OBSTACLES ENCOUNTERED BY UNICAMP ENGINEERING PROFESSORS WHILE DEALING WITH DISTANCE TEACHING PROCESSES

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Abstract — *There is a clear growth in Web use by Universities, with the purpose of spreading online courses. However, online teaching is far from reaching its maximum potential. Several obstacles were pointed out as being the main cause for the deficiencies encountered during studies carried out in a number of countries. The causes for these problems were personal, technological, and institutional. This article has as its main objective, to take these main obstacles that were pointed out during the studies, and see how true they are within the Brazilian reality; specially in the technological area, taking the Engineering courses at State University of Campinas (Unicamp) as the basis, through research done with professors from different courses of this Institution.*

Index Terms — Distance education, Engineering Education, Obstacles in distance learning, Engineering online courses.

INTRODUCTION

The increase of Internet use as a way of improving communication means as well as the broadening of computer processing power, have favored the growth of distance learning through the web (online teaching). This has motivated Universities to re-think their practices and teaching policies, and to adopt online teaching programs.

The increases in the learning process quality, the maintenance of competitive advantage, and the improvement in the means of education access, were pointed out as the three main reasons for the set up of online courses according to studies done at the end of the last decade by Universities [1], [6] and [9].

However, the use of online teaching potential is far from reaching its maximum. A number of studies and researches done throughout the world indicate various obstacles, which were pointed out by professors. These obstacles were caused by personal, technological and institutional problems.

This article has as its main objective, to take the main obstacles identified in these studies and researches, and see how true they are within the Brazilian reality, especially in the technological area, taking into a basis the Engineering courses at State University of Campinas (UNICAMP), through researches done with professors at this Institution.

OBSTACLES FOR THE INTRODUCTION OF WEB BASED LEARNING – WORLD CONTEXT

A lot has been written about the importance and the value of the contextualized computer in the teaching/learning process. Glace and Smith [3] wrote about the gap that exists between the expected technological level and the one really used by professors. To obtain success in the integration of technology to teaching, we should not only rely upon the use and acceptance of technology by the students; but also, and on priority bases, rely upon its understanding and mass use by professors.

In the case of online teaching, studies have shown a number of obstacles (barriers) that block the effective use of technology by professors, causing a gap to appear between the expected and the real use of such technology.

Pajo and Wallace [10], based on research results done with Professors at the Business, Science and Education School at Massy University (New Zealand), pointed out as the main obstacles: 1) time required to learn how to use the technology; 2) time associated with the development and implementation of web based courses; and 3) time required to use online teaching environment as well as course monitoring (student feedback).

Aside from this first set of personal obstacles, the same authors point to another group that are imposed upon by the teaching Institutions, which they called organizational obstacles: inadequate technical support, the lack of institutional of recognition/importance of processes involving online teaching and insufficient available funds.

Already in 1995, James and Beattie [7] did a study on graduate education in Australia, which showed a slow evolution of options in his long distance teaching, whereas

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main means of instruction was still written. According to the authors, a major use of online teaching has not yet been reached due to lack of academic pattern consensus, to bad results about other academic work, and the lack of technical support.

Specifically on the item academic work impact, the authors with the help of professors who were interviewed, identified the reasons that influenced this negative impact, and arrived at the three main (obstacles): 1) time required for managing the groups and other chores that go along online teaching (especially feedback to students), 2) a large amount of time required for the production of good quality learning material; 3) long distance teaching is just as rewarding, or less than through traditional teaching methods.

To enhance this hypothesis of problem universalizing, the work of Daugherty and Funke [2] done at Calgary University with students and professors reinforces he existence of obstacles, which are in common to all. The findings obtained by researchers while working with professors as to the obstacles, or changes imposed by online instruction take in were (through order of importance): 1) lack of technical support; 2) lack of equipment as well as adequate software; 3) amount of time required for material preparation and course managing; 4) holding back on the part of students; and 5) lack of institutional support.

Still on this same line of thought, two other studies show that there is usually poor performance on the part of online professors, as to questions pertaining to time and technical support, seeing as how very little or no importance is given to these items [5] and [8]. The later [8], goes as much as to say that the recognition of time involved in the creation of quality products, the development, and its setting up is still not yet agreed upon by the majority of Universities.

