Development of a virtual learning community for the subject Numerical Methods under Moodle

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MetNum is a meeting point for the students of the subject "Numerical Methods" of the Engineering School of Informatics in the University of Málaga since 2003-2004. The former platform, existent in the University of Málaga, was firstly used, and results were improved quickly. The basic tools we worked with in MetNum were distribution lists and forums, as a means to encourage and guide students' daily work. Since the year 2004-2005, MetNum has been developed under Moodle. The new tools provided by this platform have been exhaustively applied. We would like to emphasize the ability of Moodle to directly make a preview of LaTeX code, which is usually used to present mathematical material.

Keywords E-learning; Mathematics teaching; Moodle; Virtual Teaching

1. Introduction

The subject object of this project is given during the first half of the academic year, and it corresponds to the second year of the degrees Ingeniería Técnica Informática de Gestión and Ingeniería Técnica Informática de Sistemas. Both subjects have the same program and the same number of credits (4.5) so, in the teaching experience, activities have been carried out for the students of the 4 groups (2 for each degree) without making any difference between them. The aggregate number of students which benefit from this experience has been 683. One of the main difficulties of this subject is the reduced number of credits with respect to the wide program, which becomes worse due to the great lack of knowledge of some previous subjects which cannot be corrected in the classes, since there is little time available for the current program.

Since year 2005-2006, the virtual campus MetNum has been the workplace of 4 groups with more than 600 students. We underline that a great amount of learning units has been developed by using the tools provided by Moodle: questionnaires, lessons, homework, glossaries (students built a glossary with hundreds of frequently used concepts), forums, tutorships, dates, etc.

Last year, MetNum has been the key to achieve 83% of students passing the subject (data obtained from the Academic Regulation Commission) over the number of students that were present in the exam, in the group 2º B of Gestión (pilot for the convergence in the EEES- Espacio Europeo de Educación Superior - European Higher Education Area). After the experience, there is no chance but to use distance-learning tools in order to transform the way of work in the process of convergence in the EEES.

In this work, we will describe the tools that have got the students to work continuously in the subject. Analogously, we will go into details of the tools that are not useful in our environment due to the student overcrowding. We emphasize glossaries of commands of the scientific language Matlab, developed by the students and widely used as a mechanism to make consults.

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2. The virtual campus we have developed

2.1   Basic tools in MetNum

If we browse http://www.informatica.cv.uma.es and click on Ingeniería Informática – Métodos Numéricos, the recently developed virtual campus appears (Fig 1):
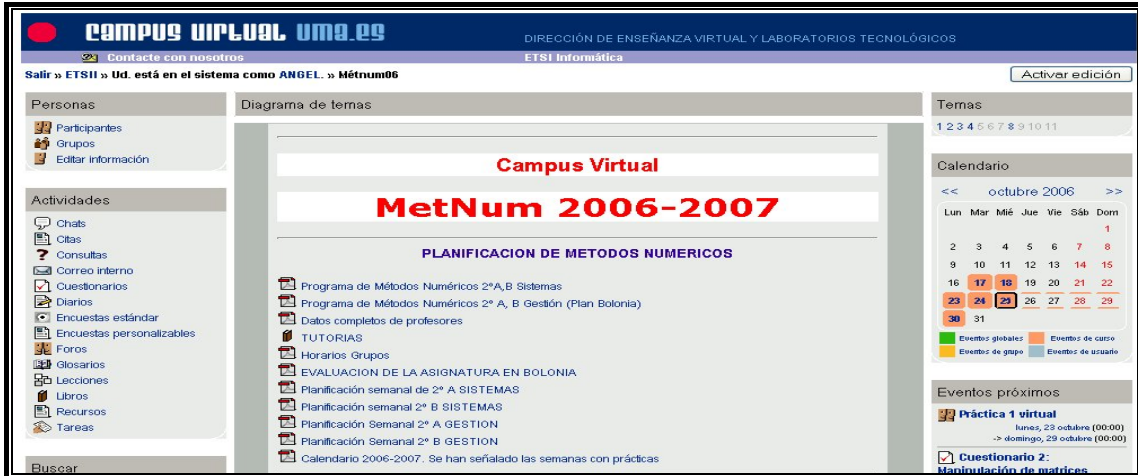

Fig. 1 Main page in MetNum.

Under the name of the campus, we keep all the information about the subject: the program of Numerical Methods, weekly planning of the classes, tutorships, professors' data, etc. In the left hand side, it can be seen that we can access to the information of all the participants (the students) and the basics developed tools: questionnaires, forums, lessons, diaries, books, homework, glossaries, etc. At the right hand side, students can see the next events and consult the calendar with the daily planning of the subject.

Fig 2. Tools and Chapters 0 and 2 of the subject.

In Fig 2 we show the organization of the material of the subject by chapters and how some tools offered by the platform Moodle look like (Matlab Learning Forum, Theory Forum Chapter 2 2006-2007,

Glossaries "F.A.Q. definitions of theory" y "Self-Glossary of Matlab Commands", chat, e-mail service, etc.).

In every chapter, some tutorials for practice, slideshows and forums (Fig. 3) have been developed in order to encourage the daily work. Replies given by professors or students to doubts asked by students are commonly presented in a nested way.

Fig 3. Example of forum in MetNum.

Another tool offered by Moodle is homework. An exercise is proposed to the students and they solve it by using one or more files that are sent to the professor by means of its interface. The teacher can make a report of that homework. We stress that this is a powerful tool offered by Moodle to achieve a greater individualism and tutorship of the students. Precisely, this level of individualism makes this tool not useful for our subject, since every year, as mentioned before, we have more than 600 students of Numerical Methods in both degrees.

