Development Education (DE) introduced in two major Spanish Technical Universities (Technical University of Catalonia, TUC, and Technical University of Valencia, TUV) during nineties and beginning of twenty-one century.

In this paper, after a brief presentation of DE concept evolution and its links with sustainable development and education for sustainability, a classification of different instruments that the University owes to push DE activities is presented. This Proposal is based on the conclusion of the Spanish Committee of University Co-operation for Development (CEURI), re-elaborated by the authors of this paper.

After the overview of instruments, main characteristics of four strategies developed in the two Universities referred above are presented and discussed. These initiatives illustrate the feasibility and great potential of DE activities for introducing non-technical issues in engineering education. The initiatives highlighted are the following ones:

- Ethical codes such the Ethical Code of the School of Industrial Engineers of the Technical University of Valencia.
- Training of faculty/lectures and teaching innovation groups such the GREVOL group of Technical University of Valencia and the Interest Group of Collaborative Learning of the Technical University of Catalonia.
- Free elective courses in bachelor/master studies dedicated to international development aid and technology for human development as well as promotion of end of grade works and projects in both universities.
- Student mobility programs in coordination with technological-focused Non-Governmental Development Organizations, as Engineering without Borders Spanish groups, which are present in the two universities.

Keywords

Development education, technical universities, ethical codes, teacher training, development lectures, student mobility.

1. Development education and its relationship with sustainable development

Development Education (DE) is recognized as a specific tool of the international co-operation system by Spanish and Catalan laws and related co-operation for development master plans [1; 2]. The DE concept evolution is commonly divided in five stages, linked with corresponding co-operation for usual development strategies and a certain development paradigm [3; 4]. The definition followed here has been proposed as representative of the fifth generation: DE is considered as a strategy of international cooperation aimed at the citizens of the Northern societies, which main goal is the empowerment of people through a teaching-learning process, developing knowledge, skills and values, which enable them to become members of a global community of equals [5]. This definition includes global citizenship as a reference point of the educational process and highlights the importance of people agency to challenge inequalities both in local and global context.

Sustainable Development aims at "Meeting the needs of the present without compromising the ability of future generations to meet their own needs"(Brundtland, 1987). But a purely environmental approach is insufficient. A wider perspective is needed, which includes goals such as poverty alleviation, social justice and local and global connections [6; 7]. Therefore, DE is a crucial element for sustainability in engineering studies. Moreover, DE directly focuses on sustainability principles as intragenerational equity, respect for social and cultural freedom, involvement of stakeholders in decision-making processes, recognition of the unique contextual factors in each decision-making situation and responsibility for impacts resulting from one's decisions, five of the nine principles of sustainability [8]. Equivalently, DE focuses can be identified in questionnaires about sustainable development knowledge [9]. Finally, as development of humanity as a whole and especially of poor communities and countries can only be understood when it is put in context and linked with development of North students' societies, DE helps to link spatial and temporal scales, a key issue of sustainability understanding [10].

2. University instruments that facilitate the introduction of DE

In this section, we give a general description of the instruments available to universities to carry out development cooperation projects and their relationship with DE. This taxonomy is based on the University Strategy for Development (ESCUDE) [11], and other studies in which the authors had had a decisive contribution [12; 13].

2.1. Subjects of free choice or configuration.

The first instrument refers to complementary subjects in student education. Their content, duration and academic standing depend on the departments, schools and faculties; although in many cases the universities have allowed lecturers to make proposals freely, later validated by the institution. This situation has given rise to the appearance of development cooperation subjects based on DE pedagogic proposals. In our opinion, as we explain in the following section, free choice has been shown to be one of the most interesting options for the introduction of DE into universities.

2.2. Main, optional and compulsory subjects.

The main and compulsory subjects contain the basic degree curriculum, with the main subjects being common to all degrees recognised in Spain. Obligatory subjects are those that an individual school or faculty establishes as its own and which must be taken by all students. Optional subjects compose the options for specialising within degree courses.

