

# The Use of Internet as a Teaching Tool for Undergraduated Students' and a Distance Learning Proposal: a Decision Support Systems Laboratory Experience

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**Abstract** — Since 1986, there are three classes in Production Engineering Graduation – Federal University of Santa Catarina (UFSC) – that have been using computers and, since 1997, Internet for complement the present teaching. In the beginning of 1999, this tool has been used in distance teaching. The purpose of this paper is to show the results, problems and challenges of this experience and the futures related projects.

**Index Terms** — Computer education, distance learning, technology barriers, social barriers, pedagogical barriers.

## I. INTRODUCTION

LabSAD [1] was created in 1985 to develop Economic Engineering Softwares to support the some classes in Production Engineering Graduation – Engineering Economy, Industrial Planning and Projects Management.

The LabSAD has Professors, graduated and undergraduate students. Nowadays, there is a partnership between LabSAD and an entrepreneur management softwarehouse. This partnership get access to new computer tools, scientific initial research activities, information for helping thesis, dissertation, books and articles development. Other advantage gained by this partnership is related with computer aided for present teaching and a creation of a distance teaching program of the classes above.

The computer tool introduction in the production engineering graduation teaching at last decade was a important step. LabSAD is keeping its innovative role through information disclosure and good communication between students and Professors by e-mail. The next step is put the three classes in Internet and start the distance production engineering graduation teaching phase.

The use of Internet look for resolving two kinds of problems: to provide modern study conditions and to attend a more students that don't have classes because the insufficient number of Professors – caused by federal budget cuts and increased needs of graduation vacancies.

One of the solutions for the problems above (less Professors, more students with more quality) is a computer based teaching using Internet and others technologies like that for distance teaching.

The distance learning methodology analyse, the strategy of the pedagogy, the questions related with technology and culture are some of the aspects that need to be studied for the success of distance teaching.

The methodology of distance teaching must have basic modules for basic studies and special modules for improved topics. To stimulate this experimental learning it must have also different pedagogy strategies from traditional learning. The technology will offer the support and will present some problems like the program of computer. These problems will require people with specific knowing and creativity to produce a attractive and interactive environment.

The culture is another problem that not permit the frequently use of Internet and accept the break of the traditional paradigms of teacher talking and student listening.

LabSAD is living this experience in the class mentioned and will present here the results and problems found.

## II. THE USE OF THE COMPUTER TOOL

Some engineering applications depend on complex calculus and formulas. For calculating them, tables and calculus ruler and other things were used. Some formulas depend on logarithm values and since century 16<sup>th</sup> values tables have been used for each situation. Other example is the calculus of interests that have been done using values tables either.

The information technology brought with its softwares and hardwares, algorithms that implement mathematics functions and procedures, and give fast and precise complex problems answers. The graphical interface is being better and easier each day.

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The planning and economic calculus like PERT-CPM graphics became easier since de use of softwares.

LabSAD has started use the informations technology in the Engineering Economy, Industrial Planning and Projects Management classes since 1986 looking for a better engineer.

Nowadays, for each two theoretical classes, there is one class using computer. The students of these classes learn to use the market tools and graduate more prepared to the competitive world that waits them.

### III. THE USE OF INTERNET IN THE PRESENT TEACHING

The Internet is used like a helping teaching tool, disclosing informations e improving the communication between the Professors and monitors and their students.

The disclosure informations are:

- The classes programs;
- The classes schedule;
- The valuation approaches;
- Exercises;
- Complementary texts;
- Professors and monitors e-mails;
- References and,
- Two web-pages with databases made specially publishing students' score and compose teams to groups works.

The homepages of the classes are, usually, accessed during the laboratory classes because the majority of the students doesn't have Internet accessing at home or some of them don't matter or knowing about Internet use.

There was not any experiment about disclosing important more information. But the LabSAD work team presume that it will not make differences in the student Internet access culture. There is a strong preference in waiting the class day instead of communicating by e-mail.

UFSC [2] has 19.493 students and 413 personal computers in graduation support laboratories. The 117 personal computers are at Technological Center Laboratories [3] which include almost 4.600 students. So any UFSC' student can access Internet by its laboratories. Further, there are more 20 laboratories for doctorate and master students.

