Focusing the Future of Engineering Education

Ciampi, M. M.
President
Safety, Health and Environment Research Organization - SHERO
São Paulo, BRAZIL

Brito, C. da R.
President
Science and Education Research Council - COPEC
São Paulo, BRAZIL

Vasconcelos, R. M.
President
Pedagogical Council of the School of Engineering - University of Minho
Guimarães, PORTUGAL

Amaral, L. A.
President
Computer Graphics Center - CCG
Guimarães, PORTUGAL

Barros, V. F. A.
Executive Secretary
Science and Education Research Council - COPEC
São Paulo, BRAZIL

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INTRODUCTION

The definitions of teacher and student are changing and Education is moving out of episodic experiences at traditional institutions like classrooms and schools into learning flows that course through our daily lives. The use of new technologies in classroom is also an important requirement for a teacher in Higher Education especially in engineering; it is part of teaching environment now. So utilizing emerging technologies to provide expanded learning opportunities is critical to the success of future generations. It is clear that there is a life long learning environment not only for future engineers but also for teachers. This paper describes the "International Engineering Educator" developed by the engineering education research team of COPEC – Science and Education Research Council. It is offered by the International Institute of Education of COPEC, which is a certification organization that certifies in accordance with the Ministry of Education of the Country referring to the National Law of Higher Education, with an international certification.

1 PROBLEM FORMULATION

It is a fact that most of the engineers in education field at the moment are engineers with a PhD or Master degrees. This does not mean that the professional has all the tools to be a proper teacher and now more than ever, once we have students with peculiarities that were unthinkable not long ago.

No matter the field, students are facing changes in the world, which characteristics have consequences for their formation, as happens with engineers. One of them is the constant change in the way people develop the work. This aspect is enhanced by the quick and strong technology

development. Students today require more advice than properly information acquisition once information is now available any time any place in a huge amount, apart from the ability to be connected all time. Students should know how to use educational technologies to apply knowledge to new situations, analyze information, collaborate, solve problems, and make decisions [1].

It is necessary to have in mind and realize that teachers now use emerging technologies to provide expanded learning opportunities for future generations' knowledge achievement. So teachers have to prepare themselves to motivate and entice the students on how to get knowledge pertinent for their formation as engineers. So it is possible to state that the use of new technologies in classroom is also an important requirement for teachers in Higher Education especially in Engineering. It is part of teaching environment and therefore it is necessary to understand the environment of a young pupil. It is clear that life long learning environment is not only for future engineers but also for teachers.

2 HIGH EDUCATION AND ITS PHILOSOPHICAL ASPECTS

More than ever, education is a key factor for economic success of a nation, as well as personal satisfaction, social stability everywhere and for all levels of society, age groups and subject area.

A philosophical aspect of present education environment however states that it is subjected to the capitalist work demands. It means that schools and universities are exposed to the interests of work market dictated by the capitalism environment ruled by private sector. The ideals of employability and entrepreneurship have the goal to convince people that they are free as the capitalists as long as they are "their own bosses". Through this perspective, the competences required by present higher education demand the formation of a professional which main aspect is that s/he has to be capable to know how to be and not so much about the amount of knowledge that s/he has [2].

Therefore, taking into account the present historical moment, preparing a professional means preparing them for the employability and entrepreneurship which main requirement, besides the pertinent knowledge, is the "know how to be", i.e., the capability to develop personal skills that provide adaptability, flexibility and problem solve mind.

Under this perspective educators are considered the ones responsible for the preparation of citizens according to the values, skills and knowledge that the capital needs.

Anyway, this paradigm of education busted by technology resources is shaping a different kind of education requiring a different kind of educator who, apart from philosophical discussions, has to survive in this extremely competitive market in a global scale.

This means a deep change in the role and profile of educators. This change leads to the following aspects:

- Time for activities that integrates the several disciplines
- Willing to learn altogether with the students and with the experience
- Challenge the students with complex tasks that enhance them to mobilize their knowledge
- To be aware that s/he is a didactic situation organizer and also a buster of activities that are meaningful and pertinent for them.

In this sense the role of an educator is not to transmit the knowledge accumulated by humanity; the emphasis of the educational action of educators is to provide the students with tools that help them to understand the world and so to act on it [3].

In this new context, educators have a deep influence in the way education is being developed in classroom. The educators have now to master the art of entice and foster students to pursue a career that is really meaningful for them and to be the best, otherwise it would be very difficult to survive in the work market. It also means that the professional has in her/his hands the possibility to master her/his career despite the historical moment and no matter the work market.

3 ENGINEERING EDUCATOR SKILLS

Besides the knowledge of engineering the new educator has to learn how to develop some competencies as any professional in order to be competitive and achieve success in the career.

Besides having the solid knowledge about her/his field of expertise, the engineering professor is expected to have some competences such as:

- Interpersonal skills, which mean to be able to interact with students, listen to them and get information to boost the learning process;
- To be capable of developing a collaborative work environment;
- Leadership and ethical behavior that shows respect;
- Always prepare the classes with organization and didactic;
- To be innovative, open minded for innovations that inspires students;
- Flexibility to accept new ideas, and different kinds of personality;
- To be able to learn and make different use of evaluation;
- Global vision and capability of create conceptual models as a competitive differential.

One important aspect is also that presently many institutions have developed programs to prepare the engineering professor to perform in order to be competitive as a professional and to enhance education to form the citizen for this century of uncertainty and challenges [4].