Similar results to the ones mentioned above, were also found in other researches done in other contexts, schools and countries [4], [11], [3] and [13].

As we can see, there is harmony in the results of reported researches, and therefore, there is an indication that there is a universalizing of obstacles found by professors in the online teaching process. Our intention is to bring it to accordance with the technological area, specifically in engineering courses.

UTILIZED CONTEXT FOR THE OBSTACLE VALIDATION IN THE ENGINEERING AREA

State University of Campinas (UNICAMP) is a public teaching institution that offers a range of knowledge areas, and levels of undergraduate and graduate courses; preferably through traditional methods. It stands out as one of the largest public universities in Brazil. It has 21 thousand students divided as follows: (55%) undergraduate and (45%) graduate students [12].

UNICAMP does not have clearly defined policies in relation to long distance teaching. Therefore, the observed reality is the existence of individual efforts of a small part of the faculty who is conducting pilot online teaching programs, in its majority, used as support to present teaching.

In the technological area, specifically in the Engineering School at UNICAMP, the scenario is not different.

Only a small percentage of UNICAMP´s school of Engineering faculty (not more then 5%) take or have taken the initiative to use the *Web* channel as teaching means.

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In its context, the encountered obstacle validation process which was found by professors in the long distance teaching process, specifically in the engineering area of UNICAMP, was restricted to a small sample of professors, making this limitation advantageous to the study, because we were able to opt for individual semi-structured interviewing with each one of the faculty members that used or are using the long distance teaching process, wishing to explain with more accuracy the individual perceptions as to obstacles encountered during their online teaching experience.

Table I shows the various schools of engineering at UNICAMP, and the number of professors that were interviewed in each.

TABLE I
SCHOOL OF ENGINEERING AT UNICAMP AND THE NUMBER OF PROFESSORS THAT WERE INTERVIEWED IN EACH LEARNING UNIT.

School of Engineering at Unicamp	Number of professors interviewed
School of Computer and Electric Engineering	4
School of Civil Engineering	2
School of Mechanic Engineering	2
School of Chemical Engineering	2
School of Food Engineering	2

Methodology

The interviews were done during April and May 2002, dates were previously scheduled, and, when authorized they were taped.

Each interview lasted for at least 30 minutes, and in some cases it lasted for as much as 2 hours.

RESULTS FOUND IN THE VALIDATION PROCESS

The interview was guided by the central question: "*what are the obstacles in distance teaching?*" Because of the format of the semi-structured interview, it was done in an open way, without limitations on the part of the professors when answering the questions.

The majority of the professors, who were interviewed, gave as the main obstacle "*time consumption in the*

development of the teaching material, and time spent for the redirection/conduction of the group (feedback) " In the words of one of the professors:

> *"The biggest obstacles are: time and preparation...you spend time to prepare the material, to help the students, and to work with the computer".*

Concerning *feedback* to students, another professor mentioned:

> *" In my attempts (long distance teaching), I used the e-mail as communication means. It was terrible! I wasted all my time doing this, and couldn't do anything else (more important)"*

As to the preparation of teaching material to be used, it was observed that, in the majority of the cases they were already available. They were not, however, in an adequate format or style to be published and or made available for the online teaching. In this sense, one professor points out:

> *"...it is obvious not only to the student as well as to the professor that to do such work (producing teaching material) isn´t an easy task. To write the text, for example, it demands a lot of hard work. I had already written a book on electronics, in which I referred to a course of latex, so I used this material as basis for the Classes. However, it had to be converted into HTML. The Whole conversion process demanded a lot of work."*

In the later report, in common with the set of interviewed people, goes what was identified as the second and biggest impact obstacle in the online set up process and production: "***the technological obstacle: lack of technical abilities in the handling of/ and limitations imposed by such technologies***".

