

The Fortress of Knowledge – Social Dimension in Engineering Education

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Abstract

This work is the description of a project that has been implemented in public schools in the city of São Vicente. It is the initiative of São Vicente City Hall that has decided to implement special programs for K12 in public schools in the city. The main goal is to help students to develop the necessary skills to follow carriers like engineer, which is so necessary for the development of a country, or computer science and others. The project has been named *Let's go folks!* and the *Fortress of knowledge* is the special space created in the schools where the students can spend some hours of the week enjoying the good time of learning in a complete new way. It started in February of 2002; it has been dimensioned to serve 10 thousand students per year, including the qualification of teachers and technical staff. The project has been developed and applied by the City Hall education coordination in a joint venture with Supportnet, a private enterprise with the support of COPEC – Council of Researches in Education and Sciences. The success of the project has been so good that it is going to be amplified to the qualification of poor communities citizens in the city.

1. Introduction

Engineering education in Brazil has been widely discussed because it has been facing a large decrease in the number of students in engineering programs. Not only because it is one of the most difficult program but also because it is not a so appealing career like marketing, medicine or marine biology (so up to date presently). All these aspects added to the loss of status that engineer has suffered [01]. The importance of engineering can be observed in developed countries that have achieved such a social and economical level thanks to the technology development policies. These policies led to the achievement of the best schools and centers of technology that receive huge financial aids from the government and enterprises investments.

The discussions about this issue, in Brazil have led to some practical actions at governmental level. And among the actions there is one that is the object of this work. It is the initiative of São Vicente City Hall that has decided to implement special programs for K12 in public schools in the city.

The main goal is to help students to develop the necessary skills to follow carriers in, computer science and other similar fields, principally engineering, which is so necessary for the development of a country. The effort has resulted in a project that has been developed and

applied by the City Hall education coordination in a joint venture with Supportnet, a private institution with the support of COPEC – Council of Researches in Education and Sciences.

The project has been named *Let's go folks!* and the *Fortress of knowledge* is the special space created in the schools where the students can spend some hours of the week enjoying the good time of learning in a complete new way. It has been created to make the students to feel special, a space where they can build their knowledge in their unique way.

It started in February of 2002; it has been dimensioned to serve 10 thousand students per year, including the qualification of teachers and technical staff.

All these endeavors will be followed by the creation of a public University in the town that will be accomplished in a medium to long period of time, which is the city demand due to the enlargement of population and the new mentality of the new politicians presently in charge. This new policy has been inspired by the Country new Presidency that has started a new era and that express the Brazilian population hue and cry for the betterment of its society. It is time for changes and deep changes in all levels and education must be a priority.

Another aspect that has to be taken into account is the Mercosul that is a reality although it is still submitted to an uncertain future [02].

2. Engineering roots in Brazil

The history of engineering in Brazil has its roots in the XVI Century beginning with the colonization. A Historical analysis shows visibly that it started with the military engineering, which military actions at that time in the country were basically the construction of fortifications and the seek for solutions of defense and attack evolving to what is today the civil engineer.

With the colonization of Brazil and the insurance Aspect of Portugal, the royal government recognized the necessity of forming the national engineer and so becoming it of crucial importance. It was made always attending the evolution of French Schools of Engineering and so in 1641 in Lisbon born the *Artillery and Square Classes* becoming in 1647 the *Special Class of Fortification and Architecture*. The Portuguese engineer *Luiz Serrão Pimentel* (1579-1613) managed the school and it is considered the starting point of Lusitanian-Brazilian engineering.

In Brazil the Portuguese style of construction can be seen everywhere and the engineering schools still keeps the European schools style obviously because of the great influence of its countries along the colonization process. The evolution of engineering in Brazil follows very close the world trends. From the construction of Fortifications through electrical engineer to what is called today Mechatronic engineering in the country has developed in according to the necessities of promoting its development always seeking for the best applications of sciences achievement to the local resources.

Many accomplishments of big proportions can be seen through the time, not only public buildings and houses but also practical applications of electricity like telegraphy, telephony and lighting. Electrical energy conquests that were applied in Europe and USA shows that the

insertion of electrical energy in Brazil happened in the same historical moment of industrial expansion and development of developed countries.

Since the *Fortification Classes and Military Architecture* founded in Bahia, in 1699 until the more than 200 engineering schools, engineering education has had a history of success full of many conquests and accomplishments [03].

