

New Skills for Engineering Program: Democratic Choices for the Betterment of Engineers' Formation

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Abstract

This work is the description of an educational proposal for an engineering program with the goal of forming engineers for the future work market; a work market, which main characteristic is the promotion of sustainable development and a less aggressive progress. The accomplishment of such important task demands a different kind of engineer. Attempted to this necessity, SENAC School of Engineering and Technology has conceived and developed the Telecommunication Engineering Program, which contains in its curriculum the "free period". It is called so because it is a time the students have to attend classes in the several other areas of knowledge, in one of the Units of SENAC. They are free to choose among the many options like environment issues, nursing, photography, design, fashion, languages, art, etc, whatever they want. The main characteristic of this project is that it contributes for the development of science and technology once it prepares the minds of future.

1. Introduction

The last two decades have brought deep transformations in every level of human life. This was possible because of technological development. The scientific knowledge has been applied to produce new technologies becoming so, the main element for economic success. In this scenario engineering plays a very important role since it has been involved in almost development of new technologies and in the final production of goods and services.

21st century has begun and with it so many changes has happened, that it is not possible to figure out what it can be in five or ten years in the future.

People live today in a world of no frontiers, with new complete new values and different social relations. All these aspects promoted by the development of science and technology have modified deeply people's life in all levels of the so-called "Global" society. Education institutions are challenged once more, to form the new citizen, fostering the professional prepared for the future.

It is inserted in a context of international integration, of deep and radical changes in society and in the producing system that the engineering project of SENAC School of Engineering and technology has emerged. It is a Telecommunication Engineering Program, under graduation, five years, which contains in its curricula the so-called "free period". It is a time the students have to attend classes in the several other areas of knowledge, in one of the Units of SENAC. They are free to choose among the many options like: hotel management gastronomy, interior design, fashion, languages, art, etc, whatever. They can choose as many areas as they want along the five years, at least one per two years. At the end of each period they have to present a report about their development. The report is showed and discussed with a council compound of a psychologist, a pedagogue, a professor of engineer and the coordinator of the program.

This Program is in according to the Federal Law no. 9.394, known as the LDB-Basis and Directress Law of Education. With this Law educational reforms have started, with the objective to increase the quality of superior education in the Country. Although the reforms are associated to a political project of the present team of Republic, the real motivation is due to the necessity of the education to attend the new social and technical postindustrial paradigm recognized simply as "globalization" [1].

2. Electrical Engineering in Brazil

History is of fundamental importance to understand the present importance to understand the present. Brazil is only 500 years old with peculiar colonization aspects. The intention of inserting this chapter in this work is to show the strong influence of European philosophy and style of life in this Country and also the dynamic and intense changes that Brazilian people have been through until today.

The first practical applications of electricity were telegraphy, telephony and lighting. Since then, the use of electricity has multiplied quickly and electrical engineering has unfolded in many specialization areas. Besides the traditional areas there are those, which have

originated from electrical engineering, like computing, process control, automation in general and many others of modern engineering.

The first installations of telegraphy in Brazil occurred in 1852. The first telephone line was installed in 1878. The first cities installed public lighting with incandescent lights were Campos - Rio de Janeiro State, in 1883 and Juiz de Fora – Minas Gerais State, in 1889.

Electrification in Brazil started in fact in Juiz de Fora, in 1889 with the first Hydroelectric Mill of Brazil and South America, the Mill of Marmelos. Eleven years after that, in São Paulo State was installed the Mill of Parnamba and so it started to count with a permanent public service of a hydroelectric mill. The São Paulo Light Co. as it was known has begun a new phase in this history. Between 1905 and 1908, in Rio de Janeiro, the Rio de Janeiro Tramway, Light and Power Co Ltd. Has built the Mill of Ribeirão das Lages. These facts and the Mill of Cubatão – São Paulo State mark the beginning of electrification in Brazil.