2.1   Advanced tools of Moodle implemented in MetNum

We emphasize the use of questionnaires, as the advanced tool that has been exhaustively utilized in every chapter. We think that it is the tool that has encourage the students to work the subject day by day.

In Fig 4 we show the beginning of a questionnaire on the chapter of introduction to Matlab. We can see how the student answers to the proposed questions. Moodle informs the student about the time left to answer the questionnaire. Each activity of the campus is given a grade over 10 points and the student receives its mark at the end of the questionnaire. An option to let the student see the correct commands for each question can be activated. In the right hand side, we can see the marks that automatically Moodle has given to all the students.

Fig 4. Questionnaires in MetNum.

In Fig 5 we show a lesson used in our campus as a student self-evaluation tool. Lessons allow showing the student an explanation about one specific theme, after which the student is asked. If the answer is

right, the student can go on with the following explanation and question,… With these lessons we go in depth into questions that are permanently source of doubts year by year.

Fig 5. Lessons in MetNum.

Last year we promoted among the students the creation of a knowledge base of our subject. We expressed the need of two glossaries. The first one is called by us "Matlab Self-Glossary" and the second is a glossary of theoretical questions. Both glossaries have been created by the students and in aggregate we have about 500 Matlab commands and theoretical concepts explained and commented by the students. In fact, many students do use these glossaries instead of consulting the bibliographic references recommended for this subject.

Fig 6. Glossaries in MetNum.

3. Work dynamics in MetNum

Throughout the year, we propose in every chapter some questionnaires, lessons complementing the already suministrated material (tutorials, class slideshows, problem listings, etc.). This makes the students be in constant contact with the campus and also progressively get closer to use the proposed tools. Also, we consider very important the participation of students in forums: asking new questions and answering already asked questions. Teacher have a look from time to time and answer those doubts that are not correctly answered. In addition, we propose every year 3 weeks of virtual practices in which questionnaires, lessons, homework, etc. are more intensively prepared. With this weeks, we pretend to promote the use of the campus, as well as to consolidate much of the knowledge of the themes developed throughout the year.

How can we convince the students to work daily? We know this is every teacher's dream. We make the students get hooked on it by giving up to one additional point to the mark achieved in the exam.

All the work devoted to develop the virtual campus since 2002 has helped to revert the tendency of number of students attending and not passing the exams that was normal since long time ago. Since the academic year 2002-2003 marks have been gradually improved year by year.   The level of satisfaction of the students with the work done has arrived to us in several ways. Our campus has been proposed as an example by students and colleagues, which is very pleasant and helps to continue next years in this direction. We have been congratulated because of the work done by all our students (even those that did not pass the exams), and because the quality of the new campus by another years students. It seems to be clear that Moodle is a good tool for the students to work in a uniform environment in every subject.

4. How the teachers and students accept the new tools? Future work and conclusions.

We are convinced of the advantages that the application of new technologies contribute to improve the quality of the teaching. In our environment there is much people working hard in applying new forms of teaching. But we have detected in the university community the feeling of a part of the teaching staff who thinks that working hard in a virtual campus is a waste of time, unnecessary, and even implies to worsen the quality level of the students. In the same way, not every student accept the new learning methods, and to work in the virtual campus is a sacrifice maybe because they discover that it is necessary to work in order to learn and/or pass the exams. It is true than there exist certain fears, over-efforts, uncertainty, resistance to the change, etc. And it is not less true that using new technologies imply a change of mind of teachers and students.

We can but claim a positive consideration (in every level) for the hard work made in a virtual campus and which is currently not considered as a merit for teachers.

Nowadays, as short- and medium-term work, we pretend to improve the tools in MetNum developed under Moodle. Some free tools capable of been added to Moodle are being studied and evaluated, improving the communication-interaction-dynamism with the students. Currently, we are testing some tools that can help Moodle evaluate the students' work: PHPWebQuest, phpESP (survey management system), PHPTest (application of questions and answers),…

To end with, as conclusion, we would like to emphasize that MetNum has been the key to achieve 83% of students passing the subject over the number of students attending the exam, in the pilot group for the convergence in the EEES (data obtained from the Academic Regulation Commission of the School). After the experience, there is no chance but to use distance-learning tools in order to transform the way of work in the process of convergence in the EEES. MetNum is the heart of the process of adaptation of the learning method of this subject to the guidelines proposed in the declaration of Bolonia with respect to ease the individualism and tutorship in the university learning.

Only the use of new technologies will allow the introduction of new work dynamics. **For us, MetNum is a no-return point in our teaching methods and represents a great satisfaction.**

References

[1] C. BARBA, La investigación en Internet con las WebQuest. Comunicación y Pedagogía, 185, 62-66. (2002).

[2] M. CEBRIAN DE LA SERNA y J.M. RIOS ARIZA. Nuevas tecnologías aplicadas a las didácticas especiales. Editorial Pirámide. (2000)

[3] M. CEBRIAN DE LA SERNA, La Enseñanza virtual para la innovación Universitaria. Editorial Nancea. (2003).

[4] C. GARCIA FERNANDEZ, Nuevas tecnologías y educación. Telos, 28, 9-10. (1991).

[5] R. VIVINA BRITO , El foro electrónico: Una herramienta tecnológica para facilitar el aprendizaje colaborativo. Edutec. Revista Electrónica de Tecnología, 17. (2004).