To understand the present it is necessary to look back history. Engineering in Brazil has a history of real achievements that led to the creation of engineering schools in the country. Although the schools are very young they have got a very respectful level of quality still forming very good engineers with strong engineering basic sciences knowledge.

3. One step to keep up the conquests

There is a consciousness of seeking the best ways to keep up the conquests of education in Brazil despite the several efforts of some governments to do the contrary.

With the creation of Public Universities in the many states of the country, which have worked very well for many years, the country has achieved and has built a solid reputation even abroad also creating generations of Brazilian scientists and educators [04]. These people fortunately have refused to accept the ominous and narrow-minded neo-liberal policies for education having started a fighting to keep up the achievements already gotten and actions that help to maintain and to enhance the researches in every field of science and technology [05].

Many discussions at national level during conferences, all communication medias like radio, TV, etc took place for many years may seem to be a lonely fight once economical speculations seems to be more powerful with more sharp actions world wide. Anyway, professionals and educators of every field of science and technology have been discussing the destiny of education in the country taking into account the historical moment of the world.

Certainly some of these discussions have generated some practical actions at governmental level as a response to the society that see itself as the most interested part in the issue. In Brazil in engineering and technological fields the situation is very delicate. Although the proliferation of private universities all over the country expanding the number of 3rd grade students it does not assure the increase of students in engineering and technology areas. Looking through this perspective the K12 appears as one way to help students to develop skills to follow careers in these fields.

São Vicente City Hall management is one example of the new political mentality and so after some social conquests has decided to implement a special program for K12 in its public schools. Conscious of the importance of eradication of the so-called “technological illiterate” (that is now as important as the eradication of the “illiterate”), has been working hard to get the goal to enhance the number of students to choose the engineering and technology fields. The reasons are obvious and urgent.

4. Technological Education Benefits - Meeting the needs of a new education paradigm

To accomplish such task the City Hall is counting with the excellence of a national private enterprise located in the city, which is Supportnet that has been acting in the market for many years and that has a reputation of quality services and credibility. It is essentially the appliance of solutions for technological problems oriented to the clients/students necessities, in the several areas of knowledge.

It is known the importance of educational informatics in the development of students' cognitive potential. The informatics knowledge is a powerful educational instrument to turn them their own agents of learning process and in the building and acquisition of their knowledge; at last a student more autonomous in the solving of problems using their logical - deductive reasoning in an effective way becoming them more capable to interact with people and the reality that surrounds them [06].

With globalization and the speed of technology advancement it became essential the use of informatics in all human environment. The intelligent use of computers becomes effective when it is used in a way to make the student to explore her/his capabilities and to develop skills. It makes possible to the student to explore, better saying to seek for new knowledge, to solve problems in more creative way and share information [07].

5. Let's Go Folks! - The Project

As mentioned before this special program is based in an integrated educational method using computers as the tools to increment the learning process aiming the betterment of fundamental education system, the K12.

Engineers, Pedagogues, Social Agents and others scientists and technicians involved with education have been working in the implementation and development of this project. It encompasses top technologies with access to Internet and complete didactic material designed for this kind of proposal.

The project has been named "Let's go folks!" as a strategy to reach the young students. Another strategy of marketing to get the attention of them is the name of the labs, so called "Fortress of knowledge".

6. The Fortress of Knowledge - Using Technology Effectively to Enhance the Learning Process

The point of departure is the student-centered paradigm of education. The implementation of this new K12 program aims essentially to generate the intellectual excitement among the students toward the acquisition of knowledge in subjects that are considered very difficult. The new approach with the computer as a powerful tool has showed to be effective to enhance the learning process.

The *Fortress of Knowledge* following the educational strategy is the special space created in the schools where the students can spend some hours of the week enjoying the good time of learning in a complete new way. It looks like the ancient fortresses that were built in the city in the XVI Century to protect it from the pirates and invaders. Nothing more charming! It contains in its space the computers around 20 (in each school) connected in a network, with Internet access. Historically the fortress has an importance to the city once it helped to assure the security of the village. The lay out of the lab building was conceived with two goals: to have a more pleasant and beautiful place to the students and at the same time to make it as a symbol of strength and power. It has been carefully studied and analyzed to cause an impact in the schools and in the students. The goal has been achieved once it has been pointed out as the symbol of the program.

