

Ethics and Social Responsibility in Engineering Courses

Alessandro LA NEVE

Centro Universitário da FEI, S.B. do Campo, SP, Brazil, alaneve@fei.edu.br

Carla Soares DE ARAUJO

Centro Universitário da FEI, S.B. do Campo, SP, Brazil, cansoar@fei.edu.br

KEYWORDS: *Ethics, social responsibility education in engineering courses*

ABSTRACT: *It is intended to present in this article the experiences and results of the ethics education and social responsibility in engineering courses, gotten to the Program of Social Action of Extension in the University Center of the FEI.*

It has been broken of the principle that the engineer as person has a social paper to play. In such, it is necessary to recoup the principle of the dignity human being – who is the man - to understand the potential of social contribution in the exercise of his profession. The engineer is called to be entrepreneur of new society doing it with ethics and social responsibility in the development and sustainability of this society, for the good of the man and all humanity.

For this reason, considering courses of human sciences to the engineering courses, it is considered the student to know the social context in which is inserted, to search solutions to the problems and to supply the effective necessities, working ethical and moral principles, as well as considering the involvement of these pupils in social projects acquiring knowledge them, in the practical one of these actions, their social paper. More than to answer to a marketing requirement through these you discipline is looked to answer the integral formation of the person and the professional.

The ethics in which the engineering student are educated is centered on the engagement with social reality, by which they can learn what are needs and possibilities that exit in the social context and experiment new forms of relationships and work.

The Program of Social Action of Extension makes possible the pupils to be engaged in a social work, using its specific formation, in an occasion of experience and learning. The contact with lacks social human beings and stimulates the sprouting of scientific or technological projects that come to answer the necessities of the social reality. Through these projects the Program it propitiates to the pupils the possibility to express its intelligence, transforming inventive capacity and with courage, tenacity, ability and effort, in a way of discovery of itself and of the other. This is a proposition of academic excellency followed of social realism and public sense.

1 EDUCATION FOR SOCIAL RESPONSIBILITY AND ETHICS.

The University, considering the reality in which it is inserted, has to accomplish a social and transforming role by the education of the individuals that participate in the construction of the social reality. We call the attention to the fact that the problem is not based on the production of new theories and ideologies, but on a mentality change that consolidates in values and actions distinct of the ones experienced so far by the consumism culture, the individualism, the opportunism, the idea of taking advantage of anything.

The Centro Universitário of FEI - Faculdade de Engenharia Industrial, institution of jesuitical inspiration that forms engineers for more than 50 years, leads to a integral formation of the student, providing the privilege of not only his academic and professional formation, but also contribution to his social and ethical formation, adding value to his aesthetic, religious and cultural dimensions.

The University is a space for formation and reflection, a space for the individual's conscience education, reflection of the reality and his integral formation. That is the reason its role goes beyond the

limits of scientific and technological production as a final accomplishment. The University must consider the human being in his integrity and contribute for the social changes in a fair and adequate way for this humanity.

2 THE FORMATION OF THE ENGINEER.

The engineer has a social role to accomplish in his formation process. That role transcends the potential production of scientific researches for technological purposes, and it requires that his formation provide also for the consolidation of the principles of human dignity, to recover the potentiality to contribute to the social area in his professional activity. The engineer is expected to effectively participate in a new society, embedded of social ethic and responsibility for the development of such society, for the good of mankind.

Therefore, the Centro Universitário of FEI, through its Social and Juridical Sciences Department, besides subjects of technological and scientific nature that provide solid formation in technology and research, includes some disciplines of humanistic foundation throughout the whole Engineering course, as a proposal of an integral formation of the engineer as a professional and as a whole human being.

In order to consolidate the above-mentioned humanistic formation, a series of disciplines is ministered to the student to help the student to develop a better conscience of himself, and of the reality in which the student is inserted. Disciplines such as Sociology, Philosophy, Social Christian Teaching, Ecology, Religious Culture, Ethics and Notion of Law, are scattered along the course of engineering each semester.

