

WIDENING THE PERCEPTION OF ENGINEERING WITHIN SOCIETY

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Abstract

In general, our society has no real views on or has an inappropriate idea about what engineering means. Everything related to pollution, bad usage of natural resources and human endeavours is connected to engineering. Modern society accepts the positive achievements that engineering has given us, but some people continue to hold a “negative opinion” related to technology. It is important to show and to explain to the general public that engineering generates many benefits to society. Communication is essential in our society.

The Spanish programme “Ciencia en Acción” offers the possibility to link up with a general audience which has a positive approach to science, technology and engineering. This project began ten years ago from a group of scientist and engineers working in CERN, ESA and ESO who promoted a first meeting in Geneva, at CERN headquarters in order to give a message to European society by means of teachers and students.

The main objectives of “Ciencia en Acción” are:

- Finding new ideas to make science and technology attractive to the population
- Pointing out the international character of science and technology
- Promoting the interest in science for educators and students
- Involving research in scientific and technologic communication activities
- Showing the importance of science for progress and welfare in general.

Our society continually needs more engineers and more from the engineers. If we want to change mind sets, we need to explain the applications and help the use of engineering to increase the quality of life of everybody in a sustainable manner. If we want to communicate successfully the advantages of engineering we must get close up to our audience.

What are the facts that people remember best? Without doubt, the answer is “the facts involving positive emotions”. If we feel a passion related to some aspects of technology, we will remember it and we will add a positive connotation to engineering. This relationship will stay with the person for some time and it will be a cord that will not be broken easily. It is good that the experiences, and in special the first experiences with engineering, are exciting. If a child had a good feeling in the school when “making a device” with other children, he/she will continue with this positive feeling in the future. We must get the students to feel emotive in building simple devices or in solving some problems in the technological framework!

School classes should offer some examples of this kind of experiences. We should use all the above mentioned strategies such as causing surprise, enthusiasm, encouraging the participation of everybody and to feel technology much more approach. These strategies can be presented in the “Ciencia en Acción” programme in order to show them to all the educational, scientific and technological communities.

“Ciencia en Acción” programme is open to all the Spanish and Portuguese speaking countries and all the participants can present their contributions in any of the official languages in Spain and Portugal. The CSIC (Spanish National Research Council), INTA (National Institute for Aerospace Technology), the RSEF (Spanish Royal Physical Society), the SGE (Spanish Geologist Society) and the UNED (Spanish Open University) have annually organised “Ciencia en Acción” in order to increase the quality of science and technology communication and to promote innovation within science teaching. In the last edition of

“Ciencia en Acción”, the Portuguese program “CienciaViva” (Portuguese Science Programme) has been integrated in the organisers group.

This program moves Science and Engineering to the street by involving general audiences in both these areas. “Ciencia en Acción” increases in importance every year. The final event of the last edition grouped together about 15,000 people in two days. “Ciencia en Acción” is integrated in the international program “Science on Stage” organised by the EIROforum (the CERN (European Organisation for Nuclear Research), the EFDA (European Fusion Development Agreement), the EMBL (European Molecular Biology Laboratory), the ESA (European Space Agency), the ESO (European Organisation for Astronomical Research in the Southern Hemisphere), the ESRF (European Synchrotron Radiation Facility) and the ILL (Institute Laue-Langevin) with the financial support of the European Union.

In the most recent editions of “Ciencia en Acción”, a specific category has been promoted in order to bring the general public closer to “Science, Engineering and Values”. Several proposals were presented within this new category: from university departments, from engineering teams, and from NGOs coming from Spanish and Portuguese speaking countries. This modality is sponsored by a chair linked to the Technical University of Catalonia and the leading electric company ENDESA showing that people involved in the management of public and private entities can reach agreement about the importance of the previously mentioned topics.

Workshop Topics

Human scale engineering; The role of emotions in learning

I INTRODUCTION

Often our society has no real views about what engineering incomes. All related to pollution, bad usage of natural resources and human endeavours is connected to manufacturing. Contemporary society accepts the positive achievements that engineering has given us, but some people continue to hold a “negative opinion” about technology.

