

# EDUCATIONAL INNOVATION APPLIED IN THE UNESCO CHAIR OF MINING AND INDUSTRIAL HERITAGE

**J.A. Ramírez Masferrer, D. Fernández-Ordoñez Hernández, J. Herrera Herbert,  
J. Castilla Gómez, D.A. Martín Sánchez,**

*Universidad Politécnica de Madrid (SPAIN)*

*j.ramirez@upm.es, david.fernandez-ordonez@upm.es, juan.herrera@upm.es,  
jorge.castilla@upm.es, domingoalfonso.martin@upm.es,*

## **Abstract**

The "Innovatio Educativa Tertio Millennio" group has been 10 years developing educational innovation techniques, actually has reached the level of teaching on the technical teachers has developed, and share them with other groups, that can implement them in their teaching activities.

UNESCO Chair of Mining and Industrial Heritage has been years working on heritage, and on the one hand teaching in conservation and maintenance of heritage, and on the other doing raise awareness of the meaning of heritage, the social value and as must be managed effectively.

Recently these two groups work together, thus is spreading in a much more effective manner the concepts of heritage, its meaning, its value, and how to manage it and provide effective protection.

On one hand being a work of dissemination based on internet and on radio broadcasting, and on the other one of teaching based on educational innovation, and courses, conferences, and face-to-face seminars or distance platforms.

Keywords: applied Educational innovation, innovation techniques.

## **1 INTRODUCTION**

Today the needs of new teaching methods are evident in all fields of education. These needs are partly forced by changes set by the new framework established by the EEES (European Space of Higher Education) and also set by technical and social developments involving a total integration of students with new technologies and the new forms of communication established by the widespread use of social networks. While these technical advances are not directly related to the educational environment, are tools that can be applied to achieve the targets set in formal education. Even the application of these techniques can be a channel of communication to facilitate such learning.

The efforts made by the Educational Group Innovation "Innovatio Educativa Tertio Millennio" has been acknowledged by various university organizations, in particular, by UNESCO Chair of Mining and Industrial Heritage.

The particularities of the UNESCO Chair of Mining and Industrial Heritage makes not feasible teaching based on "classic methods", or prone to hinder aims to attain, which are based in an international education, multidisciplinary and multicultural, able to be received from any place. Therefore, it is a fundamental premise to make the best distance teaching.

Thus, educational innovation objectives and quality education are working in cooperation to develop an educational program able to attain both purposes.

## **1.1 Educational Innovation Group “Innovatio Educativa Tertio Millennio”**

More than ten years ago, a group of professors of the Polytechnic University of Madrid (UPM) began to carry out new experiences seeking to improve teaching methods.

In this area, and after several proceedings, within the field of teaching innovation, an Award conferred by the General Foundation of the UPM in 2002 was obtained. This fact encouraged and consolidated the group. The group was reinforced and recognized by UPM as Educational Innovation Group, endlessly participating in projects of various kinds.

The IETM group has had a constant progress from 2000 till now [1]. In this framework, the Group of Educational Innovation develops work methods using different tools so that subjects can be adapted to the requirements of different situations that arise. Thus, we have developed systems for adapting university courses to the European Higher Education Area (EHEA) based on distance learning methodologies and collaborative learning in numerous student groups

## **1.2 UNESCO Chair of Mining and Industrial Heritage**

The UNESCO Chair of Mining and Industrial Heritage, from the Universidad Politécnica de Madrid, aims to provide an interdisciplinary, critical, reflective, open and rigorous study, research and debate on major issues and problems affecting the conservation of heritage history.

The objectives of the UNESCO Chair (Spain) of the UPM are to promote activities and programs in order to enhance the general principle of UNESCO, dialogue among civilizations and cultures based on common historical heritage (Declaration of New Delhi, 2003) and strengthen the creation of networks between institutions involved in heritage conservation and research, especially with other similar purposes UNESCO Chairs in collaboration with UNESCO.

