

AN INNOVATIVE ENVIRONMENTAL ENGINEERING PROGRAM

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Abstract ^¾ In Brazil, among the many governmental and private initiatives that have emerged, many projects have been developed with success. One of these initiatives is the one of University Center of Lusiada with the creation of an Environmental Engineering Program specially designed to form professionals capable to insert themselves and act effectively in the raising work-market in the Country. The coordinating team of Engineering College of this University has created and implemented a program under the new education paradigm that preaches a generalist formation and the development of skills to act in an effective way, solving problems with creativity. To get this goal, the program was conceived with peculiar characteristics, which have been working very well, so far. The project consists basically in the addition of the Science of Earth courses: Meteorology, Geology and Geography (emphasizing Human Geography) and also what has been named “modular education”, which is the development of the program in periods called “theoretical modules” and “search modules”, they last four months each and they are complementary. At the end of the Program s/he will be an engineer capable to promote sustainable development of the Country.

Index Terms ^¾ Science of Earth, search module, sustainable development, theoretical module.

INTRODUCTION

Environment, its preservation, costs and benefits are problems that the planet has to face and all united because we would be naïve to believe that what happens in one part of the earth will not affect others. For Countries that belong to what is called “Third World”, the biggest challenge is to promote scientific and technological development urgently. This task is not always easy to accomplish without any damage for nature or economy. To overcome these issues, laws and punishments are not enough; it is necessary to educate people so that everybody can understand that human life is possible in this environmental and to embrace the cause to preserve the nature using its resources in a rational way. The question is: How to foster economical growth preserving natural resources reserves with low investments in technology? This issue is of extreme importance for next generations, what to do now without compromising the future of human race. Although time has showed that it is not possible to end pollution, what can be done is to reduce its level the matter seems to be reduced to costs and benefits.

It is not a big issue for developed Countries but by the other hand, environmental policies in developing Countries presently is more of economical character once they are submitted to international economical interests. This situation in most of the cases is due to the mentality of the politicians of those Countries, which policy is no education, no investment in science and technology, to keep people ignorant just to guarantee the election of corruptors, generation after generation. These are strong words that sadly show the reality of almost the majority of the Countries of this planet, so it is hard to believe that without the adoption of strong ethics, humanity will survive.

The end of XX Century and starting of the new millennium has brought a new world. It has its origins around the end of 60s and middle of 70s. Three different processes were developed: first, the revolution of computer technology; second, economical crises of capitalism and statehood and the consequent restructuring of both; and third, the apogee of cultural social movements like the women's liberation, human rights, anarchism and environmental. The interaction between these processes and the reactions provoked by them has raised up a new dominant social structure, the net society; a new economy, the global/computer economy; and a new culture, the virtual reality culture.

So the scientific-technological revolution that humanity has been living has also propitiated among many other things, a new sense for the words “out of use”. The sense of the words “out of use” was always intimately linked to the old, something that lost its usefulness. However, the elapsed time that has happened the “out of date” sense is notably inferior to the one of some years ago.

This same approach has been worth for the information learnt by the student, or the professional, especially the intimately linked to the scientific-technological area, in what s/he is respected to his/her formation. The “out of date” can be inferior to three years of professional exercise for some modalities, principally in the software area, for example.

The proposal for now presented, demands a commitment from the faculty, once this in the exercise of educator's priesthood will provide a fomentation atmosphere to the research, motivating the necessary depth as well as valuing the kinetic aspect among the groups that cannot and they should be formed for such. This methodology presupposes sharply, the total involvement of the students once the largest task will be shown extra-class, therefore depending of a certain academic autonomy. So this exercise will result in countless benefits to the student in a way that it

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will join to their knowledge the necessary aspects of the professional life when persevering in the incessant search in the scientific and technological borders.

This project consists in a proposal of an Environmental Engineering Program, conceived by the Coordinating Team of Engineering School of Lusiada University Center. It is a five years program, having in its curriculum some new courses of modern sciences, besides the ones demanded by the Education Law of Brazil Ministry, for engineering programs. It is a modular education developed in periods called "theoretical modules" and "search modules". They last four months each and they are complimentary. At the end of the Program s/he will be an engineer capable to promote human welfare contributing to decrease the grade of the impact of progress over nature and even over men.

LUSIADA UNIVERSITY CENTER - ITS HISTORY

History is part of human life once it shows where men come from and can explain why the present is the way it is. So before describing the project let's tell about the Lusiada University Center, which as many Universities in Brazil is very young one.

In 1967 the Lusiada Foundation was created and it started its activities with the Medical Science College.

In 1969 Management College began and after having consolidated the two Colleges, other Colleges has come. Finally in 1993 the Education Ministry of Brazil recognized the Lusiada as a University Center.

The main characteristic of University Center of Lusiada is the preoccupation with the excellence of education that it offers. This characteristic is expressed in its modern and well-equipped laboratories, libraries and research centers.

Besides a high level of Faculty with 400 members, the University Center of Lusiada also maintains services to the community. By an agreement between the University and the city Hospital, the "Guilherme Alvaro Hospital" can receive around 11 thousands patients per month. It has 220 places and 22 are reserved for Aids patients. All its Research Centers develop a kind of work to the community, which enriches their work too [01].