“Ciencia en Acción” is a Spanish programme which offers the possibility to present to a general audience a positive approach to science, technology and engineering. This task began ten years ago from a group of scientist and engineers working in CERN, ESA and ESO who promoted a first meeting in Geneva, at CERN headquarters, in order to give a message concerning science and technology to European people by means of teachers and students.

A specific category has been promoted in “Ciencia en Acción” in order to bring the general public closer to “Science, Engineering and Values”. Some proposals were presented within this new category: from university departments, from engineering teams, and from NGOs coming from Spanish and Portuguese speaking countries.

The modality “Science, Engineering and Values” is sponsored by a chair linked to the Technical University of Catalonia and the leading electric company ENDESA, devoted to human values in engineering, showing that people involved in the management of public and private entities can reach agreement about the importance of the before mentioned themes.

II WORLD FEDERATION OF ENGINEERING ORGANISATIONS

The chair which is sponsoring “Science, Engineering and Values” is an Associated of the World Federation of Engineering Organisations (WFEO) [1], the world’s largest engineering organisation. WFEO is involved in many worthwhile projects that make a number of benefits devoted to the profession and society, cooperating with many nationwide and global specialized institutions interested in the development and the application of the engineering work. The Federation, which its lifetime is forty years, was founded by a group of regional engineering organisations, under the auspices of the United Nations Educational, Scientific and Cultural Organisations (UNESCO) in Paris.

The World Federation of Engineering Organisations (WFEO) is a nongovernmental international organisation that brings jointly national engineering organisations from more than 90 nations and

represents a quantity of 15 million engineers from around the world. WFEO gives information, presents ways, offers and furnishes methods of leadership and provides guidance to the engineering' lines of work.

WFEO serves people, and is recognised by countrywide and worldwide organisations as an appreciated basis of recommendations and leadership on the policies, interests and concerns that are connected with engineering as regards the human and natural milieu. The Federation facilitates contacts and collaboration among engineering organisations and with other organizations, mainly those of the UN scheme, and international nongovernmental institutions dealing with science, engineering, technology and business.

The Federation fosters concord and promotes sustainable development on a worldwide root as well as engineering learning and teaching, the exchange and sharing of technology and application of ethical concern and conduct. It brings as one the developed and the developing nations for joint advantages. It facilitates relationships connecting governments, business and citizens by contributing an engineering dimension to talk on policies and investment. It is operationally working on the transferability of engineering qualifications linked to the essential requirements.

WFEO and UATI (International Union of Technical Associations and Organizations) formed together in 1994 the International Council for Engineering and Technology (ICET), one of the twelve NGOs formally associated with UNESCO. WFEO, UATI and FIDIC (International Federation of Consultant Engineers) generated in 1992 the World Engineering Partnership for Sustainable Development (WEPSD).

III TECHNICAL UNIVERSITY OF CATALONIA

The Technical University of Catalonia (Universitat Politècnica de Catalunya-UPC) [2] has promoted and possesses an assortment of initiatives, and has supported numerous external initiatives, according to commitments (and resources), surrounded by means of collective performances allocating ideals and principles.

The attendance of values and attitudes in the breathing preparation in scientific knowledge and technology argues that a lot of voices around the world are calling for education in values and attitudes as a significant portion of the training of new technicians in the contemporary society and civilization. That's why some studies were developed in order to evaluate human values in technical subjects taught, in the UPC and in the other Spanish universities. The obtained results showed a low presence of subjects with humanistic purposes.

IV “VICTORIANO MUÑOZ OMS” VMO UNIT

The UPC has a unit named "Victoriano Muñoz Oms (VMO)" [3], the chair previously related to "Science, Engineering and Values" that is sponsored by ENDESA, the most important Spanish electric company. This VMO Unit has been devoted, since its founding, within the framework of the university itself and externally too, to the learning and the diffusion of the work of the famous engineer who gives his person's name to the VMO Unit: Victoriano Muñoz Oms had a plenty vision of the form to consider the problems, looking for solutions that gave satisfactory improvements to all requirements (not simply related to the economic point of view). At the same time the VMO Unit puts forward a set of activities related to the study and the promotion of human values, individual attitudes and ethics in engineering; so many examples were given by this referred engineer.