Course activities that seek the introduction of DE in a transversal way can be included in this section. Here we should emphasise that universities often receive aid for educational innovation and this aid is usually designed to give priority to improving the most "stable" part of the state controlled teaching, i.e. the compulsory part of the curriculum. This situation could provide an opportunity for the transversal incorporation of DE.

2.3. End of grade works and end of grade projects.

These exercises are a compulsory part of the course: they may include exercises in applied research or development. Since these activities are usually practical in nature, interesting projects could be considered with North and South comparisons in order to promote the DE perspective.

2.4. Practice in public and private enterprises.

Throughout the student's university career, some of his credits may be obtained by working in public or private enterprises. A suitable strategy for the objectives of DE would be to give an incentive for this practice to be carried out in multilateral and non- government organizations dedicated to development.

2.5. Postgraduate studies.

There are diverse possibilities for introducing DE into postgraduate studies. On one hand, a transversal strategy can be defined, which, as in undergraduate studies, will aim to promote DE knowledge, skills and values in Master studies and different specialties. Another line of work is to consider DE in postgraduate studies as a professional qualification in international development and cooperation. In our opinion, if DE is incorporated into postgraduate studies, this could contribute to making future development professionals carry out their work with values that tend to create a democratic environment, fight against discrimination, help the disadvantaged and promote dialogue, progress and participation, all of which are basic principles which should direct the efforts of professionals in international cooperation [14].

2.6. Training of teaching and research staff and administration and auxiliary staff.

These are training programs offered by educational science institutes or similar bodies. As we shall see in the initiatives in the following section, the promotion of teaching innovation in teacher training based on concepts such as DE is a good strategy to increase the awareness in human and sustainable development in Universities.

2.7. PhD Thesis.

We refer to doctoral programs offered by research departments and institutes which end in developing a thesis based on original research work. In our opinion, therefore, the only possibility of introducing DE into this level of university education is to encourage the writing of theses based on DE itself.

2.8. R&D&I.

University research into DE is on a very small scale. This is mainly due to the shortage of public financing for lines of investigation into international cooperation and development. Besides demanding more financing for this field in general, we should emphasize that in the case of DE support could be obtained from areas close to education. DE also has ties with Education for Sustainability, or sustainable development, which, besides, receive further support from the area of environmental conservation.

2.9. Networks.

These are networks created by teachers, researchers and administrative staff on national and international scales with objectives in education, research and development. They appear to be a good instrument for directing the attention of the universities towards sustainable human development, since they would allow work to be carried out jointly with professionals from the South. However, the negative aspects that we have already mentioned concerning research are, in our opinion, serious obstacles to the formation of stable teams to work in the field of DE.

2.10. Technical assistance (Transfer of technology and knowledge).

This has to do with cooperation between universities and other public and private organizations, both national and international. Here again we have to point out the existing structural deficiencies for this transfer in the field of international development and cooperation. Few research resources are applied to the needs of local communities. Teaching, especially at the post-graduate level, is designed to suit the characteristics of the universities of the North. This inclines us to think that in this field also the combined efforts of public and private organizations involved in development are required to make advances. Interesting studies have been published in the form of consultations by NGDOs for certain public administrations, with the participation of university staff, which could be taken as good examples of the transfer of knowledge and technology from the university to other social areas. As

other authors have stressed, the ties with universities should not only be at the individual level but the role of the university in this field should be seen in academic circles [15; 16].

2.11. Mobility programs.

These programs are designed to increase the mobility of the members of the university community for reasons of teaching, research and administration. The AECI (Spanish International Cooperation Agency) has in recent years created programs of this type (such as INTERCAMPUS, absorbed lately by the Interuniversity Cooperation Program). We should point out that some universities have their own mobility support programs, while others participate in international volunteer programs (such as UNITes, created by the UN). Some NGOs have also started mobility programs between universities, which we shall examine in the following section. We consider this to be an interesting instrument but which should clearly include DE criteria, especially in the previous training and subsequent work activities of the participants.