The implementation of the program started in February of 2002; it has been dimensioned to serve 10 thousand students per year, including the qualification of teachers and technical staff for the next four years.

7. Physical and material aspects of the Project

The physical infra structure of the project counts with 16 laboratories with 20 points of network each, in according to the international pattern EIA/TIA 568-A, where each lab contains one Rack with key and the local network active element (Switch 24 doors 10/100 MBITS).

The whole project is compounded by:

- 320 Celeron computers 800 MHZ/ Disk of 20GB and 128 MB RAM/ Colored monitor with 15"/ CDRom/ Stabilizer;
- Supply of 32 printers, 2 for each lab;
- Large band internet access.

The dimensions of the laboratories are large enough to attend the necessities of the schools for present and they can be enlarged with the time and in according to the new demands.

The Internet access infra structure:

- The chosen technology for Internet access is the frame-Relay and 512Kbps speed.
- All labs have local and remote connection equipment (Switch, rotator and modem).

The didactic Supportnet material has received special attention it is complete providing to the students all the necessary information for the correct use of computers.

8. Pedagogic Aspects

Teaching Methodology:

- The proposal of teaching methodology in this program is based mostly in the interaction and real experience;
- The qualification is gotten by means of 25% of theory and 75% of practice [08].

The use of computer in education has been showing as an important agent in the promotion of closer and so important between adviser/instructor and pupil.

The Evaluation Methodology is based on some methods, some orthodox and some non-orthodox. It depends on the teacher and they can be [09]:

- Presentation of works developed with the use of the computer developed during the course;
- Frequency of classes' presence, at least 75%;
- Lectures and practical exercises;
- At the end of the course the students have a test to evaluate the knowledge acquisition based in a minimum quantity required to be approved and get the certificate [10].

9. Students schedule

To get the proposed objective the students have a schedule that has:

- 60 hours of Office package (Windows, Word, Excel and Internet);
- Professional certificate for 8th year of Fundamental School;
- 45 hours of basic Windows, Word, Excel and Internet from the 5th to the 7th years of Fundamental School.

10. Teachers Qualification

So important as to have a new kind of student is the qualification of the teachers [11].

The teachers as well as the students have a schedule to attend the necessary courses to improve their knowledge and also to help the students that will be as well transformed by the use of this new technology.

To get this goal the teachers have:

- 08 hours of typing;
- 80 hours of Office (Windows, Word, Excel, Power Point and Internet);
- 40 hours of informatics in Education.

Both students and teachers have full technical and pedagogical assistance and support of the staff for anything at all.

11. The appealing Approach

The challenge is to make the program more attractive to the students it should have a kind of content that is equally cultural and appealing. Bellow there are some examples of extra available topics plus the program content:

- Availability of Internet access;
- Virtual Bulletin;
- Web mail;
- *Let's go folks!* Journal;
- Best students of the month;
- Download areas (tutorials);

- Educational games;
- Chat;
- Know your City!;
- Test your knowledge;
- Virtual Library;
- Internet Challenges;
- News.

These are among others the material available that are constantly updated [12].

12. Main objectives of the Project

The number one objective is to provide the public school students the possibility to develop the skills to choose carriers in engineering and technology fields. It is followed by:

- Training and qualification of public schools teachers in technology education and pedagogic design;
- To promote the betterment of its citizens qualifying them through the informatics specialization.

The social dimension of this program for sure exceeds the school borders and its first goal.

13. Conclusions

Any student as a human being is without any doubt a great possibility of success and the social condition should not be impediment for the accomplishment of her/his potential.

Presently Brazil has been facing the challenge of providing its people a better quality of life once the historical world moment is crucial for every country. It is a fight for surviving the environmental problems, the wild economic war between the big enterprises among others. Problems that will become worse for developing countries in a near future if they do not find a way to over come the inner problems and start to build a true nation for its citizens.

An innovative solution in education demands not only huge investments and competency but also and mainly the commitment of politicians while representatives of society.

The *Let's go folks!* Project implemented in São Vicente public schools have got so far the very positive results. The success of the project has been so good that it is going to be amplified to the qualification of poor communities citizens of the city. It is an example of serious education policy integrated with community for the betterment of contemporary society viewing the future of youth.

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