Activities developed by UNESCO Chair of Mining and Industrial Heritage are between others, to provide a specialized technical training in conservation; measures to extend the cultural heritage significance to society in general, especially the new generations, through coordination with the institutions related to education and mass media; work for reflection and communication about the reality and the prospects of cultural heritage, especially the mining and industrial history. This includes the publication of books, studies and articles in magazines, the convening and organizing of seminars, workshops, conferences and meetings, the dissemination through information, communication media studies are made, etc.

## **2 EDUCATION PROGRAM**

Training and technical preparation promoted by UNESCO Chair of Mining and Industrial Heritage is based on contact with the Schools of Engineering and Architecture for the creation of the elective subjects on engineering heritage conservation, preparation of future Master's Degree concerning World Heritage and Historic Cities and to establish a scholarship program for students in the School of Mining Engineers of the UPM. [2]

On this basis and with these goals, an innovative approach is required to develop a special teaching based on distance learning in which teacher and students will never share a traditional classroom.

To meet these aims, UNESCO Chair of Mining and Industrial Heritage is implementing the on line education methodology. It has been already successfully tested by the innovation educational group “Innovatio Educativa Tertio Millennio” on regulated subjects in engineering curricula.

Although the methodology applied is combining classroom learning with distance learning, the findings show that student's knowledge can be tested as well as checking assessments that distinguish and verify, satisfactory, different student's achievements. More results will be discussed below.

### **3 METHODOLOGY**

The methodology framework is that each student will spend special time to a specific subject, according on the extent of the branch of learning. Based in the extent of the subject, which is expressed in ECTS, the student can organize itself at will. Each week the student will receive material (video, audio, written material, bibliographic references etc..) and the student will have to make a short work ( essay, report, meet a test, or some other task). All activities will be evaluated by teachers. After 9 hours of personal work, there will be a tenth hour in which the student will work together with the teacher in a computer meeting. Additionally, there will be different optional activities as well as different means to promote teacher-student communication valid to ensure learning and to deepen learning useful subjects.

#### **3.1 Virtual Platform**

The system developed is based on the Moodle virtual platform, with the advice and technical support of the Cabinet of Tele-Education (GATE) of the UPM.

Moodle is an Open Course Management System Source (Open Source Course Management System, CMS), also known as Learning Management System (Learning Management System, LMS) or Virtual Learning Environment (Virtual Learning Environment, VLE). It is a free web application that educators can use to create effective learning sites online.

There will be a Moodle page for each course and each block will be organized according to the syllabus of each course. Thus, for each of the blocks will have various evaluation methods. With the qualification of each of the proposed activities will produce a note of qualification for the block, and can verify student learning. Developed activities are described below. All activities are performed under Moodle platform.

#### **3.2 QUESTIONNAIRES IN MOODLE FOR EACH TOPIC**

This is the most common element that can be seen in Moodle as assessment. It is mainly the development of questions of varying range and type to be answered in a limited time. Questions can be multiple choice, numeric, short answers etc..which deal with the "shared" topic, not taught in the course.

You can create quizzes with different type of questions, generate random questionnaires from sets of questions, allowing users to have multiple attempts to check with the stored answers. This activity would be most familiar to students, being widely used in both blended learning and classroom teaching.

It has the advantage that once prepared by the teacher, does not have to worry about its correction, because Moodle does it automatically. If the base question is large enough in each subject, the system randomly selects questions to create the questionnaire item, being different questionnaire for each student.

### **3.3 VIDEOS**

The video would be the easiest way to replicate a teleclassroom time teaching. By contrast it needs an editing and production work to get the best of it. The most widely used video is one in which you edit a display similar to what a student sees in a class, on which an audio is added explaining what the student has in front of the screen.

The main advantage of making teaching videos is that students can watch it as many times as necessary for a best learning. It has the disadvantage, if so it can be considered, that it does not allow an instant student-teacher interaction, having to use other available ways of communication, such as forums or e-mails, for example.

There are videos with different formats, which account for still images, repeat lectures by experts, etc. Each topic has a few videos to see. After watching them, the student has to perform some activity, such as answering a questionnaire.