2.12. Preparation and promotion programs for university participation.

Here we refer to information and promotion programs for volunteers directed to the university community. Many universities, using the structures that exist to encourage internal solidarity, organize activities to inform public opinion, such as conferences, campaigns, debates or exhibitions. They may also encourage the university community to take part in the activities of voluntary social, environmental, international solidarity or even linguistic organizations. Such activities are frequently carried out in cooperation with NGOs. When these voluntary activities occur within the framework of non-government regulated education (including initial training, follow-up and evaluation of the volunteer experience), they are often recognized by the assignation of credits to the students who request them, in conformity with the academic requirements of the schools and faculties.

2.13. Lobby activities.

These include those activities specifically designed to achieve a suitable institutional *ethos* for the human development objectives. This minority working environment has suddenly grown in the last year due to changes in the regulations with the coming into force of the Spanish Organic Law of Universities in 2001. The incidence activities possible within the university community are not only confined to the aspect of the regulations but can also include declarations and agreements between lecturers associations and university governing bodies or in adopting ethical codes or other similar initiatives designed to promote the values inspired in the Universal Declaration of Human Rights. In the following section, we will give some details on the ethical code adopted at TUV.

2.14 Documentation and publications.

This final aspect includes support to the documentation centers (real and virtual) as well as establishing policies of producing publications to support the introduction of DE and those that in general refer to the field of international cooperation and development. These instruments strengthen most of those others already mentioned and receive feedback from them. Involving university records and libraries is especially important, given their strong long-term impact on the community, even if it is also somewhat costly due to the operational conditions of the these institutions [17].

3. DE initiatives in scientific and technical Spanish studies.

In the following section, we present four specific initiatives which, in the opinion of the authors, cover a wide spectrum of the above-described instruments. They are also actions in which the authors have either taken part or on which they have reliable information, which makes it possible to highlight key aspects of their implementation. To obtain further information on these and many other actions carried out in the course of scientific and technical studies, we recommend the reading of proceedings of 2001, 2004 and 2006 editions of *University and Cooperation for Development* Spanish Conference. The fourth edition is due to come out in November 2008, edited by the Autonomous University of Barcelona.

3.1. Ethical codes

In the transmission of values, institutional *ethos* is fundamental as embodied in the values held by the university institution. Even when democratic values are given intense and systematic attention in the lecture halls, if the institution itself and the teachers who give the lectures do not act according to the criteria and norms of a plural democratic institution, students will consider democratic standards to be an interesting classroom exercise, outside which they have no practical interest or value.

We thus enter on another topic which we wish to include in the initiatives for promoting DE in the universities: the drawing up of self-regulating ethical instruments, and in particular, ethical codes. These are the written expression of "The will to formulate the responsibilities shared by an organization and to publicly express the criteria, values and aims that identify it" [18:186].

One of the interesting experiences in this field was the drafting of the Ethical Code of the Higher Technical School of Industrial Engineering of Valencia, approved by the School Board in November 2005. This code, apart from the values of liberty, respect, dialogue, responsibility, integrity and commitment, describes a series of attitudes consistent with these and invites the respect of all the bodies that constitute the School: lecturers, students, administration staff, etc. This document is available at: www.etsii.upv.es.

We are still not able to offer results on the impact of the ethical code in the organisational climate or in the behaviour of the people who study and work at the Engineering Faculty, but we can point to some conclusions on the production process itself.

- The first conclusion is that teacher involvement has been noticeably lower than that of the Administrative staff. This may be due to distrust of this type of process, but we think that the main reason is the lack of a feeling of belonging to the Faculty. The way Spanish universities are structured means that the teachers belong directly to the departments and the University while the Faculty is relegated to third place. In other words, the teachers generally did not understand that this code could affect their day to day work.
- The second conclusion we would underline is that there is general agreement on the ethical problems detected by the teachers, students and administrative staff.
- The people who participated in the process of drawing up the ethical code valued the initiative positively but were doubtful about how it would develop. It was said that other factors such as political and economic issues could run counter to this initiative. In other words, the conflict of interests would prevail over development of the values.
- And finally the commitment from the Engineering Faculty's Board of Directors has been a key element in facilitating the project and its future development.

