

Using new technologies out of the classroom

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Abstract: - In the new era of the new technologies, and in the ‘particular’ case of Europe with its convergence process of Bologna, it seems essential to adequete the classes of the subjects in order to promote the study out of the classrooms. At the same time, the greater and greater lack of the new students when they start the degree in university is tried to reduce. Therefore in this paper a new approach by means of the use of a multimedia support is presented. It is not a simple video: it has slides of Power Point (with animations), there are links with mathematical software such as Mathematica, teacher writes in the slides ‘on-line’ like in the blackboard, and at the same time there is an audio (with the teacher’s voice) to explain and remark the concepts of the lesson.

Key-Words: -Multimedia, video, Bologna process, continuous education, presential classes, constructive learning

1 Introduction

Since years we have observed in Spain that students who accede to university do not bring the necessary training to begin higher studies. On the one hand, the reform of curricula in Bachelor causes that, in general, they have attended less hours than those that would be advisable to obtain the necessary basic knowledge for the access to university. On the other hand, the attitude of the pupils has undergone a gradual change that has taken them to lack, almost completely, of individual ability to work. That is to say, it is not only a problem of lack of knowledge, but that is clearly agravated by the fact of the lack habit, that in some cases even arrives at the incapacity, to face the work and individual effort that require higher studies.

In order to try to palliate the first of these problems, the deficiencies of lacks of knowledge, some measures have started up at university level, among which we could emphasize the so-called ‘Course 0’ in basic matters. Although it does not seem the perfect tool, because the ideal would be to correct the problems in inferior levels, it is at least of easy application since its beginning only depends on the own university.

The second detected problem does not have simple solution. To modify habits of study requires a set of measures that involve the own student. The foundation of the learning based on the European credits (ECTS) inside the so-called ‘convergence

process of Bologna’, where the base is the own learning of the student and where his work is considered, must be a salutary lesson for that student. An exhaustive knowledge, for the part of the student, of the competitions who must reach, of the methodology that teacher will use in the classes and of the evaluation of the matter (kind of tests, individual or group works, etc.), must stimulate his desire to learn.

2 Modify methods and attitude

In Spain we are still waiting to know how the degrees are going to be defined and structured inside the framework of convergence of Bologna. But it turns out interesting to begin to take steps that allow a gradual adaptation, both of the knowledge that student has to acquire and of the form in which this student can do it. We can assume that the degrees are going to undergo certain adjustments as far as the number of years (at present, the engineering is a five year degree) and it is obvious that it will be affect the distribution of credits among all subjets. But it does not seem correct that this must irremediably bring with substantial modification of the contents that students would know, at least if we desire to maintain a quality learning.

All the previous ideas take us to express the need for a modification of methods and attitudes. That is to say, if, in a generic form, we want the student to

continue receiving the learning in contents that he acquires at present, but we assume a relative reduction of the hours of lessons, this deficiency would be replaced somehow. Now is when we must submerge in analyzing the methodology followed until present considering a simple but strategic question: does the Masterly Class fulfill our prospects of learning? And what is more important: does it fulfill the prospects of learning of the student?


3 Learn to learn

If we consider that a basic part of the new exposition is to turn the process of 'teach to learn' in a process of 'learn to learn', transforming the conventional conception that we normally have of the learning process into a constructive conception, the teacher must assume that his paper of mere transmitter of knowledge (information) has to change. He must at least assume that the center of the process is not him but the student, and that the quantification of the credits will not be on the basis of his dedication, but on the one of the student.

Therefore, certain premises have settled down that are going to motivate the introduction of

changes in the traditional way of teaching at university level:

- In the paradigm teaching-learning, it is taking place a change in which the educative efforts are centered every time with greater intensity in the individual that learns (the student). The society of the knowledge is also the **society of the learning**. These ideas are closely related to the conception of the education within a wider context like the **continuous education**, where the individual needs to be able to handle the knowledge, to update it, to select what is appropriate for a determined context, to be in permanent contact with the sources of information and to understand the learned things in such a way that it can easy and fastly be adapted to new and changeable situations.
- Likewise, student must know why learns a concept in order to adapt it to its context. This would create own initiative in the student, so that an individualized process of learning settles down (**the one that learns is oneself**).



