USING LECTURE RECORDINGS TO SUPPORT CURRICULUM CHANGES IN THE EUROPEAN CONVERGENCE PROCESS

S. Aguirre, E. Barra, J. Quemada, J.Y. Pastor

Universidad Politécnica de Madrid (SPAIN)
saguirre@dit.upm.es, ebarra@dit.upm.es, jquemada@dit.upm.es, jy.pastor@upm.es

Abstract

The aim of this paper is to present the experience of using lecture recordings to support curriculum changes within the framework of the European convergence process, mainly courses that need to be promoted or discontinued. We will explain an integrated solution for recording lectures consisting of a web portal, a videoconferencing tool and an economical and easily transportable kit. The validation process was performed recording three different courses at the Universidad Politécnica of Madrid (UPM) and using different diffusion channels, such as Moodle, an open source web portal called GlobalPlaza that supports streaming and recordings and the YouTube UPM channel. To assess the efficiency of our solution, a formal evaluation was conducted and will be also presented in this paper. The results show that lecture recordings allow teachers to support discontinued and new courses and enable students from remote areas to participate in international educational programmes, also the resulting recordings will be used as learning objects for future virtual courses.

Keywords: Media in education, Multimedia/hypermedia systems, Higher education, Technology Enhanced Learning.

1 INTRODUCTION

The Bologna Process, launched with the Bologna declaration, is a European reform process aiming at establishing a European Higher Education Area (EHEA). The participation of this process has required a complete restructuring of traditional education in Spain, mainly on higher education. As part of this process, the Universidad Politécnica de Madrid (UPM) is restructuring its curriculum, promoting new courses and degrees, and discontinuing some programmes. However, these programmes need to be supported for those students enrolled under the old curricula who do not pass this year´s exam [1]. The adoption of the Bologna process has increased the teachers´ workload, which are typically fully loaded with teaching and other activities.

The use of video has been promoted as an educational resource for students and has been used to support student learning in all branches of education [2]. The use of video in education may lead to a better description by the lecturer and better visualisation, recognition and identification by the student [3]. Online video recordings of previous lectures allow students to view lectures they missed or to review difficult lectures again to improve understanding [4]. On the other hand students highly value the use of non-traditional resources, especially videos [5] [6] and lecture recordings can be a powerful addition to traditional lectures and learning materials [7] [8].

With the aim of participating in the Bologna Process and considering the advantages of using video in education, we have developed an integrated solution for using lecture recordings and videoconferencing as a mechanism to support courses that need to be promoted or discontinued within the framework of the European convergence process. This solution is composed of a web portal, a videoconferencing tool and an economical hardware kit. Our purpose is to apply innovative educational methods that make students more creative and responsible, allowing them to participate in class in a different and friendlier way. Likewise, lecture recordings will allow teachers to reduce their workload by using these recordings in other courses.

We evaluate the effectiveness of our solution by validating it in three scenarios that use different channels of diffusion, such as Moodle, YouTube and GlobalPlaza [9].

2 CYBERAULA PROJECT

The CyberAula 2.0 project presents an integrated solution for videoconferencing and lecture recording as a mechanism to support courses which need to be promoted or discontinued within the framework

of the European convergence process. Our main objective is to make these courses accessible through live streaming during lessons and to provide recorded lectures and associated documents to students as soon as the lesson has finished [10]. In the next sections, we will present the architecture, the software and hardware used. Finally, we will present the participants and how they supported lecture recording.

2.1 Architecture

Our solution is made up of the GlobalPlaza web platform, the Isabel videoconferencing tool, an economical hardware kit, the UPM Moodle platform and the UPM Channel on YouTube. Fig. 1 shows the architecture of the CyberAula 2.0 project that will be explained with details in the next sections.