3.2. Training of university lecturers

One of the principal strategies for promoting DE in universities, in our opinion, involves teacher training. The Educational Science Institutes could play an important role in promoting activities of this nature, offering training workshops to university teachers that include the DE perspective and supporting teaching innovations in this area. In this connection, we think the experiences of the Group for Teaching Innovation in Educational Values in Scientific and Technical Studies, of TUV (GREVOL), and the Interest Group for Cooperative Learning (GIAC) of TUC, are especially interesting. We must highlight that both proposals are highly connected with DE aims because they are sharing methodological approaches.

The first of these groups is formed by 23 persons (mostly university teachers but also administration and services staff and members of NGOs committed to teaching-learning for change) who want to learn how to put into practice, in their respective spheres, the perspective of moral education. We must highlight that moral education is understood as educate professionals and citizens who build their knowledge individually, and acting in a responsible, free and committed way. In order to achieve this, a set of conditions should be created which allows university students to accept a set of values as ideals, reject the presence of an accumulation of opposing values, and, above all, build their own set of values that permits them to not only reason and think upon them, but also to create personal criteria guided by the principles of justice and equality, as well as acting coherently as a professional and citizen [19].

GREVOL Group is formed, mainly, by young teachers with great teaching responsibilities. The profiles of the members are highly interdisciplinary (with degrees in Industrial Engineering, Agricultural Engineering, Civil Engineering, Chemistry, Philology, Philosophy and Law), as well various are the subjects they teach (from statistics, electronics, drawing, hydraulic engineering, business economics, material chemistry and environmental projects to applied ethics, fundamentals of cooperation for development, French, and others). Most are teachers in scientific and technical subjects, in which it is difficult to deal with moral values. The main activities carried out by this group have involved learning subjects related to ethics and ethical learning, the creation of pedagogical tools for classroom applications (e.g. moral dilemmas), in presenting the experiences of group members in national and international forums, and in training other UPV teachers in these topics. To learn more about the characteristics, methodology and results of the experiences of GREVOL the web page of the group can be consulted (www.upv.es/grevol) and also a book edited by the members of the Group [20]. It should be remarked that GREVOL has been selected as a good practice by the Global University Network for Innovation (<http://www.guni-rmies.net/news/detail.php?id=1040>).

The GIAC appeared in February 2000 after an international seminar with teachers from different universities (especially from the Polytechnic University of Catalonia) interested in going deeper into the application of cooperative learning (CL) in teaching. CL involves students working in teams under following particular conditions [21]: Positive interdependence, individual accountability, face to face interaction, appropriate use of collaborative skills, and group processing. CL is proposed as effective from learning point of view, but also as a good methodology for promotion of social skills, as those looked for in DE strategies. The aims of the GIAC teachers are to experiment with cooperative learning strategies, share their experiences and spread the use of cooperative learning to other groups. The group's main activities are periodic meetings to exchange experiences and the compilation and diffusion of interesting material within the area of cooperative learning. GIAC holds an annual conference whose papers are available at giac.upc.es. They receive institutional support from the ICE of the UPC and the Deusto University and belong to International Association for the Study of Cooperation in Education, www.iasce.net. It should be pointed out that GIAC has received a special mention in the 9th UPC Board of Trustees' University Teaching Quality Award in 2006 for its project "GIAC (Cooperative learning Interest Group): Six years of cooperative learning at the UPC".

In our opinion, both experiences show the importance of teaching innovation to build up pedagogical interventions based on uncommon pedagogies in tertiary education: ethical and cooperative learning. Moreover, the example of GREVOL and GIAC is extremely illustrative of the benefits of an interdisciplinary team working. To be more precise, we think that those experiences could in a future not only promote the emergence of new proposals on ethical and cooperative learning, but also to give a firm support to the teachers interested on educational innovation.