In Sociology it is provided a broad vision of the contemporaneous reality, reflecting over social events and over changes of paradigms in the relationships, at work, in the production, in the consumption activities, technology, economy and politics. Philosophy works on the development of the human being's individuality, centered in his spiritual/rational nature, whose improvement factors are: realistic and critic attitude and distinction between the use of the technological and scientific reason and a reasonable use of this knowledge, even in daily activities or in defining the major concepts that will indicate the mainstream for economic development and political organization, as well as the analyses and consolidation of the ethical, a esthetical and religious dimensions of the human being. In Social Christian Teachings it is discussed the work, the social development, the specific roles of the government and the families, starting from the concept of human being as an absolute value. Ecology deepens the discussions on the ecosystem in all its dimensions, and on the environment preservation, where the students analyze and discuss all forms of pollution. These studies are based on the background provided by the three previous periods. Based on the concepts expressed in the social Christian anthropology, the discipline Religious Culture reflects on the importance of giving the correct value to all aspects of the human experience. Through the teachings on ethic it is proposed to know the social context in which the student participates, in order to look for solutions for the problems faced and supply the demanded needs, working on ethical and moral principles. The discipline Notions on Law brings the students to the ground of recognizing the points their profession touches on juridical aspects and social organization administration. Therefore, more than giving an answer to a market demand, all these disciplines provide an integral formation of the student.

In this context, Ethics and Social Responsibility implies to educate the students in a new culture; implies to form a new attitude as a human being, citizen and professional, bringing the possibility to solve problems such as environmental pollution, utilization of recycled waste materials, goods production, digital inclusion, and adequate utilization of Information and Communication Technology, under a wholly and realistic approach.

The ethic on which we educate our students is the social ethic that observes the reality from a broad and comprehensive point of view. Especially the reality of work, where the student learn how to deal with the needs and possibilities found in the social context, and to experience new ways of relationship and work.

The word "responsibility" comes from Latin and means to respond, which implies in "whom" to respond to. We respond to somebody, to another one, so the engineer must respond with his intelligence, creativity and expertise to the society's demands, producing technology for the good of the community. To respond to the powerless ones, the socially marginal members of the society. To respond to the society, or better, to respond to men's needs, is the reason to belong, under an intrinsic unity, to the

experience of humanity. It is the affirmation of the meaning of the reality, the meaning of knowledge, technology and science.

This is the reason why the engineer should not restrict the exercise of his profession to only propose technical solutions, but also to enlarge it to the conscientization of society and prevention of problems. This way the engineer plays an active role, especially when he assumes administrative duties in governmental or private areas, as well as formative role within the academic field.

This is an educational path to build up a new culture and new social values, which is the contrary of an individualistic accommodation, or a mercantile utilitarianism, and is a way to “roll up the sleeves ” and put hands on work. This work, however, must take the human being in consideration in its totality, and the needs of the people that this engineering student finds today, which will those that he will face as an engineer tomorrow in his professional activity.

That is the reason why this educational premise is based on the reality, on the people’s demands, not an idea of what they need. The people’s demands act as a positive provoking idea for our students to show their intelligence, creativity, effort and responsibility with the present reality.

From the point of view of the professional formation, the role the University is being called to play is to provide such a formation that, when participating in the governmental, private or third sector activities on the market, the professional could search for solutions that supply the increasing demands of the society. Problems such as excessive monetary concentration, environmental degeneration, social exclusion, undernourishment, hunger, to cite some of them, come from the dissociation between economic development and social, environmental development. Those problems also must be faced out.

3 EXTENSION SOCIAL ACTION PROGRAM.

With all premises of the engineer formation already established, the Centro Universitário of FEI, through the Extension Social Action Program, broadens the usual formation and proposes practical experiences by project developments on social promotions for the good of the community. The students, motivated by the subjects worked during the Engineering course, make their effort to participate in the projects, even suggesting new themes to their coordinators. As a result, we have teachers and students engaged in developing scientific or technological projects of social scope, applying the knowledge available to minimize other forms of exclusion.