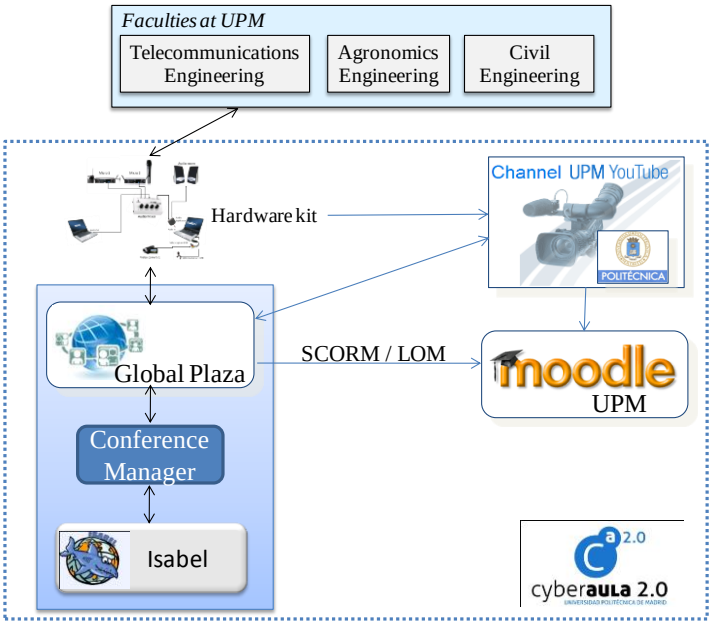

Figure 1. CyberAula 2.0 project architecture

2.2 GlobalPlaza and Isabel

The videoconferencing tool that we used in this study was Isabel [11], and the web platform that was integrated with Isabel to schedule, perform, stream, record and publish the videoconferences automatically was GlobalPlaza.

The development of Isabel started in 1993 as a broadband application able to support the distributed lectures of the Summer Schools on Advanced Broadband Communication [12] [13]. Since then, its development has continued, and Isabel has been used in several European projects (i.e., GLOBAL, Collaboration and Rural) and supported many distributed congresses and classes. Its code was released in May 2010, and it is now open source. Isabel is based on interaction modes that allow the operator to select which audio and video is available and in what sizes.

GlobalPlaza was developed in the context of the GLOBAL Project, a research project supported by the European Commission's Seventh Framework Programme. GlobalPlaza has supported more than 500 videoconferences and stores more than 900 videos. It has been open source from its first version and can be found in production at http://www.globalplaza.org. GlobalPlaza's privacy policy (http://globalplaza.org/policy) warns users that their image will be recorded when they participate in GlobalPlaza events. Therefore, the videos can be streamed and recorded without legal problems.

GlobalPlaza also provides other functions that can be useful for distance education, such as a wall for sharing comments, a document repository for uploading files (which can be associated with the events, i.e., the slides used), and statistical information that enables teachers to identify and emphasise the most frequently viewed lessons.

Finally lecture recodings produced with this system can be uploaded to Youtube, shared directly in GlobalPlaza or can be exported in GlobalPlaza as SCORM objects to be imported into Moodle.Our solution is made up of the GlobalPlaza web platform.

2.3 Hardware kit

The classrooms used for the scenarios in this project had no multimedia hardware, so all of the facilities for recording the lectures had to be provided. All of this hardware was combined in an easily transportable and usable kit (Fig. 2).