Finally, we would like to remark, although those Groups are not focused on global issues and the pedagogy that some teachers use in their classes may not be considered similar to DE, it is undoubtedly a space to collective reflection and learning on ethical issues and innovative pedagogy. For instance, teachers members of GREVOL that hadn't previously work with moral education pedagogies have started to address ethical contents in a collaborative and participatory way [22].

3.3. University studies

Within this area, various activities are carried out that have been described in the typology mentioned in the previous section. The conceptual framework *Technology for Human Development* (THD) [23; 24; 25] has facilitated the development and expansion of a series of DE events in Spain that began in the mid nineties and are still going on. DE events have not been reduced to THD concept itself. Different engineering fields have been tackled under the perspective of sustainable human development in DE activities.

The first point to clarify is the offer of specific subjects, fundamentally, though not exclusively, of *free choice*. To date, free choice has been the usual way of introducing DE to technical studies. In the Polytechnic Universities of Valencia, Catalonia and Madrid and the University of Coruña, among others, there has been a wide experience [26; 27; 28].

For instance, In Valencia, more than 3,000 students have taken the two free choice DE subjects on Cooperation for Development since the academic year 1995/96: Introduction to Cooperation for Development and Development Cooperation Projects [28]. This experience started in 1995 when a group of students and engineering professionals belonging to a Non Governmental Development Organization named Engineers without Borders-Valencia started an innovative course on the topic of

development aid. The Technical School of Industrial Engineering of Valencia endorsed this initiative and, with the support of the Department of Projects Engineering, the first lecture was given on Development Aid in an engineering environment in Spain.

Other example can be found in Catalonia, where DE promotion program 2000-2005 was awarded with the 9th UPC Board of Trustees' University Teaching Quality Award and the *Jaume Vicens Vives Award* from the Generalitat de Catalunya in 2006 [29; 30].

Nowadays, the introduction of the European Higher Education Area is fostering a reorganization of free elections subjects related with Development Aid, Values and Skills, Sustainability and Science, Technology and Society. It should be pointed out that the total offer is a little greater than two complete academic years, with cooperation for development forming around half of the total. These results show that the capacity exists to offer lectures in these areas on a large scale (each subject usually involves more than one teacher).

On the other hand, in the area of scientific and technical studies, there already exists considerable experience in carrying out projects, studies and end of course projects on the subject of international cooperation and development, reinforced by the existence of a national competition that awards prizes to the best projects in this field [31]. Here we should emphasize the special complicatedness of university institutions in offering viable proposals that are both useful to NGOs and external institutions, due to the difficulty of knowing their respective capacities and possibilities. Establishing ties with groups and lines of investigation greatly widens the opportunities for collaboration.

Another strategy is participating in activities with social volunteers, periods of overseas social work (which will be dealt with in the next section) as well as work practice in organizations and institutions involved in cooperation for development, normally regulated by educational cooperation agreements.

Finally, regarding postgraduate and MA studies, we should point out the profound changes that the adoption of the European Higher Education Area model is causing in these instruments. Up to now, the social perception of postgraduate studies has been intimately related to the permanent training offered by the degrees of foundations associated with universities. With the change in the educational model, the link between undergraduate and postgraduate studies will be closer, and there will be a clearer relation between postgraduate and doctorate studies by the adoption of official master degrees, issued either by the Spanish state or the Autonomous Communities. This change is considerable for its serious implications for universities and departments in the definition of the new offer. Up to now there have been very few opportunities in specific postgraduate studies in the area of engineering and development cooperation, but, undoubtedly, there will be room for manouevre in the following years.

3.4. Mobility programs and overseas stages

The final initiative presented in this work focuses on student mobility programs coordinated by universities and NGOs. We should point out that mobility programs can form part of university studies so far as they are included in training and solidarity programs with recognition of credits. We should also point out their ties with promoting technical assistance from the universities to the NGOs.