### IV. THE USE OF INTERNET IN DISTANCE TEACHING

The Internet is a new broadcast that can be used in any part of the world in a synchronized or not synchronized way, on-line or off-line, get together text, sound, video and provide services like e-mail, dates transfer, videoconference, etc.

Its use in teaching is became more usual and common tool in present and distance teaching.

LabSAD use Internet in present teaching of the classes mentioned before.

A pilot project planning started in October 1998 and its perform began in January 1999. This project has some different characteristics for distance teaching. The most important characteristics are:

#### A. Teaching Methodology

The present teaching methodology is different from the distance teaching methodology.

In the last case, the Professors must make good use of the building of the knowledge. These implies that information are changed between Professors and students not in real time.

Another example of this kind of methodology can be seen in the Chemistry Engineering Graduation of the Michigan University where the use of home pages is usual without taking of the text books.

The LabSAD's pilot project has three students, two students of PET (Special Training Program), two undergraduate students of Scientific Initial Program of CNPq and two graduate students that will get master and doctor degree. The core of the methodology is homepages, graphics, games, simulations and texts e exercises.

All of these tools are organized in a modular way for keeping the knowledge evolution.

#### B. The strategy of pedagogy

To answer some questions about how the Professors can implement new methodology, how the Professors can be sure it will work or how can overcome the problems a strategy of pedagogy for the pilot project was developed for three different classes in distance teaching.

In the present teaching, the teacher develop tactical and strategically abilities to explaining the topics of the class. At each classes, the teacher develop more abilities in explaining the topics.

New theories presented by Nonaka and Takeuchi [5] say that the teacher develop a tactical knowledge that help him to explain concepts in some situations, like in a class room. It's important to understanding the best tactical knowledge for this kind of teaching and the most appropriate methodology.

How the teacher can be sure that this strategy will work? The pilot project team decided chose, at first time, the students who will have this kind of class trying to find students that are ready for that methodology.

Besides, the commitment (team, teacher, student) is essential for the success of the strategy.

How the Professors can overcome the problems a strategy of pedagogy? Some problems identified can be classified in technological, cultural or pedagogical.

The strategies of pedagogy is the key point and needs constantly exercises. In this sense, creativity can't be forgotten. Innovate solutions can help the student acceptance.

#### C. Technological Barriers

The technology has developed quickly since 40's. The introduction of interactive HTML home pages is ten years old. In the last three years the growth of Brazil Internet use has became signicative.

Some Internet technologies are being developed and increased in complexity and number. New possibilities are appearing each day and it is difficult to be up-to-date.

The LabSAD team can see these problems. The programmers have different solutions for the same problem. They have to decide with many variables. When they decided about a solution, they need to learn the tool use. Other problems, like financial problems are found. The intensive use of Internet claims powerful process and high store capacity equipments. But the reality is different and there is not a special budget to get that. This technological barrier is a key point that will determine if the team have resources to use.

The cost of the technology is a important aspect for the users. Many users don't have financial resources for accessing these technologies.

Even at UFSC it's possible to find technological barriers. Some graduations don't have sufficient equipments and softwares for their students or don't permit the use of their equipments for all students.

#### *D. Cultural Barrier*

Many people in the UFSC don't use information technology frequently. This includes students and Professors. A survey in LabSAD shows that in 13 days in February 1999 there were 70 access for Engineering Economic class, 62 for Industrial Planning class and 48 for Project Management class. It can be resumed in 3.69 until 5.38 access per day. Theses results show the low student interest in Internet use.

Besides this aspect, the students need to be accustomed to use new technologies.

The distance teaching demands much more from the students and it's important to know how to motivate them.

### V. CONCLUSIONS

The three classes need to use computer. In the Economic Engineering and Industrial Planning, the use of Microsoft Excel as a learning tool permit the building of graphics and simulations calculus that are essential for the classes.

In Project Management, softwares like Microsoft Project and Super Project need to be used.

The LabSAD was created in 1985 to develop economic engineering softwares for personal computers. Now the production engineering students are using these softwares in some classes.

Since the first used terminal in Production Engineering linked to central computer of UFSC and the use of BitNET on it, the LabSAD have been a part of the evolution of teaching technologies.

Probably the beginning of the graduation, after the master program, has a big part in this history. Nowadays, there is a very strong experience in distance teaching postgraduate program. There is a need to understand this experience and evaluate it.

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