An analysis of electrical energy conquests that were realized in USA and Europe shows that the insertion of electrical energy in Brazil happened in the same historical moment of industrial expansion and development of developed countries. And in parallel, electrical engineering in Brazil has emerged and developed. The Mill of Parnamba had the capability of 2.000 kW, amplified later to 16.000 kW transmitted to São Paulo from a distance of 33 Km, under the tension of 24.000 V that were later raised to 40.000 V.

As Brazil has become in one of the biggest market not only of equipment for generation, transmission and distribution of electrical energy, of electrical equipment for industries, but also the lighting and the use in buildings and residences so a powerful industrial park was installed to supply the sector. Once more Brazilian electrical engineering was involved and has found new opportunities to improve.

In the last 40/50 years, Brazil designed and built, essentially with its own engineering, some of the biggest energy generation systems, ever built in the world, like hydroelectric complex of “Ilha Solteira”, “Itaipu” and “Tucurum”.

So the education institutions in the main cities of the country have started to offer electrical engineering programs. Some of them have adapted the German model of Polytechnic School of Zurich. And most of them still follow this model.

The relevance of the History of Electrical Engineering in Brazil resides in the fact that it is also the History of Engineering Education in Brazil [2].

3. The SENAC

As important as to understand Brazil of 500 years of existence is to understand what is SENAC. It is a special kind of institution, which has emerged in the 40's. SENAC means “National Service for Learning”. It is one of the largest education institutions of Brazil. It is spread all over the Country, and it has 52 and units only in São Paulo state (one of the 25 states of Brazil).

Blazing new trails, keeping ahead of change, signaling new trends. And more: turning all this into a consistent project of support for people and organizations in the world of work and business. At the turn of the century, SENAC has wholeheartedly taken up the challenge of the processes that have as a scenario an economy made dynamic by new technologies, by galloping globalization and the fierce competition [3].

In the mid-1990s SENAC realized that it did not have to concentrate all the diffusion of knowledge within its own physical facilities. The Educational Centers are essential for the provision of courses and tailor-made packages for firms, and for holding seminars and congresses; but there are other ways of making expert information widely available. This led to the creation of SENAC and SENAC's Publishing House.

The setting up of the SENAC publishing house was a vital step in extending educational activities to a broader public.

Investment in distance education culminated in the launch of TV SENAC. The result of a consistent successful plan for gradual expansion, the new channel soon achieved nationwide coverage, with the distribution of its signal via satellite, cable and open channels. The first privately owned channel in Brazil to deal exclusively with education and the fostering of citizenship, SENAC TV Network, to use its present name, is a breathtaking succession of achievements. Gratifying achievements such as the technical standard of its programming and the formal solutions of its content. Twenty-four hours a day, every day, the station discusses leisure, culture, quality of life, citizenship, and the world of work, through reports, documentaries, telenews, debates and interviews.

Since the launch of its pioneering Technology Course in Hotel Management in the late 1980s, SENAC - SP has steadily and judiciously broadened its portfolio in the field of Higher Education.

Today it offers over ten titles under the aegis of the SENAC Colleges. As always it pursues innovation, gearing its efforts toward the newest, most promising fields of knowledge and toward the labor market. The differentiated programs include Hotel Management, Fashion Design, Multimedia Design, Computer Science, Environmental Management and others.

At graduation level it offers equally varied programs, with specialization in Health Care, Tourism Gastronomy, among others.

4. Description of the Project

This project is basically the development of an engineering program with the goal to overcome the challenges brought up by the global world. This new world, which has the science and technology working together, not only in terms of structured and based knowledge but also in terms of effective practice [4].

The program contains in its curriculum what was named "free period". It is called so because it is a time when the students have to attend classes in the several other areas of knowledge in one of the Units of SENAC [5]. The main characteristics of this program are:

- The students are free to choose among the many options like environment issues, nursery, photography, design, fashion, languages, art, and many others, whatever they want.
- They can choose as many areas as they want along the five years, at least one per two years.
- At the end of the each period they have to present a report about their development.
- The report is showed and discussed with a council compounded of a psychologist, a pedagogue, an engineer professor and the coordinator of the program [6].