"Reality Recognition Projects" (RRP) is a program designed by Engineering without Borders (EWB) in Catalonia with the aim of encouraging the participation of engineering and technical students in long term development cooperation programs. The program was conceived in 1999 as part of its strategic planning of DE activities in the university. The novelty of the proposal described here lies in it being specifically for engineering students as well as being designed for participation in cooperation programs with a considerable technological component. Remarkably, the proposal received support from the Co-operation for Development Center of the TUC through mobility grants.

The RRP program consists of the following stages.

- 1- The creation of a list of place offers and RRP profiles related to EWB cooperation programs in developing countries (preferably at the beginning of the academic year) and later publication of the offers.
- 2- Selection of participants, bearing in mind among other criteria, previous experience in cooperation or solidarity, associative trajectory, technical profile, etc.
- 3- Basic training in cooperation for development and international volunteer work with the aim of, on one hand, ensuring students recognize the dynamics and actors belonging to cooperation programs in developing countries, and on the other to guarantee specialized technical training to ensure the quality of the activities. This training usually lasts for a month.

- 4- The assignment of a group (normally 3 or 4 persons) for a minimum of two months to a project or activity in a development program (coinciding with summer vacation).
- 5- Subsequent evaluation of the experience and awareness and support activities for the next group of RRP participants (in the course of the following academic year).

A total of 61 UPC students took part in these activities between 1999 and 2004. The growth of the program is closely tied to the capacities of EWB Catalonia, which reached a total budget of €500,000, for the first time, in 2004.

In spite of the fact that the impact of the program in terms of quantity is small, we should point out that the focus has always been more interested in terms of quality. The experience has strengthened the institutional and creative capacities of EWB as a result of this approach. In general, students who participate both in the technical and strategic aspects of cooperation programs repeat the experience, either with EWB or in their subsequent professional careers. The subsequent involvement of the participants has been "strong" in around 40%, "moderate" in another 40% and "low" in 20% (according to the evaluation of the group coordinators. About 20% of the participants have subsequently acted professionally in international cooperation projects [32].

It should also be pointed out that the initiative has spread to other university-EWB partnerships in other associations of the Spanish federation and abroad. Remarkably, experiences of ISF/EWB in the US and Canada have been highlighted in [33:85] as examples of voluntary service organizations that can help mobilizing the engineering profession in order to successful development of infrastructure services to meet the Millennium Development Goals.

4. Conclusions

In this paper we have highlighted different possibilities we owe in a tertiary environment which seeks change of attitudes that sustainable development requires. These experiences are more or less connected with DE paradigm, understood as a strategy of international cooperation aimed at the citizens of the Northern societies, which main goal is the empowerment of people through a teaching-learning process, developing knowledge, skills and values, which enable them to become members of a global community of equals.

We have summarized four of these experiences which have been developed at two of the main Spanish Technical Universities: TUC and TUV:

- Ethical codes, as an instrument to orient the moral climate of the university institution towards the moral values that underlie human and sustainable development.
- Specific training for teachers and the formation of teachers' working groups.
- Coordinated offer of free election courses, with special emphasis on its inclusion in the strategic planning proposals of the university.
- Mobility and visiting programs for university students and teachers coordinated with NGOs.

These experiences are not the unique possibility to spread DE aims, but are good examples of how we can make the road by walking.

