Teaching in university with web services

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Abstract: - This last years European Higher Education Area (EHEA) has special importance with the adjustment of the curricula and the non-presential hours of the ECTS (European credits). Web services are considered an important tool to develop the new education, even out of universities, and to fit in with the new european project of education. We present in this paper an educational use of web services even with commercial applications suc as Mathemnatica.

Key-Words: - web services, education, university, license

1 Introduction
Nowadays the use of telematics is becoming a tool that improves the quality of the educational relationship between lecturers and students. Internet can have application in any field of education: university, school and even business, in general in everything talking about the establishment of an information exchange with an educative aim. E-learning has been considered during these last years an important resource that could balance some of the disadvantages of education: the overcrowding in classrooms or the short time to develop the subjct as the teaching staff would want to.

The web services are within the great number of tools that can be used for aid of traditional education and the development of e-learning. Basically a web service is a class published in a Web server with support for ASP.NET (until recently the Internet Information Server 5.0 of Microsoft was the only available one after being updated with .NET SDK, although the last version is the 6.0 developed for Windows Server 2003) being possible to call remotely to its methods. These classes can be written in most of the languages that the technology .NET supports, such as Visual Basic.NET, Jscript.NET and C # [1], [2], [3].

Many utilities can be applied from the information that can be found and interchanged through the network. Besides, we can use this information to obtain all the advantages that the new technologies offer us.

The advantages that e-learning offers in the field of education are growing to a considerable rate [4]. Among them we can enunciate the following ones:

• Regarding the place, everywhere is valid with a computer connected to Internet.
• There is no problem regarding the number of students, nor regarding the number of professors, since it is only necessary somebody sending the information and someone receiving it at the other side.
• Regarding the time, it is its main advantage, since the messages are stored and seen when the user (student or professor) has time to do it.
• Regarding way, the telephone routes ensure communications.
• Regarding the relationship professor-student, direct communication with the use of the electronic mail (e-mail), or groups of discussion in real time can be established, or even video-audio conferences. It will only vary the personal relationship that will not be face to face.
• Regarding the information that goes both sides, it will be of greater quality, since it is sent everything that is wanted to be communicated, in writing, with images or sounds, to be stored and registered, and thus it provides a greater quality in the communication between the student and the professor.
• Regarding the cost, it is a cheap way, for the university, and the students.
• The benefits of Internet are more and more outposts, since it begins to offer advanced telematics services for a low price, for example the video-conference.
The difficulty when we try to make conferences, seminaries... in the traditional form (deficit of classrooms, delays in the flights, excessive registrations...) can be solved so the student receives the same information with the use of the network.

In the field of education and mainly in the university, we can use e-learning to complete and expand knowledge transmitted to the students throughout their educational trajectory. To teach them technological applications they can meet in their careers and presenting them the possibility of learning through the network and using the web services.

Nowadays most of the efforts goes to educative models in network, since the technology web provides a frame adapted for the interactive work, granting to the student starring role in the educational process.

In some subjects, this educational process leans on using certain software, which normally has a high cost for the economic capacity of the student. Therefore, the method usually chosen for working with that computer science package is to create reduced groups that use software in the laboratories of the university center. This implies, as well, the cost on the part of the University of a certain number of network licenses in order to install this software in the computers of those laboratories.

In addition to that, problems of saturation of computer science classrooms have begun to appear, as well as disparity of schedules in the same subject (professor has to separate a class in several reduced groups to have access to the laboratories) and loss of quality in teaching when the same computer has to be shared by two different students.

These difficulties are multiplied if the subject does not require necessarily and urgently the use of some type of software, but this is used as a support tool to teaching.

One of the great advantages of the web services is that it is possible to have access to them from any application able to generate messages and to understand messages written in SOAP, even in case it has not been designed for the platform .NET. In addition to that, the applications that use these services do not need to know neither is the platform nor the model of objects nor the language used to implement these services. Another great advantage is that they do not present an extreme difficulty when we want to write them [7].

We have been tried to harness some aspects of university education related to e-learning, through the web services, without forgetting that this tool is not exclusive of the non-presential education (that education that is implemented without a teacher in the classroom or even without a classroom) but that it is valid for traditional education.

Using web services it is possible to improve the participation of students in the subjects where using software can be handy (as raw material, or as main tool or helpful one), and to provide an activity to the student within the subject as opposed to the traditional passivity of the master classes. This last point has special importance with the adjustment to the European Higher Education Area (EHEA), where those non-presential hours of the ECTS (European credits) can be guide, among other possibilities, towards laboratory works at home, that is to say, used of software at remote level.

3 Development
The development could be divided into four objectives:

1. The main objective is the use on the part of the students in remote form, specially from the computers that they can arrange at home, of software under license without installating that computer science package in their own computers.

2. Along with what has been previously exposed, we consider as an objective that the application that is designed is as general as possible, that is to say, valid for not only one computer science package.

3. Besides, it is intended to improve the participation of the students in the subjects in which it can be useful the software handling (as raw material or as main or auxiliary tool).
4. And finally, to provide an activity to the student within the subject as opposed to the traditional passivity of the master classes.