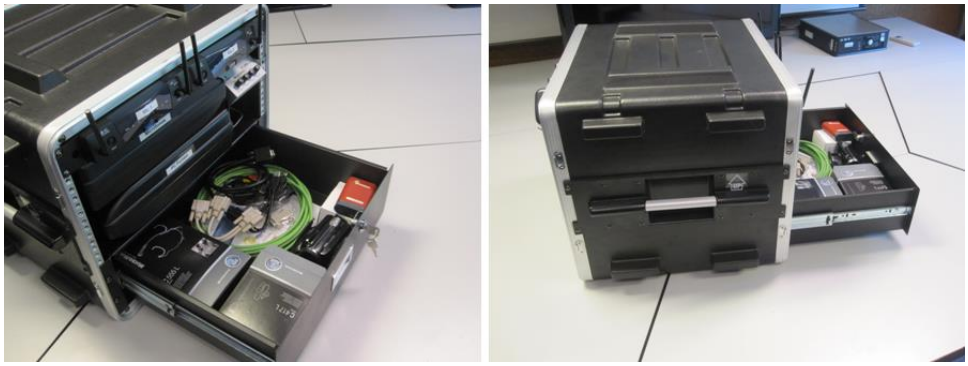

Figure 2. Hardware kit provided

This kit can be considered a relevant result of this project. It will be used for other complementary and transversal videoconference projects when this project finishes. The kit contains everything that is necessary to carry out videoconferences, with only an Internet connection and a power supply.

The price of this kit is about 2,000 Euros, which is affordable for almost every project. The price can be expected to decrease in the near future, as with all technology.

As can be seen in Fig. 2, the kit contains a box at the bottom where small components can be kept and includes rack mounts on both sides to attach and connect the rest of the components.

A detailed schema of all of the components in the kit is provided in Fig. 3, which also shows the teacher's laptop and the connection between the components. The dotted lines indicate the connections that the managing student has to establish, and the solid lines represent the connections that are included in the kit.

The audio components are two wireless microphones (Micro 1 and 2, one for the teacher and one for the pupils), a pair of speakers to reproduce any audio from the teacher's laptop, and an audio mixer to combine the different audio sources.

The video components are two cameras, one digital video camera that is captured with a video capture card, and a USB webcam.

Finally, the Isabel laptop has a VGA capture device that is attached to the VGA output of the teacher's laptop to capture the presentation.

2.4 Participants

Although this was a technical project, the key to achieving its objectives was the collaboration of the people involved: the teachers who taught the classes and agreed to participate in this project, the students enrolled in these courses who managed the videoconference technology, and the technicians from the Telecommunications Engineering School who provided support and training to the student managers.

Our goal was to enable students to manage the appropriate hardware and software to prepare the sessions, connect to the technology and solve any potential problems. The main difficulty is that these students were not technical specialists, and they lacked adequate knowledge. Therefore, the technicians had to prepare several training courses. These courses began with the most basic ideas, such as explaining the project scenarios and architecture, and progressed to the most advanced

concepts, such as installing the videoconferencing system on a laptop or connecting and using cameras and wireless microphones.

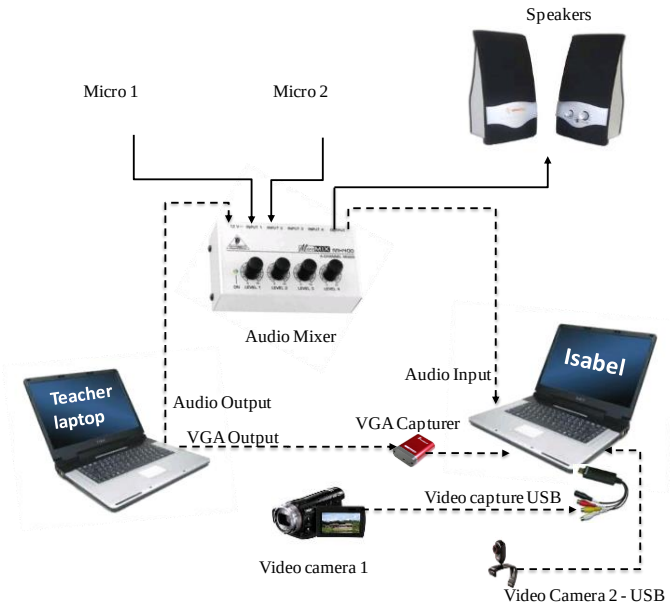

Figure 3. Kit components detailed

After their training was completed, the students received additional support from the technicians. This support was necessary, especially during the first lessons when the students were not yet accustomed to managing videoconferences.