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Matematika Aplikatua Saila
KALKULU INFINITESIMALA

(2) Espazioko kurbak

Ekuazio parametrikoa:

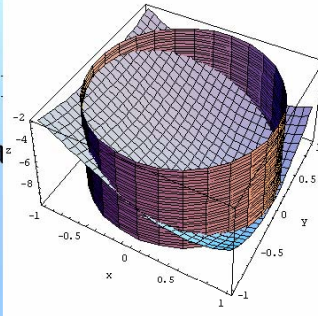
$$\begin{cases} x = x(t) \\ y = y(t) \\ z = z(t) \end{cases}, t \in I$$

Ekuazio implizitua:

$$\begin{cases} F(x, y, z) = 0 \\ G(x, y, z) = 0 \end{cases}$$

Ekuazio bektoriala:

$$\vec{r}(t) = x(t) \cdot \vec{i} + y(t) \cdot \vec{j} + z(t) \cdot \vec{k}, t \in I$$



erreferentzia sistema

Adibidea:

$$\begin{cases} x^2 + y^2 - 1 = 0 \\ z = (x + 2)(x^2 + y^2 - 4) \end{cases}$$

$$\begin{cases} x = \cos t \\ y = \sin t \\ z = -3(2 + \cos t) \end{cases}, t \in [0, 2\pi]$$

Fig. 1. Slide of the Power Point for the video with use of Mathematica software

- As a consequence, student must see recognized and evaluated his effort. In fact, the evaluation must be source of feedback both for the students and for the teacher. The role of the evaluation is to guide, motivate and drive the work of the students, who must see it, in fact, like generator of prospects. For that reason the evaluation is made throughout all the process and not only at the end.
- If we want a **constructive** system of education, teaching must establish in an organized way the activities that will facilitate the accessible construction of the scientific knowledge. And to consider, also, which the student already knows.
- Learning requires that students imply themselves helped by the teacher. The relations teaching-learning (teacher-student) are complex and nondeterminist. But, in any case, student must know that it learns doing.
- Spectacular changes in the teaching structure are not expected, but qualitative changes in the teaching strategies.

Basically, it will imply to maintain a balance among subjects, alternative program and teaching time. For this reason it is fundamental to design a sequence of learning progressively increasing the difficulty of the tasks and organizing the support according to the difficulties of the student.

- All these represent an accessible challenge by the students since they can participate in his construction.

Of all the previous it is deduced that, according to the traditional teaching, it is necessary to establish changes at three levels:

1. Entrusted task
2. Structure of the class
3. Operation

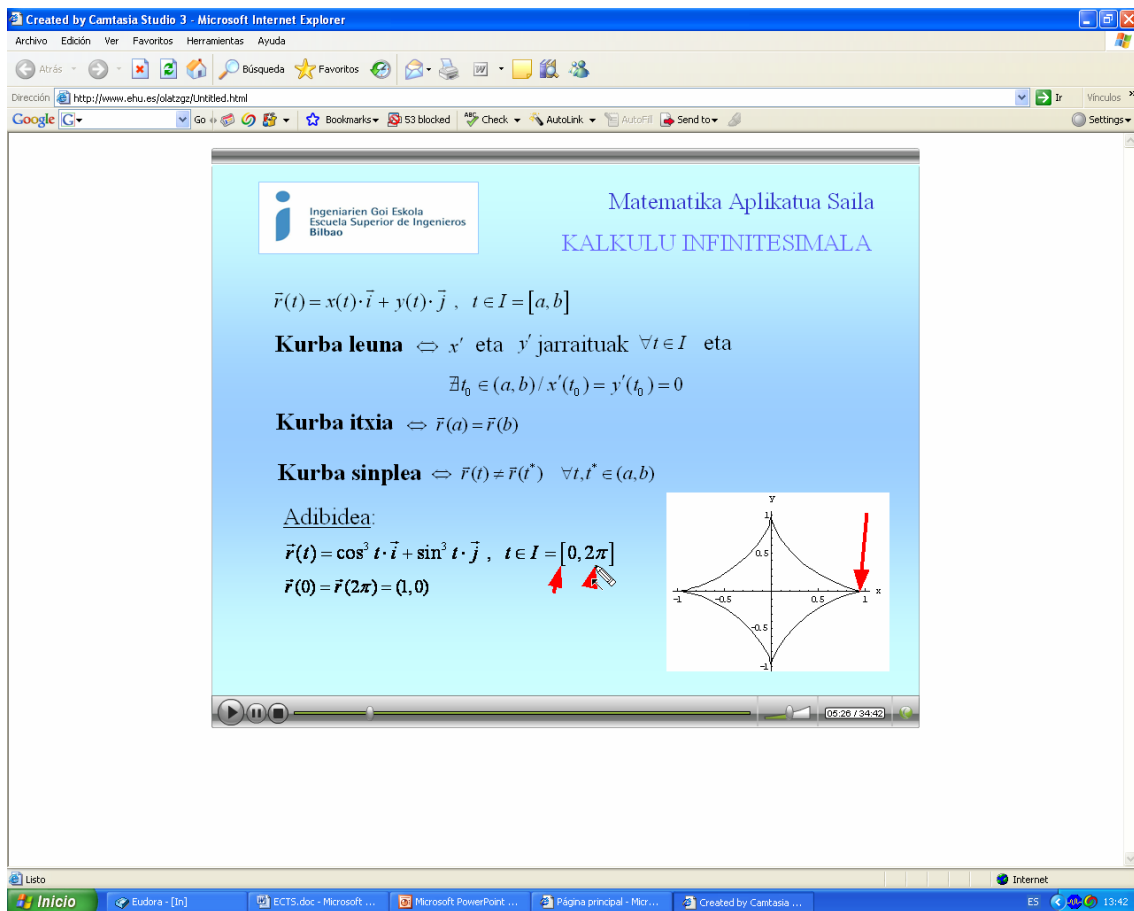


Fig. 2. Interaction in the video.

As far as the **entrusted task**, it will be essential to establish a sequence of activities:

- i) Initial activities: to locate the subject and to encourage the student to specify his conceptual schemes.
- ii) Introduction of new concepts: this implies his justification. Either the well-known until that moment does not solve the question expressed at present, or the new concept does with greater facility.
- ii) To develop scientific methodology.
- iv) Activities to use the learned concept: 'Something has been learned (understood) when we are able to apply it in different problematical situations'.

All previous one implies, doubtlessly, a previous work of reflection by the student on the initial activities and, later, on the activities for the introduction of new concepts.

With regards to the **structure of the class**, it seems that to form small groups of work is an advisable practice.

And this will bring a change in the **operation** of the class since, although these groups do not have to work simultaneously, they do not do either autonomously, but they must interact.

As it has been indicated previously, it seems a fact that the number of hours of lessons, in their present form of Masterly Class, will be reduced. This brings the necessity to reduce the use of presential tasks and to develop the semipresential tasks and the remote tasks with the object to teach to learn so that the student can learn to learn, conceiving the university education like other stage of the learning throughout the life.

4 Innovative academic experience

In the last academic years a pilot course has been set in motion to the introduction of the ECTS in the Engineering School of Bilbao. In that frame, taking care of the exposed necessities previously, we proposed new formative activities, based mainly on the necessity to develop the work of the student.

One of these activities has involved the preparation of videos relative to matters pertaining to the program of the subject, which have been hung in Internet. The objective that is persecuted with this

new material is double. On the one hand it is tried to lighten the number of presential hours of lessons (masterly classes). For it, the teacher develops a subject in an exhaustive way, as if exposition was done in the classroom, but with the advantage of being able to make use of all the technology that a computer offers, and he puts it, in form of video, to be used by the student. On the other hand, the student does his work meeting his capacities and necessities. He decides how many, when and where he will receive information of the video. In this way, the personal work of the student and his capacity of self-management are powered, forcing him to develop a sense of responsibility that the presential class annuls in many occasions.

Moreover, the way of communication is attractive for the student: Internet. To make use of a tool that in many cases it is associated to the leisure in order to acquire knowledge aids to turn the learning process more attractive.

The material has been developed using Power Point to create the presentations. Moreover, we have been able to make use of all the software available to expose with the greatest possible clarity concepts that, in a presential class, would be more complicated to explain.

Once these presentations prepared, we have recorded the video (slides of Power Point and audio of the teacher) by means of the software Camtasia. This tool allows to capture in video format all the activity that is being developed in the screen of the computer.

The opportunity to attend a class in which the teacher explains to him, the times that the student needs, ideas and concepts of the subject that he is attending is offered to the student. Besides, the lesson is exposed with examples and techniques that are not feasible in a masterly class with the traditional style.

It is obvious that this kind of teaching-learning requires of certain complicity between the teacher and the student, even more than a Masterly Class in which both are physically present. The work that the student makes in front of his computer, listening the explanations of the teacher while attractive examples help him to understand what it is exposed, has to be valued in their measured. And, although the teacher has been able to reduce certain presential hours of lessons, it is also true that a good work done by the student will bring, without doubt, the necessity to resolve his doubts, either in class, or in a tutorship.

5 Conclusions

This paper presents a possible framework for developing the capabilities of the students out of the classroom by means of the use of new multimedia technologies. Other conclusions can be classified as follows:

- There is a need to reduce the presential hours of lessons.
- Promote the active participation of the student in his learning.
- Encourage the use of the new technologies in front of the classic blackboard.
- Create different ways of communication in the relation teacher-student, without the restriction of the classroom, and encouraging, for example, the tutorships.

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