The students participate in projects with objectives and theoretic references adequate to the final goal, with a methodology that provides the students with a sound experience in research and social actions, always under orientation of a professor, who proposes the project.

Within the projects now on process that relate to digital inclusion, we can mention the Computing Basic Course, performed by our students of Casa Edimar that teach young men and adults the abilities to use computers, in order to give them better chances in the formal job market through improved professional qualification. Casa Edimar is a non- profit and non-governmental organization, devoted to the promotion of the integral person in the social, cultural, educational and formative ambit, aiming at a special support for poor young people and their insertion in the labor market. . This an answer to the growing unemployment in town, which affects especially people with scarce or no professional qualification .In two years, eight students of the Engineering course of the Centro Universitário of FEI shared their expertise on computing with more than 300 people in this institution.

In their testimonies our students present their experiences with the projects and point out the value of these actions. They recognize the importance of the actions for their professional future:

"Teaching in the Casa Edimar has been of great value for my professional future, adding precious teamwork experience, as well as relationship with different people. I can assure that the work I've been developing in this project has been of a sound value to my personal and professional improvement." A.P.

They recognize the importance to observe the premises worked by the disciplines of humanistic conception:

"I have learned a lot about humility concept, of values that I had not brought into consideration. In fact, only when we get there we understand how important for those people is to take part on a basic computing course." V.G.

They also recognize the importance of the possibility to share knowledge and specific abilities developed in the University:

"If I had the opportunity of having a computing course for myself, and now I have the chance to bring this knowledge to someone else, what's the difficulty? This was the reason that motivated me most to come into this project: to help others. Especially the experience of observing the joy in the people's eyes for learning something new, and for being updated in this global world, of so fast breakthroughs." J.P.B.P.

As a result, the SAVI - Sistema de Aprendizado Virtual e Interativo (virtual and interactive apprenticeship system) came to light motivated by that first digital inclusion project. This second project has its goals set on developing a virtual environment and a student-computer interactive system, to facilitate students with learning and/or sensory impairments, providing effective computing courses as well as other disciplines. This project is under development process, and is planned to start mid of the second semester.

Other results of the digital inclusion projects can be seen in a partnership established with the São Bernardo do Campo Educational State Directory to enable teachers of São Bernardo do Campo's educational public system on Information and Communication Technologies for teaching activities, and disseminate within their students all knowledge available. The state public educational system has 93 schools in S.Bernardo do Campo, with an average of 40 teachers each, and almost 1000 student per school. There are ten students participating in this project in a public school near the University. From the second semester of 2004 on, other two schools will be included in the project, when more graduate students will be invited to participate in the project. Thus, the first students engaged in the original project will act as multiplying factors of the experience, in order to have this project installed in more and more schools of the public educational system.

In a different line of projects, the Environmental Conscience Program relates to the selective garbage collection activities. They are held on FEI campus, and carry the aim of stimulating practical attitude changes, as well as formation of new habits toward improved methods of natural resources utilization. This project opens the opportunity to reflect on the ethical responsibility of our school as part of the community and the planet as a whole. It stimulates the participation of the community in the process of selective collection of solid waste material generated on the University campus. All garbage to be recycled collected on FEI campus is sent to Associação Cristã Verdade e Luz, which is an institution where former garbage collectors who lived in the streets receive formal training through courses on entrepreneurship garbage recycling. Recycling material is collected, selected and sold to recycling companies, generating jobs for the community. In this way students at FEI can give a small contribution, which is at the reach of their hands, for an ecological and social cause.