3 SCENARIOS

CyberAula 2.0 was validated through a set of educational scenarios associated with three faculties at UPM (Universidad Politécnica de Madrid): Telecommunications Engineering, Materials and Civil Engineering and Agronomics Engineering. The main features of these scenarios are presented in the Table 1.

Table 1. Main features of the CyberAula's scenarios.

Title of course	Faculty	Type of course	No. Students	Technologies used
Web 2.0: Understanding and Using the Social Web	Telecommunications Engineering School	Presencial course	50	Each class is recorded through GlobalPlaza and is subsequently exported to Moodle
Materials Engineering	Materials and Civil Engineering School	Seminars	40	The videos generated are published through the UPM Channel on YouTube.
Plants of Agro-alimentary Interest	Agronomics Engineering School	Practical workshops and oral presentations	21	Both the workshops and the oral presentations have been recorded and stored using GlobalPlaza.

The first scenario is developed by the Telecommunications Engineering School, which is currently promoting a new course called Web 2.0: Understanding and Using the Social Web. This course is an elective and intends to provide students with knowledge of Web2.0, social networking, identity and privacy as well as the bases on which new Internet services have been built. Fig. 4 shows a printed screen of the Web 2.0 course using GlobalPlaza.

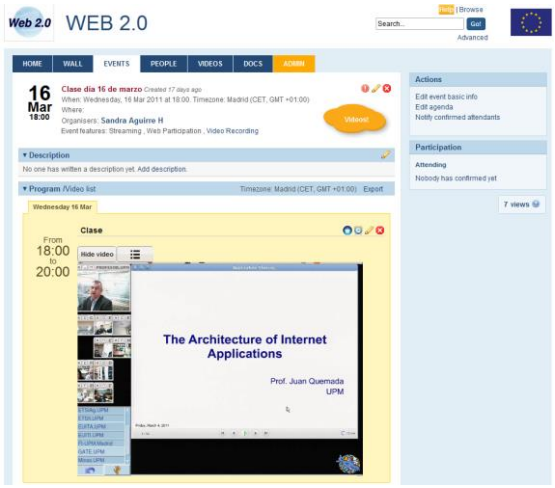

Figure 4. A screenshot of the Web 2.0 course using GlobalPlaza

The second scenario is related to the development of international seminars on Materials Science offered by the School of Materials and Civil Engineering. These interactive seminars are held each Monday to disseminate current and outstanding issues within the area of Materials Science and Engineering. Areas of discussion range broadly from biological materials to functional materials to purely technological applications. These forums include the selfless participation of leading researchers and technology experts from national and international universities, companies and research centres. Fig. 5 shows a printed screen of a seminar on materials using YouTube.

Figure 5. A screenshot of an international seminar on materials structure using YouTube

The third scenario is conducted by the Agronomics Engineering School with its course Plants of Agro-alimentary Interest, which is a second-year elective course and is being discontinued. Students have participated enthusiastically in this course, which provides transversal competence through the preparation and presentation of a report in the last week of the semester. This course is one of the most popular electives among the students, who participate actively in practical workshops and in their individual presentations. In the workshops, students are required to identify, describe, classify and even taste several species of agro-alimentary interest (fruits from temporal or tropical regions, aromatic plants and spices, edible mushrooms, cereals and pseudo-cereals). Fig. 6 shows two screenshots of students' oral presentations that were recorded using GlobalPlaza.

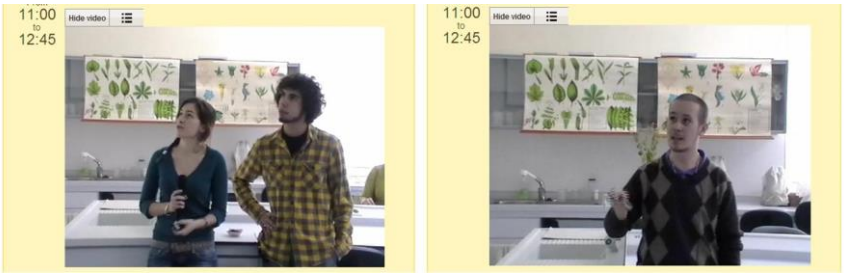

Figure 6. Screenshots of the student presentations recorded using GlobalPlaza

4 RESULTS

In this section, the outcomes will be presented in two parts: the impact of the three scenarios and the results of the questionnaires. The number of views presented in the tables has been taken from Moodle registry data, from Youtube itself and from GlobalPlaza via Google Analytics.