These objectives have been fulfilled. Nevertheless, except for the first and main objective that has been fulfilled very satisfactorily, the other three have been reached at a basic level, that is to say, although it has been able to make the basic of these objectives, these can be, and would have to be, developed more widely.

The greatest difficulties we found for putting in practice this kind of activities are of two types:

- First, in spite of the high implantation of Internet in the homes of the Basque Country, it is still a tool that has not been implanted for the totality of the students of the university, reason why some students would be deprived themselves of the possibility to access to these applications that would allow a substantial improvement in their learning.

This problem could be solved having rooms of computers of general use in the different centers of the University of the Basque Country (UPV/EHU), available to the students, as they have rooms for studying in each center.

- On the other hand, although it seems strange, the students do not consider Internet like one more tool they can use in their studies. The students have got used to use the network to connect themselves with their friends and to send messages, so they do not use the great potential to compile information, to complete their knowledge, etc.

It is, therefore, work that we must do, to make them aware that Internet is a useful tool for their studies.

3.1 .NET technology

The application consists of the completion of a computer that works as server, along with the accomplishment of a web page in which the necessary connections for using the software of a certain subject are introduced. The communication between the web page and the software (that would be in the own server) would be made under .NET technology.

3.2 Mathematica

A study of the bookstore .Net/Link of Mathematica has been done. The programs that relate Mathematica to applications of type console, Windows or of Internet, are in that bookstore. Especially, the files corresponding to the Mathkernel class and the IkernelLink interface.
4 Results

Regarding the results obtained in the development they can be divided in three parts:

- Web services developed exclusively with .NET.
- Web pages developed with the webMathematica application.
- Web application for Mathematica developed with .NET.

4.1 Web services developed exclusively with .NET

Several web services have been developed using only the .NET technology. Most of them have been tests that have helped to improve the web services that have been created later.

These web services have the advantage of being able to connect to them from outside the university, nevertheless, the potential reached in them has nothing to do with using, in addition, other commercial packages. But we cannot forget the freedom of design that means not to depend on any program, so it is an option to be considered. For that reason, this potential can be improved with the extension of the research in a future time.

4.2 webMathematica

In this case a series of applications directed to the solution of certain problems related to the numerical analysis has been made. Later on, other applications can be developed using the web services.

This type of applications, as it is displayed in the image, only allows to execute the commands implemented in the web page in the corresponding button, so that from a point of view of initiation to a subject and the solution of problems, they can be very useful.

Nevertheless, if we are trying to give the student an opportunity to face the own problems of each exercise and not to be so directed to its solution, which is a second step and more important one within the learning of a matter, it is necessary to give him the possibility of having a tool that allows him to conduct all the operations necessary to solve the problems, so that he himself must make the decisions about which the method he is going to use to solve them is.

This last point is what we try to create in the application of the following section.

4.3 Web application for Mathematica developed with .NET

It is an application that allows the student to use all the potential of the Mathematica tool, with no tie, so that the own student makes his decisions to solve the problems.
In this case, we need a server who supports the .NET technology in the university, and we need to purify some more the prototype so that the student finds no difficulties when using it.

We must give him guidelines of use, help, so that knowledge of language of Mathematica application is not an obstacle to solve problems, since although the installation of the Mathematica program is not necessary on the part of the student in its computer (simply it is necessary to be connected to a web page), he needs to know some commandos of the program to be able to use it.

5 Discussion

The connection done to use the available web services is made through any browser (Internet Explorer, Netscape, etc.) through two different ways, both extremely simple for the user:

- One of them is the direct connection through a URL direction, that is to say, keying in the direction of the web page where web service is located.

- And the second one is doing click in some control (button, picture, etc.) of a web page and to which the web service is referenced. The student, or user in general, has to do not more than click in some of the buttons (or another control) of the web page so that the connection is made.

Nevertheless, there are certain difficulties for the attainment of this type of activities. Although the implantation of Internet in the Basque Country can be considered wide, it is still a tool that is not installed in the totality of the homes of the students of the UPV/EHU. For that reason, some students cannot accede from their houses to these applications and have restricted their access to the Centers of the university and other places such as cybercenters, cybercafes, etc. This implies that the potential of the tool cannot be used by the global set of the students and, therefore, at the moment there can be certain discrepancies on the use like obligatory tool from outside the university. In any case, it is doubtless that the use of the web services would allow a substantial improvement in the students learning.

Besides, students do not consider Internet like one more tool they can use in their studies.

This is going to undergo a radical change with the incorporation of our university system to the European Higher Education Area (EHEA) and with the evolution of the Spanish credit to the European one (ECTS). In this point, the use of the web services and the awareness of the students that Internet is a useful tool for their studies can play a basic role.

In this sense, we cannot forget that the web services can be a tool of three edges:

1. For traditional education, taking advantage of the web pages in a masterly class or a laboratory.

2. For that same traditional education, but within the non-presential hours that are considered with the ECTS (it is necessary to remember that, at first, it was recommended that of the credits that a student has in a subject, 25% would be non-presential). Those non-presential hours can be dedicated to laboratory work from house (using for example the web services), or to make practices, work, etc. in which Internet (and the web services) plays an important role.

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