NEW PARADIGM OF EDUCATION BRINGING CHALLENGES TO ENGINEERING COLLEGES

The present challenge of education institutions is to discuss and find solutions for the equations:

- The necessity to form professionals ready to face the competitiveness in according to the new paradigm of complex, mutable and uncertain work environment;
- What to do for changing it all.

In a new era, which the supremacy of information and the knowledge are widely preached, the formation of a professional becomes a crucial factor for success. The new paradigm preaches that the capital is the intellect and people are the most important, but by the other hand it is still

difficult the total absorption of this new model of development. Why? Because there is the natural resistance of a people to re-structure cognitively and emotionally making possible the learning and principally the creation of concepts completely new.

So following these tendencies new programs have been conceived, new approaches, new laboratories and so on. Changes have been happening and many of them are successful. Lusiada's program for engineering education is one of the successful new kind of forming good engineers prepared to face next millennium.

There is a premise that a global vision, therefore generalist, of the biological cycles and the cycles of the processes of human interference as well as its development and they lead to the idea that the co relations, interfaces and power demand paradoxically, a deep knowledge of the several areas of human knowledge, mainly the capacity to visualize and to establish the "connection synapses" among these areas (physics, mathematics, biology and chemistry, essentially).

THE PROJECT OF ENVIRONMENTAL ENGINEERING PROGRAM

To form a new Environmental Engineer the coordinating team of Lusiada Engineering School has conceived and developed a project of an engineering program, under graduation, five years, which main characteristic is the "Modular Education" [02]. So, the students have two modules the "theoretical modules" and the "search modules" [03].

The modules last four months each and they are complimentary [04]. During the "theoretical modules" the students have normal classes of basic science courses, basic engineering courses and specific engineering courses [05].

In order to increment the program two courses were aided:

- The Sciences of Earth, which includes: Meteorology; Geology; Geography (emphasizing Human Geography);
- The Cosmology, which includes: Astrophysics; Physics; Astronomy; Mathematics.

These courses allied with the basic science courses and the basic engineering courses can provide to the students a new kind of formation, which is much more dynamic and general [06].

During the "search Module" the students have the opportunity to develop research and apply them in projects for solving real problems. They spend some time in a poor community or they can have as an internship in a big Company working in a project. In reality they are considered both cases, as internship and both places are in the Metropolitan Region of Santos.

THE CURRICULA

So the subjects that were chosen are part of the curricula that attends a minimum of the resolution 48/76 of April 27 of 1976 from CFE – Federal Council of Education about the curricula directress [07].

During the last two years of the program the students have the “Work Term”, when the students work effectively in an enterprise. A professor, who altogether the supervisor of the company gives the student the work in part of a project, supervises them. They have to accomplish their work so that another student that will replace him in the project performs the next step. This experience has been very grateful once the students and the companies are satisfied with this scheme of work. The teachers/advisors, they are happy once they have a feedback for their next term. The effective work in projects during the “work term” exposes the students to real appliance of theories.

ASPECTS OF EVALUATION

To evaluate students’ improvement the teachers can choose the way to get it [08]. It can be done by means of works, seminars and tests or any other method. This flexibility [09] is important because of the objective of the courses, which is to give the student an opportunity to develop their abilities of create solutions in according to the demands of environment, helping to decrease the impact of progress over nature and men. For sure a minimum score is required to the approval for next year [10].

Good faculty members, well-equipped Libraries, Internet access and a staff of technicians specially trained for helping are some of the facilities the students can count along the five years [11].

CONCLUSIONS

At the end of last Century and the beginning of the new millennium the coordinating team of Engineering School of Lusiada University Center has conceived and applied a different type of program, an Environmental Engineering Program with the objective of changing the traditional and orthodox engineering education in the Country, It is called “Modular Education” because the students have the “theoretical modules” and the “search modules”. This is a great opportunity for the students to enrich their formation as environmental engineers because they have a strong theoretical basis and they can also to develop research and apply it. This proposal tries to position the student in this border, of applied science helping her/him to notice the need of the autonomy.

Third millennium has started and has also brought to education huge challenges as a consequence of world’s transformation. A new education paradigm has emerged and it preaches that the learning process has to be much more dynamic. It is what is called “learning by making”. It is the students building up their knowledge, creating and developing theories and effectively applying them. Following these tendencies, the engineering education

institutions in Brazil are discussing and trying to implement a new philosophy and a new kind of performance in the formation of the new engineer.

Despite of all problems of management it has, Brazil is still a Country, which nature is in many places intact so it is possible to preserve the largest part of national lands and to promote the development and the progress of the Country. This is the search for sustainable development in a way that future generations can still enjoy the merciful land of a tropical region with outstanding vegetation and nature.

Environmental engineer has most of all to be very well qualified, with skills to help the promotion of sustainable development despite policies and global demands. S/he has to be a professional with scientific mind, capable of finding solutions in according to the local context inserted in a global context. It is the ability of creating technology to be used to the welfare of contemporary society, viewing the future year [12].

The environmental engineering program of Lusiada University Center prepares the students for the effective professional practice in a more solid way, coherent with the complex demand of present and future world.

With effective work in projects the students can have a real environmental problems experience and this provides the interface between theory practices. The seeking for the right solution for a problem, its possibilities and difficulties result in experiences that enriches their formation and enlarges their academic horizons.

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