4.1 The Impact of the Scenarios

4.1.1 Web 2.0

This course began on March 16, 2011, and ended on May 25, 2011. There were four classes of two hours each. Each class was recorded through GlobalPlaza and subsequently exported to Moodle. Table 2 shows the number of times that students accessed the recordings through Moodle.

Table 2. The number of times that students accessed the lecture recordings.

Topics	Date	No. of views
Class 1	2011-03-16	130
Class 2	2011-03-23	103
Class 3	2011-04-06	102

4.1.2 Crossing frontiers: International Seminars on Materials

The videos generated by the seminars were published through the UPM Channel on YouTube. The seminars began on November 15, 2010, and ended on April 04, 2011. Each seminar lasts an hour and a half. Forty students are enrolled in the seminars, including 8 students from Spain and 29 from Chile. Three students, from Mexico, Ecuador and Argentina, participate on a trial basis. Table 3 shows the number of times students viewed the lecture recordings through YouTube.

Table 3. The number of views of lecture recordings per seminar.

Topics	Date	No. of views	Topics	Date	No. of views
Seminar 1	2010-11-15	366	Seminar 8	2011-02-14	253
Seminar 2	2010-11-22	248	Seminar 9	2011-02-21	344
Seminar 3	2010-12-13	410	Seminar 10	2011-02-28	393
Seminar 4	2010-12-20	251	Seminar 11	2011-03-14	205
Seminar 5	2011-01-17	578	Seminar 12	2011-03-21	127
Seminar 6	2011-01-24	304	Seminar 13	2011-03-28	70
Seminar 7	2011-02-07	219	Seminar 14	2011-04-04	158

4.1.3 Plants of Agro-alimentary interest

This elective course offered by the Agronomics Engineering began on September 26, 2010, and ended on January 21, 2011. There were five classes, each lasting for two hours. Each class was recorded through GlobalPlaza, where the students were able to watch the recordings. Table 4 shows the number of times students accessed these materials through GlobalPlaza.

Table 4. The number of student views of the lecture recordings by topic

Topics	Date	No. of views
Workshop 1	2010-11-19	77
Workshop 1	2010-11-22	59
Workshop 1	2010-12-16	40
Students' reports - presentation 1	2011-01-20	35
Students' reports - presentation 2	2011-01-21	81

4.2 Evaluation

To verify the efficiency of CyberAula, a formal evaluation of the system was conducted for the students. The design of the questionnaire was formulated by the CyberAula committee, which was composed of one teacher from each faculty, two technicians and the administrative personnel for the project.

We distributed the questionnaire to all students using the Drupal tool. The responses to this survey were voluntary. We obtained completed questionnaires from 86 students. In spite of the fact that the survey was voluntary, the participation level was high.

4.2.1 Evaluation results

In total, 86 students participated in the survey: 36 of the 50 students enrolled in the Web 2.0 course, 35 of the 40 students enrolled in the materials seminar and 15 of the 21 students enrolled in the agronomics course. As Table 5 shows, most students found the lecture recordings useful for their learning.

Table 5. Reported improvements in learning for students who used the lecture recordings

Questions	Faculty	No.	Mean	SD
Have the lecture recordings improved your learning?	Telecommunications Engineering Materials and Civil Engineering Agronomics Engineering	36 35 15	1.055 1.228 1.266	0.232 0.598 0.593

1: agree; 2: neither agree nor disagree; 3: disagree.