The VMO Unit is interested in developing and promoting human values and social attitudes in engineering degrees through a variety of ways. One of the topics dealt with by the VMO Unit, during the last few years, concerns a methodology to elaborate studies about education in values in engineering. The VMO Unit researches, teaches, discloses, and give some exchanges about knowledge and points of view concerning many topics on human values. Also this unit endorse a discuss, among engineers, university professors, researchers, employers, entrepreneurial agents and other concerned people to facilitate thought on ethics and the social impact in engineering. Now it is ending a study about several points of view of the engineering in Europe. Also this Unit is promoting the appropriate attitudes in the engineering students. The VMO Unit of the Technical University of Catalonia is a non profit entity. VMO Unit organises the International Conferences on Ethics and Human Values in Engineering [4]

V. “CIENCIA EN ACCIÓN”

Each year the Spanish National Research Council (Consejo Superior de Investigaciones Científicas, CSIC), the Royal Society of Physics (Real Sociedad Española de Física, RSEF), the Spanish National Open University (Universidad Nacional de Educación a Distancia, UNED) and other societies and /or foundations organise a program to promote science in schools and to a general audience, in a combined initiative. The above mentioned programmes are constructed around some areas. All the years, 60000 leaflets are distributed to Spanish schools and universities. Also all the Planetariums and Science Museums in Spain distribute the information concerning the programme, which consider several disciplines. In order to give information to teachers, 10000 CD-ROMs are also dispersed inside Resource Centres for Teachers, Local Educational Departments and the Institutes of Science Education of several universities. It is also possible to reserve the contents of the generated knowledge by means of the CD-Rom from a website. Very, very briefly, this is the program “Ciencia en Acción” (Science in Action) [5]

There are available several modalities in order to involve many scientific and technological areas. The mainstream of the mentioned areas is aimed at school teachers and professors of institutions of higher education: Biology and geology labs, Chemistry demonstrations, Didactical materials of science, Mathematics labs, Outreach, Performances, Physics demonstrations, Sustainability, Science Films, Spatial Lab, Science and technology experiments (sponsored by UPC) and also Science, engineering and values (sponsored by VMO Unit).

“Ciencia en Acción” moves citizens towards science and technology with the purpose of raising the scientific and technical cultures of society. The basic way is encouraging science teachers, professors and other professionals and technicians. The programme is addressed to elementary, secondary and college teachers and university professors, scientific divulgators of different disciplines, mass media, science museums, etc., with the intention of they participate in an annual competition by means of the presentation of their works to other partners and the general public. The national final usually is situated in a science museum where, along three days of open doors, it is possible to attend to all the organised actions (fair, exhibitions, discussions, talks, etc.). The chosen science museum is different each time.

Since 2000, “Ciencia en Acción” is annually organised for a group of entities, increasing the quality of science communication and promoting innovation within science teaching. This programme moves science and engineering to the street by involving general audiences in both these areas [6]. “Ciencia en Acción” increases in importance every year. Some final events grouped more than 10,000 people in two days. “Ciencia en Acción” is integrated in the international program “Science on Stage” organised by the EIROforum (the CERN - European Organisation for Nuclear Research - , the EFDA -European Fusion Development Agreement - , the EMBL - European Molecular Biology Laboratory - , the ESA - European Space Agency - , the ESO - European Organisation for Astronomical Research in the Southern Hemisphere - , the ESRF - European Synchrotron Radiation Facility - and the ILL - Institute Laue-Langevin - . with the financial support of the European Union .

VI CONCLUSIONS

Many people implicated in several and dissimilar public and private entities can attain accord about the importance of the issue related to make wider and better the perception of engineering within society. In actual fact there are a number of initiatives working separately or jointly in order to contribute to build a more extensive and improved mental picture of science and engineering in the world.

ACKNOWLEDGMENTS

We would like to acknowledge the Spanish National Research Council (CSIC) - the main sponsor of “Science in Action” - and the company ENDESA RED - the sponsor of the VMO Unit -

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