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References

1. Spanish Ministry of Foreign Affairs and Cooperation (2005), *The Master Plan for Spanish cooperation 2005-2008*, Madrid, España.
2. Generalitat de Catalunya (2007), *Projecte del Pla director de cooperació al desenvolupament 2007-2010*, Resolució 66/VIII del Parlament de Catalunya, DOGC 4940 – 3.8.2007, pp. 26343-26364, Barcelona, España.
3. Korten, D. (1990), *Getting to the 21st Century: Voluntary Action and the Global Agenda*, Kumarian Press, West Hartford.
4. Mesa, M. (2000), “La educación para el desarrollo: entre la caridad y la ciudadanía global”, *Papeles de Cuestiones Internacionales*, 70, pp. 11-26.
5. Boni, A. (2006). “La educación para el desarrollo orientada al desarrollo humano” in Boni, A., Pérez-Foguet, A. (Eds.), *La Construcción de la Ciudadanía Global*, Colección Informes n. 32, Intermón-OXFAM, Barcelona, 41-51.
6. Barton, J. R. (2006) “Sustentabilidad urbana como planificación estratégica”. *EURE* (Santiago), vol.32, no.96, p.27-45.
7. Conroy, M.M. (2003) “The process of planning for sustainable development: dimensions, comparisons and insights”, *International Journal of Sustainable Development*, Vol 6, N° 4, pp. 460-477.
8. Carew, A. L. & Mitchell, C. A. (2002) “Characterizing undergraduate engineering students’ understanding of sustainability”, *European Journal of Engineering Education*, 27:4, pp. 349 – 361.
9. Azapagic, A., Perdan, S. & Shallcross, D. (2005) “How much do engineering students know about sustainable development? The findings of an international survey and possible implications for the engineering curriculum”, *European Journal of Engineering Education*, 30:1, pp. 1 – 19.
10. Lemkowitz, S. M., Bibo, B. H., Lameris, G. H. and Bonnet, J. A. B. A. F. (1996) “From Small Scale, Short Term to Large Scale, Long Term: Integrating 'Sustainability' into Engineering Education”, *European Journal of Engineering Education*, 21:4, pp. 353 – 386.
11. CEURI (2000), *Estrategia de Cooperación Universitaria al Desarrollo*. Córdoba: CEURI.
12. Gómez-Torres, LL., Calabuig, C., Boni, A., Peris, J., Monzó, J.M. (2006). “Oportunidades y riesgos para la cooperación universitaria al desarrollo en el Espacio Europeo de Educación Superior”, *Revista española de desarrollo y cooperación*, 18, pp. 101-120.
13. Baselga, P., Ferrero, G., Boni, A., Ortega, M.L., Mesa, M., Nebreda, A., Celorio, J.J., Monterde, R. (2004), *La Educación para el Desarrollo en el Ámbito Formal, Espacio Común de la Cooperación y la Educación. Propuestas para una Estrategia de Acción Integrada*, Universidad Politécnica de Valencia, Valencia.
14. Chambers, R. (1997), “Editorial: Responsible well-being - a personal agenda for development”, *World Development*, 25, 11, pp. 1743-1754.
15. Unceta, K. (2004), *Análisis del Papel de las Universidades en la Estrategia General de la Cooperación al Desarrollo*, Informe solicitado por la SECI, Universidad del País Vasco.
16. Rodríguez, F. & Solís, F. (2004), *Estudio para el Fomento de la Investigación en Áreas Relevantes para la Cooperación al Desarrollo*, Informe de Consultoría. Madrid: Oficina de Planificación y Evaluación.
17. Hernández, M., A. Pérez-Foguet, M. Puertas y A. Valls (2006), “Información al servicio de la cooperación al desarrollo: desarrollo humano y sostenible en las Bibliotecas de la Universidad Politécnica de Catalunya”, *III Congreso Nacional Universidad y Cooperación al Desarrollo*, Madrid.
18. Lozano, J.M. (1997) “La ética en la dirección empresarial: participación y responsabilidad” en Cortina, A. (dir.), *Rentabilidad de la Ética para la Empresa*, Madrid: Argenteria/Visor.
19. Martínez, M. (1998). *El Contrato Moral del Profesorado*. Bilbao: Desclée de Brower.
20. Boni, A., Lozano, J.F. (Eds.) (2005), *La Educación en Valores en la Universidad. Los Dilemas Morales como Herramienta de Trabajo en los Estudios Científico-Técnicos*, Universidad Politécnica de Valencia, Valencia.
21. Ahern, A. (2007) “What are the perceptions of lecturers towards using cooperative learning in civil engineering?”, *European Journal of Engineering Education*, Vol. 32, No. 5, pp. 517–526.
22. Lozano, J.F., Palau, G., Gozávez, V. & Boni, A. (2006), The Use of Moral Dilemmas for Teaching Agricultural Engineers, *Science and Engineering Ethics*, 12, 327-334.