According to Fig. 7, most students agreed that the availability of lecture recordings on Moodle was useful to them. Using Moodle, they were able to watch the recordings as often as they wanted and use the forum to share comments and ask questions.

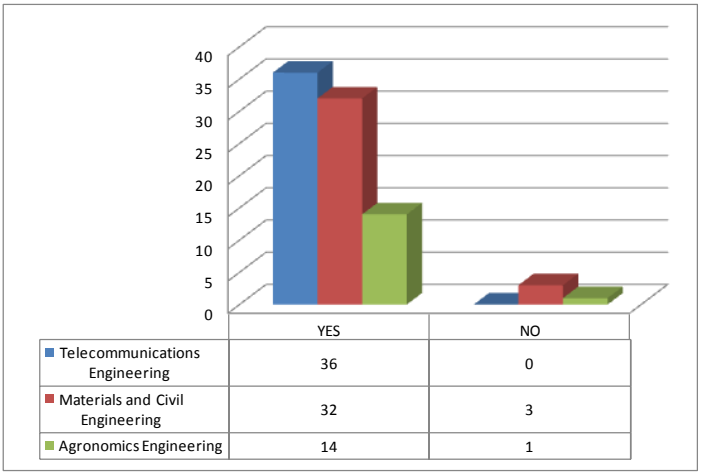

Figure 7. Do you think it is a good idea to make the lecture recordings available through Moodle?

The questionnaire results demonstrate that most students positively assessed the quality of the educational material used in the three courses (Table 6). However, students reported that the audio quality was not optimal (Fig. 8).

Table 6. Reported quality of the educational material presented in the course.

Questions	Faculty	No.	Mean	SD
Assess the quality of the educational material presented	Telecommunications Engineering Materials and Civil Engineering Agronomics Engineering	36 35 15	2.027 1.628 1.4	0.506 0.689 0.632

1: excellent; 2: good; 3: regular; 4: bad; 5: very bad.

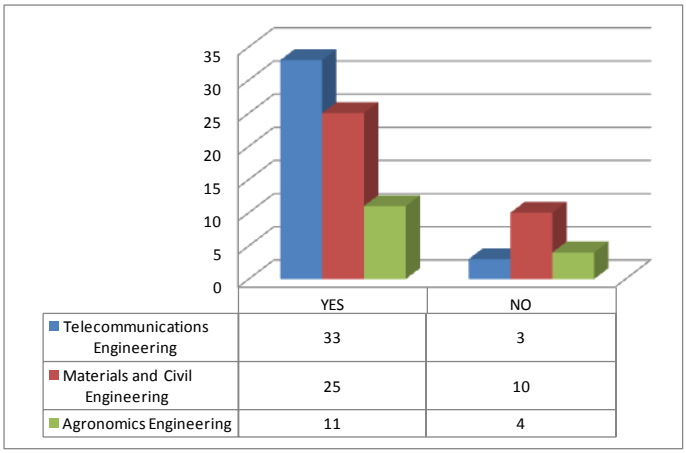

Figure 8. Was the quality of the video and audio optimal?

Respondents were asked to indicate what problems and what advantages they had experienced in using the lecture recordings. Table 7 summarises the responses and their frequency. The most frequently reported problem was related to the quality of the recorded audio, whereas a large number of students reported that the main advantage of the recordings was the convenience of being able to view the recordings to review the class at any time and in any place.

Table 7. The problems and advantages of the lecture recordings, as reported by students..