There is an interesting comment made about the second obstacle:

> *"The main obstacle (in long distance teaching) is the lack of effective multidirectional communication. Interaction is jeopardized, thus reducing adaptation space according to the moment and group re-feeding. The tools used for communication nowadays are sufferable, to say the least".*

Besides the communication limitation, also another limitation was pointed out; the one related to the tools aimed at teaching material production. There is a particular aspect pertaining to the technological area, as pointed out during the interviews. In the technical engineering area, there is great need for concept expressing in form of mathematical formulas. These formulas need a tool that facilitates the construction and the publishing process. Therefore, we come upon the third obstacle, which is: "***the lack of specific tools for the technological area which facilitate material***

publication process". One of the professors who were interviewed points out:

> *"...when you need to create material, just to think that one has to use equation editor, is hard enough, and there is no point in giving a long distance course unless you have appropriate material. You take twice or three times more time to use an equation editor, as you would if using a text editor or simply did it by hand. It's a great sacrifice".*

The fourth obstacle arises because of the limitations imposed by technology, and it is widely pointed out by the professors who were interviewed: "***the need to (re-learn) a new post as professor/tutor***".

A very pertaining comment came up regarding the fourth obstacle:

> *"The professor has to have it clear in his mind, that long distance teaching is not the same as classroom teaching. There is a difference in standard, and as such, it forces a change in posture in the process of participating agents, especially the professors' ".*

The majority of the professors' manifestation became clear as to the lack of incentives on the part of the institution, to support course transformation projects taught in the traditional way (professor present) to online format. Such manifestation points out another obstacle found: "***lack of clear institutional support to faculty members***".

The professors who adventure into such tasks are the ones who look for innovative processes, not worrying about the return or the institutional support. Here is a comment that emphasizes this obstacle:

> *"... if you can give a professor-present course in which you go there for 2 to 4 hours a week and see from 5 to 6 students because the others don´t look for you anyway, and when it's distance teaching, the ones that never look for you, come and ask questions just to say that they are taking part...and this unmotivates; seeing as how we don´t earn anything extra to do this. Therefore, most professors prefer to stick to professor-present classes only".*

The view that the "institution" does not support such processes can be verified by the views of many professors in the educational format of online teaching:

> *"... so, distance teaching demands a lot more work than professor-present classes, and sometimes this is not very well understood, and when other professors found out that I was teaching online, they asked: what does he do? Do you mean he doesn´t teach? What does he do during his class time? There is a lot of prejudice towards it, but these people are a bit slow, so they don't really*

understand this new way of educating, so I have to explain everything, and show that I spend a lot more time then I would if I were teaching a professor-present class; in which I'd show my ready made transparencies, with nothing new to add; so the teaching task is very small….it´s alright if stay in the classroom for two hours, but I take a lot more then two hours a week to do this online course!"

As for last, other obstacles were pointed out by the professors during the interviews; not in an emphatic way as the ones already mentioned, but that in a way cause a bit of worrying because they touch upon the effectiveness of the long distance teaching set up. Some of them are: lack of support personnel; excessive personal exposure: prejudice on the part of the students: and the fact that communication tools are still deficient.

Table II shows a summary of the main obstacles in order of importance: as they were pointed out by the professors of the engineering courses at Unicamp, while they undertook the long distance teaching process.

TABLE II
MAIN OBSTACLES FOUND BY PROFESSORS IN THE ENGINEERING AREA

Degree of Importance	Obstacles
1	Time used for the development of teaching material and for the conduction and redirecting of students *(feedback)*
2	Technology: Lack of technical handling abilities and limitation imposed by such technologies
3	The lack of specific tools for the technological area which could facilitate the publishing process of technical material.
4	The need to re-learn the new professor/tutor posture
5	Lack of clear institutional support to faculty members

FINAL CONSIDERATIONS

As first proposal, the research done with the faculty members from the Engineering School at UNICAMP, had as a goal, to identify the main difficulties encountered by professors while using the Web for teaching, and to compare them to the results of others researches done in others Universities and countries.

The validation process was successful, for the main obstacles that were pointed out by UNICAMP´s engineering professors, and they were coherent with the ones presented in other papers.

In this comparison, it was possible to validate the use of those papers in future researches in online teaching.

The only point not emphasized in the researche done, but which was highly high lightened by the professors in the technological area, was the lack of tools to facilitate the publishing process of technical contents/mathematical, like formulas, resolution mathematical processes, and technical drawings.

Therefore, we are aware that such obstacles were pointed out as being in conformity with all the professors during the process of setting up online teaching courses; no matter what the geographical location was, or its work area. The great difference in the powering of online teaching is in the bringing out of valid standards, and the construction of a new model, and a new teaching structure, proper for this new context.

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