23. Pérez-Foguet, A., Oliete-Josa, S., Saz-Carranza, A. (2005), "Development Education and Engineering: A framework for incorporating reality of developing countries into engineering studies", *International Journal of Sustainability in Higher Education*, Vol. 6, N. 3, pp. 278-303(26).
24. Pérez-Foguet, A. (2006), "Tecnología para el desarrollo humano: Un marco de referencia para la promoción de la cooperación al desarrollo desde la ingeniería", in E. Velo, J. Sneij and J. Delclós (eds.) *Energía, Participación y Sostenibilidad*, Ingeniería Sin Fronteras, pp. 31-42.
25. Pérez-Foguet, A. & Pérez, S. (2006), "La educación para el desarrollo. Eje de la tecnología para el desarrollo humano", in Boni, A., Pérez-Foguet, A. (Eds.), *La Construcción de la Ciudadanía Global*, Colección Informes n. 32, Intermón-OXFAM, Barcelona, pp. 23-38.
26. Pérez-Foguet, A., Martínez, J.A. & Manjarrés, A. (2006), "Formación universitaria en Tecnología para el Desarrollo Humano y Sostenible. Propuestas y referencias en España 2006", *III Congreso Nacional Universidad y Cooperación al Desarrollo*, Madrid.
27. Pérez-Foguet, A. & Peña, E. (2003). "Propuesta de educación para el desarrollo en las escuelas de caminos desde la experiencia de Barcelona y A Coruña". *Encuentro Internacional de Enseñanza de la Ingeniería Civil*. Ciudad Real.
28. Boni, A. (2007). Las asignaturas "Introducción a la cooperación para el desarrollo" y "Proyectos de cooperación al desarrollo". 10 años impulsando procesos de aprendizaje críticos y transformadores en la universidad" in CCD (eds.) *Un proceso de aprendizaje: experiencias de cooperación para el desarrollo en la UPV*, Universidad Politécnica de Valencia, Valencia,
29. Pérez-Foguet, A. (Coor.), (2006), *Impuls de l'Educació per al Desenvolupament humà i sostenible a la UPC 2000-2005*, Consell Social, Universitat Politècnica de Catalunya, Barcelona.
30. Pérez-Foguet, A. (2007), "Partenariado ONDG/Universidad para el impulso de la Educación para el Desarrollo. El caso ISF-UPC 2000-2005", in A. López, M.C. Martín, *Experiencias de Educación para el Desarrollo*, Hegoa, Universidad del País Vasco, Bilbao, pp. 65-75.
31. Cabrera, M., Ortiz, I., Mataix, C., Sánchez, E., Gómez, M^a LI., Calabuig, C., Pérez-Foguet, A., Ortega, X. (2006) "Estrategia para el impulso de los trabajos final de grado y doctorado sobre Cooperación Internacional y Tecnología para el Desarrollo Humano", *X Congreso Internacional de Ingeniería de Proyectos*, Valencia.
32. Sneij, J., Camós D., Delcòs, J., Pérez-Foguet, A. (2006) "Programa de Conocimiento de Realidad de Ingeniería Sin Fronteras. Desarrollo de la dimensión social de los estudiantes de ingeniería", in Velo, E., Sneij, J., Delclós, J., (Eds.). *Energía, participación y sostenibilidad*, Ingeniería Sense Fronteres, Barcelona, pp. 57-70
33. Calestous, J., Yee-Cheong, L. (Coor.) (2005) *Innovation: applying knowledge in development*, UN Millennium project, Task Force on Science, Technology and Innovation, Earthscan, London.

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