

Alejandra Boni, Enrique Berjano

Technical University of Valencia, Spain

Promoting professionalism for the public good in engineering studies. The experience of the Technical University of Valencia (0035)

Programme number: A5.3

Research Domain: Learning and Teaching

Ethical learning is an educational proposal which aims to prepare our students for their future working life by helping them to acquire skills that allow them to carry out their professions with autonomy and responsibility. In this paper, we reflect on the main characteristics of this pedagogical proposal and on the experience gained at the Polytechnic University of Valencia (UPV). We describe two examples of how we have been introducing ethical learning into engineering lectures by means of two different approaches: through a technical course, named "Industrial Sensors", and through two humanistic subjects, called "Introduction to Development Aid" and "Development Aid Projects". Finally, we critically assess the advantages and disadvantages of these two approaches: humanistic courses versus engineering courses.

Ethical learning is a model for moral education conceived as construction of the moral personality. It is a model inherited from the cognitive-evolutionary and Kantian traditions. It seeks to orient and stimulate the person to build his own moral-evaluative dimension, both in individual or private settings and in public or collective ones. In order to achieve these objectives, the ethical learning educational model works in the following eight dimensions of the student's moral personality [1,2]: 1) Self-knowledge; 2) Autonomy and self-regulation; 3) Capacity for dialogue; 4) Capacity to transform the environment; 5) Critical understanding; 6) The capacity of empathy and social perspective; 7) Social skills and 8) moral reasoning.

Setting out from this model, we can formulate the proposal for ethical learning in the university as follows: educate professionals and citizens who build their knowledge individually, and acting in a responsible, free and committed way [3].

Example of ethical learning in an engineering course: "Industrial sensors"

One way of developing moral awareness in engineering students is to develop ethical issues in other subjects. The use of moral dilemmas, the analysis of practical cases with ethical aspects and the use of examples are good strategies for improving engineering students' ethical training. Educational initiatives must go beyond the mere teaching of Engineering Ethics, and must develop programs of Ethics across the Curriculum [4].

Over the last three years, we have proposed and conducted three activities on ethics issues during a senior-level elective course on Industrial Sensors within an "Industrial Electronics Technical Engineering" program, which is equivalent to a US baccalaureate degree in engineering. The activities (with a duration of two hours each one) were suitably sketched in an engineering environment, and they dealt with different problems such as 1) exploited children (moral dilemma), 2) work conflict

resulting from globalisation (video forum), and 3) industrial development and ecology (role-playing). The number of students varied across the three years between 13 and 22.

The activities were opportunely conducted in order to gain the involvement of students. In fact, the first one (moral dilemma) implied a previous individual thought, and information search work, and a taking part during a class discussion. The second one (video forum) requested a thought at class and a debate with the other students. For the last one (role-playing), student had to prepare a fiction role and later to performed a dramatization (or overplaying) during a simulated debate. Finally, students and teacher conducted a final thought.

Example of ethical learning in two humanistic courses: "Introduction to Development Aid" and "Development Aid Projects"

In 1995 a group of students and professionals of engineers grouped around a Non Governmental Development Organization named Engineers without Borders started an innovative course around 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 in Development Aid in an engineering environment in Spain started its journey. 10 years later, more than 3.000 undergraduate students have followed two free elective courses: one on introductory issues regarding development and development aid (Introduction to Development Aid) and another one around development projects (Development Aid Projects)¹.

The profile of the students which decide to follow these courses is slightly different from other students. The results of a recent survey conducted at UPV [5] shows that an important characteristic of these students is their special sensitivity towards the most excluded people. As a consequence, the level of motivation of the student towards the subject of development and international aid is higher than other technical subjects.

The teaching approach underlying these courses is based on the methodologies proposed by the Development Education theory, which is closely related with ethical learning. Development Education (DE) is a recognized tool of international development and co-operation sectors.

Conclusions. Ethical Learning In Higher Education: Humanistic Courses Versus Engineering Courses

Regarding with the approach of ethics learning during the engineering courses, we observed the following advantages. Firstly, we feel that the message on ethics reaches to student by a privileged way, since that engineering students observe to teacher as a senior-level engineering, and hence take him/her as a suitable professional model. In contrast, humanistic courses can be perceived as second class courses (moreover if the institutional atmosphere not contributed to enhance this kind of issues) and, consequently, the impact on students could be smaller.

¹ More information on these lectures can be seen in <http://www.dpi.upv.es/udcde> [accessed 6th October 2007].

Secondly, the activities on ethics allow contacting with non preferred students. This can be very interesting since that some students are totally ignorant of the non-engineering topics. Likewise, this can be an obvious disadvantage due to not all the students in the engineering course do have the same motivation level on ethics learning. In the case of humanistic courses, the effects are totally the opposite: more motivated students but only the motivated will attend these courses.

On the other hand, the approach of ethics learning during the engineering courses implies some disadvantages. Firstly, the groundwork and implementation of the activities (especially those based on debates and discussions at class) involve an extra effort for the teacher who as a rule is exclusively focused on technical issues. Even more, not all the engineering teachers are prepared to suitably motivate and drive this kind of activities. Regarding with humanistic courses, the teachers can really choose the methodological approach to teach, from an exclusively theory-based method to a really participatory way. Obviously, our option is the second one (such as has been previously reported), and regarding to that, we think that this is also an extra effort for the teacher. Even more, we believe that a teacher specialized on humanistic topics is not automatically a teacher which applies active methodologies, despite of widespread assumptions on that.

On the hand, since that only a minority of the teachers incorporate the ethics learning in their engineering courses (which is obvious from a practical point of view), the students could feel that these issues are not truly important, specially when moreover the university lacks of institutional philosophy on ethics in engineering, not this is not enough sustained.

Finally but not less important, and this is a common issue for both kind of courses, there is difficult to academically evaluate the impact of these activities on student, and to fittingly include the results of this evaluation in a global grade. A discussion on this topic is obviously out of the scope of this paper.

References

1. M. Martínez, *El Contrato Moral del Profesorado*, Desclée de Brower, Bilbao, Spain (1998).
2. M. R. Buxarrais, *La Formación del Profesorado en Educación en Valores. Propuestas y Materiales*, Desclée de Brower, Bilbao, Spain (1997).
3. M. Martínez, M. R. Buxarrais and F. Esteban, La Universidad como Espacio de Aprendizaje Ético. *Revista Iberoamericana de Educación*, (2002) pp. 17–44, 29.
4. J. F. Lozano, G. Palau, V. Gozávez and A. Boni, The use of moral dilemmas for teaching agricultural engineers, *Science and Engineering Ethics* (2006) pp. 327–334, 12.
5. R. Chambers & Petit, J., “Shifting power to make a difference” en Groves, L. & Hinton, R. (eds.), *Inclusive Aid. Changing Power and Relationship in International Development*, Earthscan, London, pp. 137-162. (2004)