What problems did you experience with the lecture recordings?	**Frequency**
The videos cannot be downloaded	1
Sometimes recorded audio was not clear	6
What advantages did the lecture recordings provide for you?	
Interesting educational resource	5
The lecture recordings allowed me to learn and consolidate my learning	52
Can be more relaxed in class and concentrate on learning and understanding the content	9
Allowed me to review the class at any time and in any place	75
Allowed both students and faculty to know what type of research was being conducted in other countries such as Spain	6
Despite not attending some classes, I could access the lectures	5
When I had to give an oral presentation, it was very useful because I could recognise my mistakes and then correct them.	4
I could avoid going to the university and work according to my own schedule	3

5 DISCUSSION

In this section, we will discuss the results of the project. As indicated by the results of the survey, the lecture recordings were received favourably in the three scenarios considered. Wieling and Hofman [4] confirmed that the number of lectures that students viewed online contributed positively to their

performance. As Table 5 shows, the students in our study agreed with the benefits of the lecture recordings. They also liked the quality of the educational material (Table 6) and the availability of the recordings on Moodle (Fig. 7). However, students indicated that they experienced problems with the audio in some cases (Table 7).

We find similar results when we analyse the open ended questions. In their responses, 75 students stated that they liked the ability to review the class lectures at any time, and 52 students remarked that the lecture recordings allowed them to learn more effectively and consolidate their learning. Table 5 demonstrates that students in Telecommunications Engineering were more likely to agree that the lecture recordings improved their learning. We believe that this is because their recordings were available through Moodle, they were very accustomed to using this tool, and they experienced fewer audio problems. However, Table 6 shows that students' opinions about the quality of the material were lower than those expressed by the students in the other scenarios. This fact can be explained by the different materials and content of the lessons. The Telecommunications Engineering School holds lectures, the Materials and Civil Engineering Schools hold seminars, and the Agronomics Engineering School holds practical workshops and individual presentations of reports.

Finally, we evaluated the effectiveness of our solution by validating it in three scenarios using different channels of diffusion: Moodle, YouTube and GlobalPlaza. We can observe from Tables 2, 3 and 4 that the three scenarios were satisfactory. On YouTube, the recordings were viewed more often and from different countries because they could be accessed without a special username and password. Additionally, in this scenario, 32 students lived far away and were only able to follow the course through these lecture recordings. In the scenarios using Moodle and GlobalPlaza, only students, technicians and teachers were able to view the videos, and students attended class in person.

Finally, as we observed in the responses to the surveys, students agree on the utility of having these recordings available on Moodle. This is why we consider GlobalPlaza's exportation of the recordings as SCORM to Moodle a feasible solution.

6 CONCLUSION

This paper shows how lecture recording and videoconferencing have been used as educational resources to support courses that need to be promoted or discontinued within the framework of the Bologna Process. An integrated solution using both software and economical, transportable hardware is provided. The technology was developed in our university and is all open source. The hardware kit is easily transportable and usable, and its configuration and management do not require technical expertise. The kits can be used for other videoconference projects when this project is finished. Moreover, this kit is an economical solution in comparison with other alternatives, such as Polycom's solution.

An important aspect of the project is the collaboration of the people involved: the teachers who agree to enrol their courses in this experience, the students enrolled in the same courses who manage the videoconference system and the technicians who provide support and training to the student managers. To use the system, a short training process is needed, and supervision of the recordings is recommended.

Three courses at our university were used in the validation process. The diffusion channels for the recordings that we used in this process were Moodle, GlobalPlaza and UPM YouTube. To assess the efficiency of our solution, a formal evaluation was conducted. All of the participants in the CyberAula project considered the lecture recordings as effective educational resources that improved students' learning. The convenience of being able to review the classes at any time and in any place was considered their main advantage by students. The audio quality was reported as the major problem. The latest version of the Isabel videoconferencing tool fixed this problem and implemented the suggestions received through the questionnaires. Options for testing the audio before beginning the lecture recording and new recording possibilities have been added.

When there is a significant difference in students' time zones, scheduling courses becomes a challenge. In the seminars on Materials, for example, some students in the course lived in Latin America. The lecture recordings enabled students living in remote areas to access the educational content and participate in international programmes.

Lecture recordings allow teachers to support discontinued and new courses as well as reduce their workload by using these recordings in other courses or educational platforms through SCORM Students enrolled in the old curriculum can access the recordings and ask questions through forums.

Based upon these results, the Educational Innovation service at our university will extend the recording service to other schools of the UPM.

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