Regarding the technological development associated to social demand, the Solar Heating System with Social Responsibility project has developed a solar system kit that demands easy construction plans and low maintenance cost, especially designed for the poor population. This project aims to stimulate searching for alternative material resources, as well as energy producing equipment. By the same time, this project responded to the social context experienced by the Brazilian population in mid 2001 when there was one of the worst rainfall periods in Brazil. In that time, the whole population had to decrease the volume of energy consumption in the whole Brazilian territory due to meager rain indices. Besides, this project can be valued by its social contribution on the viability to provide access to the poor population to this kind of technology. In the initial tests, the production cost of the heating equipment could be reduced from US\$ 1,000 (in Brazil) to US\$ 90.

By the same time, teachers and students increased their efforts to capacitate the poor population in the construction of their own solar heating equipment, stimulating professional autonomy, and facilitating their inclusion in the job market. The first application of this project will be held on the Rehabilitation Center in Casa Branca city, countryside of São Paulo state. This institution takes care of 660 mental patients, aging from 50 to 60 years old, and 300 people in the external services. In this institution the residents will learn how to assemble and provide maintenance service for the solar energy system for their homes.

This project was awarded the "Special Tigre University Award", which stimulate teachers and students to search for problem solutions, out of 405 projects. Tigre is a multinational company that produces PVC tubes and connections, which can be used as part of the project. The award also contributed to stimulate other teachers and student to propose more projects for the Social Action Extension Program, always coordinated by teachers and developed by students.

The students personal and professional lives are enhanced by these kinds of projects that encourage technological production, where their intelligence, tenacity, inventive cleverness, and transforming capacity can be fully expressed. This is the path where the students will inevitably make great discoveries about other people's minds and souls, as well as their owns.

This is a proposal on academic excellence involved by social realism and significance. This way, the possibility of change becomes a real opportunity to accomplish works that bring effectively and powerfully capacity to transform the reality.

4 CONCLUSIONS.

The receptivity of the projects by teachers, students and community members gives the feedback that contributes to the production of more projects in a self-stimulating network. As soon as results are broadcast, more teachers and students bring forward improved ideas for new projects for the Social Action Extension Program. By the same time, these relationship network cast seeds over partnerships with non-governmental organizations, public institutions and private companies that have deep interest in participating in the projects. The results are also multiplied through articles, lectures, participation in public prizes awarded for their social responsibility actions, as well as production of technologies with that social scope.

The result of the humanistic formation provided by our Engineering courses can also be observed in the increasing number of graduation projects of technological development applied to solve problems of social scope. For example, a group of graduate students from electric engineering is working on a project to produce a computer keyboard for blind people, searching for solutions to innovate and minimize costs compared to existing equipment in the market. Another group is working on the development of prostheses of limbs for impaired people.

REFERENCES

- PETRELLA, Riccardo A urgência de um contrato social mundial face aos desafios da mundialização atual: para além das lógicas bélicas. In: *O Ensino Social da Igreja e a globalização*. Editora Unisinos, São Leopoldo, 2002., p.13
- KOLVENBACH, Pe. Karl-Hans O compromisso da Companhia de Jesus na Educação. Cadernos da FEI. São Paulo: Fundação Educacional Inaciana, 7, fev., 2004.
- JOÃO PAULO II Audiência com os participantes da Conferência Internacional: Globalização e Educação Superior Católica. Roma, 05/12/2002.
- GIUSSANI, Luigi, *Educar é um risco*, Companhia Ilimitada, 2000, p43.
- LA NEVE, Alessandro & SILVA, Marli Pirozelli N. *The formation of Ethical Criteria for the sociable responsible engineer*. Proceedings of ICEE'03, Valencia, Spain, 2003
- GIUSSANI, Luigi O Eu, o poder, as obras. Cidade Nova, São Paulo, 2001, p.24. LA NEVE, Alessandro & AGAZZI, Costantino *Refleteindo à luz do Ensino Social Cristão, O papel da Informática na redução das distâncias entre ricos e pobres*. Seminário do Núcleo de Estudos da América Latina (NEAL), Universidade Católica de Montevideu, julho de 2000, p.21.