As SENAC has around 52 units in São Paulo state, it can offer many different kinds of programs, short time programs of 3 or 4 months long or long time formation programs of 3 or 4 years. The students can attend anyone, a short time program of Gastronomy for example, or a long time program like Fashion Design. In a long time formation program they can choose to attend the whole program or only some courses, it is up to them. This flexibility is necessary because the goal is to foster their abilities and to enlarge their cultural knowledge.

5. The Telecommunication Engineering Program

This proposal of Telecommunication Engineering Program has the goal to form Electrical Engineers with solid knowledge of Communications, to act in the future work market [7].

It is a five years program, under graduation, morning or afternoon classes. The students have the basic science courses, basic engineering courses and specific engineering courses, besides the courses they choose to attend during the "free period". They have a period of internship in a Company, for at least six months. The Companies are the ones that have an agreement with the School [8].

The "free period" is a great opportunity for them to refine their knowledge of humanity necessities, the local

and global context in which they are immersed. All this knowledge enriches their professional activities.

Besides the students have a period of internship in a enterprise where they work effectively. Most recently SENAC has included as internship the "volunteer work" which has been considered by the big corporations as work experience. So agreements with some social societies have been signed. It is in according to the law no. 9.608 of February, 18th 1998.

The curriculum was elaborated so that any change can be made with the goal of modernizing the program constantly [9]. So the blocs of courses were conceived and implemented to accomplish the project in a way the students can get the best formation. A formation which contempt the requirement of Education Ministry for Higher Education Programs and also pursues innovation in the field.

6. The Telecommunications Engineer Profile

The SENAC School of Engineer and Technology is forming a professional with solid theoretical knowledge - hardware and software - having also the notions of economy, management and law. S/He is prepared to specify, to conceive, to develop, to implement, to adapt, to produce, industrialize, to install and maintain computer systems, as well as to complete the integration of physical and logical resources necessary to take care of the information, computer and automation necessities and general organizations [10].

S/He is a professional with training in new communications methodologies by means of Electronic (radio, Television, microwave, telephony, etc).

In terms of work market, our engineers have a larger knowledge in telecommunications so that s/he can be a candidate in telecommunications equipment industry, entertainment industry and also in the concessionaire of telecommunications, flying companies, tramways companies, big corporations besides enterprises of engineering telecommunication design [11].

S/He is a professional, who although is a specialist in communications can act in any area of electricity, because s/he is an Electronic Engineer and an Electrical Engineer [12].

7. Conclusion

University has an important mission that goes through the centuries, from past to future, passing through present. This mission is essentially the conservation of cultural inheritance generating ideas, values and knowledge. This same University has to defeat the challenge of present world and to serve to the contemporary society viewing the future.

The Philosophical basis of this program is in the conception of a “transforming and progressive education”, which is based in Papert and Piaget education theories. It is the teaching/learning process that results in to know how to use the knowledge with creativity, promoting new solutions for new problems. A process that does not end in the transmission of knowledge, but starts in the search of knowledge, which makes possible to transform and to overcome the skills and the instructions. For engineers it is of a great importance once s/he is one of the agents of transformation of society the co-builders of human history.

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, not only for the human being but also for the Country.

Such kind of education intends to promote the formation of an engineer capable to get knowledge and to build up new ones though a reflexive and questioning attitude about them. It prepares the students for the effective professional practice in a more solid way, coherent with the complex demands of present world.

The “free period” can provide the pupils a more refined education, in a way that they become a future professional with different skills, which can make a difference in their effective acting as engineers.

The students consider this engineering program as an opportunity to full fill the lack of some areas of knowledge, which because of this or that problem was not possible for them to achieve, like the knowledge of languages, for example or design and others.

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