It is not enough that universities offer good curriculums, good labs and have top technology available in classroom because in part an important institutional competitiveness factor is also the teacher. Still the educator is a key factor for the success of any educational endeavor even in an environment where education is considered as business.

4 PROGRAM METHODOLOGY

This program is an adventure toward the discovery of new skills and the acquisition of new tools that will provide the opportunity to develop the capability of performing as educator always following the new trends in education. Besides this is a program of international certification, which is also a new trend in global education.

It is a modular program, on line, with credits in ECTS with equivalent in hours in accordance to the educational legislation of the Country.

The certification in engineering education requires:

- each module of 60 hours or 12 ECTS
- so 3 modules that add up 180 hours or 36 ECTS [5].

The program is delivered 100% on line.

The program is delivered in Portuguese Language and the target audience is the engineers dedicated to the education and citizens of countries of Portuguese language.

The program is offered to the CPLP – Community of Portuguese Language Countries.

5 THE MODULES

5.1 Core Modules

- Engineering Education in Theory
- Engineering Education in Practice
- Laboratory Didactics

5.2 Theory Modules

- Psychology
- Sociology
- Engineering ethics

5.3 Practice Modules

- Presentation and communication skills
- Scientific writing
- Working with projects
- ICT in engineering education

5.4 Elective Modules (up to the institutions that delivers the program)

- Intercultural competence
- Evaluation of student performance, grading and assessment
- Quality management
- Curriculum development
- CLIL – Content and Language Integrated Learning
- Portfolio assessment
- Creative thinking
- Collaborative work
- Coaching and mentoring
- Infoliteracy

6 LANGUAGE AND FORMATION

With more than 230 million native speakers, Portuguese is the fifth most spoken language in the world [6]. It is spoken in Europe, America, Africa and Asia. Even in Europe, Portuguese is the third most spoken language

7 SCIENCE AND EDUCATION RESEARCH COUNCIL MAIN ASPECTS

COPEC's History started with an idea shared by some scientists of creating an organization to foster the research mainly in sciences and education. This idea seized larger proportions and after some meetings the Council became reality. This is a group of scientists, professors and professionals whose vision of future has driven them to start this work.

The main mission of COPEC is to promote the progress of science and technology for the welfare of humanity.

Through its activities, COPEC maintains relations with universities, institutions of education, enterprises and the society of several countries for the discussion of sciences, technology and education directions.

COPEC - Science and Education Research Council has been very active and has developed many achievements of great importance for the Country in which it is located.

The Council is an organization constituted by scientists of several areas of human knowledge committed with education and the development of science and technology.

Its members believe that education is the main beam in the construction of a better society and that sciences and technology are the big agents in the fostering of progress to promote the welfare of human being.

8 A PROGRAM DESIGNED FOR THE IMPROVEMENT OF EDUCATORS IN ENGINEERING FIELD

As mentioned above the mission of COPEC - Council of Researches in Education and Sciences is to promote the progress of science and technology for the welfare of humanity.

The main goal is to promote an apprenticeship community and the development of education and sciences areas constituting an intelligent way of collective knowledge for the integration with social and economic agents of community [7].

COPEC as an organization that develops many activities in science and education has as one of them the IGIP National Monitoring Committee of Brazil, which provides the courses for engineering educators and has also a large experience developing and implementing engineering programs, the engineering education research team has decided to develop and to offer a specific program for engineers dedicated to education.

COPEC is an international organization that has been preparing engineers educators in Europe for more than 34 years and now worldwide [8].

For some years COPEC institution of Education has delivered the program in classroom. However, the number of people who could attend the program was very small once it happened in one geographical region of the country. With the development of on line technology to deliver programs and the possibility of reaching a much larger community the institution of education of COPEC decided to offer the program on line.

The Ministry of Education at national level recognizes the certification. Internationally the certification is an INGPAED – IGIP the International Society of Engineering Pedagogy [9].

9 ADMISSION REQUIREMENTS

Candidates' requirements for admission are:

- Candidates should have at least master degree in science, engineering, or technology
- Professionals with other backgrounds are considered based on their interest, formal education and experience in teaching [10].

10 PROGRAM EXPECTED OUTCOMES

The main and maybe the most valuable result of this program is the quality of teachers prepared to adopt new styles in teaching and also learning [11].

It fosters mainly some skills such as:

- Apply the new knowledge in classroom immediately;
- Generate new ideas, new ways of teaching;
- Learn with the students
- Create a classroom environment based on confidence, ethic and teamwork.

It indeed helps the engineers' educators to look at new styles of teaching as well as to pursue quality classes based on pertinent knowledge developing a two-way flow of information [12].

11 CONCLUSION

It is important to point out that the program has been designed in order to fit the necessities of professionals interested in the improvement of career and quality performance.

The aspect of being on line provides the opportunity for a larger audience of Portuguese language.

It is a reasonably flexible program that is developed in accordance with the needs for the accomplishment of the main goal to form engineering educators prepared for the demands of the 21st Century.

It is a great achievement for academic community once it can provide the opportunity to update knowledge for engineers, as it is lifelong education.

The engineering educator receives a certification that is recognized national and internationally.

Although the program is delivered in Portuguese some people from Spanish language are attending the program. This indicates the spectrum of on line courses, that can be even larger for those who, although the mother language is not Portuguese, are able understand it in a level that allows them to study any subject.

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