### **3.4 FORUMS**

Forums are a powerful communication tool within Moodle courses. A forum can be looked at as an online message blackboard where teachers and students can place new messages or reply to older ones, thus creating conversation nets.

Forums allow users communication from any place where an Internet connection is available. It is not necessary that the forum participants are within the system at the same time as their class mates to maintain a discussion, hence it is asynchronous nature. Each intervention in a forum is registered in the system with the name of the author and the date of its creation, so that to follow a discussion becomes an intuitive user task.

Moodle allows you to create different types of forums, with the possibility to include attachments and to assess user's activities. You can also subscribe to a forum, to receive by email every new intervention, and even allows you to enable RSS news channels, so that users with newsreaders in this format will know about the latest interventions without being in the system.

As far as forums are concerned, it would be the normal way of working with a forum in Moodle. The main change on the methodology developed by the group of educational innovation "Innovatio Educativa Tertio Millennio" is that it includes the ability to qualify participation in a forum. Thus, the teacher raises issues and students answers freely, or you create a "combined" activity in which the forum is used when the student has previously done his work-study and then he can raise issues or concerns to other class mates.

Thus, the teacher is able to assess and evaluate each student with the concerns that have emerged from his/her student personnel work. The teacher knows the extent of personal work by means of the questions or comments raised. That is, if a student raises basic questions or questions of greater scope or depth.

### **3.5 EXPERTS LECTURES**

Another important aspect for this methodology is the organization of lectures given by experts in various fields. This aspect is the key area of UNESCO Chair of Mining and Industrial Heritage. In the scope of the University Chair and, in particular in the field of teaching engineering Heritage conservation, it is key knowledge previous experiences and knowledge of work done elsewhere in the world that can be directly applied in many other places. For this reason, the organization of

lectures given by experts involved in heritage preservation would be crucial in order to achieve educational objectives. These conferences can be personally attended or recorded on video and share the same virtual platform using common applications and open access such as You Tube

In this case, it would only be necessary to share the link to each of the generated videos from the live conference attendance. Another choice is to connect via videoconference through applications such as Skype, to establish a remote assistance.

To follow the same teaching method for other activities, the methodology provides a combination of this activity with other activities such as questionnaire or forum, described above, so as to evaluate the use of the conference by the students.

### 3.6 VIRTUAL CLASSROOM

In this methodology presentation it has been mentioned that part of course would be followed on line.

This outlook is maybe the aspect in which “Innovatio Educativa Tertio Millennio” evolves further compared with other systems that combines distance learning tools and activities supplied by Moodle since this methodology provides also virtual Second Life sessions.[3]

It has been shown that the student’s mind processes the information received in the Second Life environment, so much as if he had attended a real class. [4]



Figure 1: Virtual classroom in Second Life

Second Life provides a space in which the teacher organizes a room (Figure 1) as a physical classroom. You can attend tutoring explanations, etc., where each student can connect from anywhere. Also there is a real-time interaction between teacher and students, and even allows students to interact among themselves.

Each student or user logs into Second Life, makes a personal profile (avatar) and the platform lets you interact with other participants. (Figure 2)



Figure 2: Assistant to the virtual classroom

On the blackboard, as it happens in a real classroom, the teacher submits information on the topic and each student will see all the information displayed in his screen.

This application can apply to lectures, but the greatest potential lies in the possibility of organizing conferences so that the lecturer, teacher and students are each in a remote location, without sharing physical space. One of the most popular activities we undertake is the remote conference through second life.

The lecturer comes in from anywhere in the world. Audio can be live through Skype. The teacher previously organizes the classroom and displays, in a screen, images formerly sent from the lecturer. Then, students can ask live questions. At the same time, the lecture can be followed in Second Life for those students that cannot attend personally.

In some cases, the conference takes place only in second life (Figure 3). The lectures are recorded and sent to youtube, with access from Moodle, Thus, the student can review them at will.

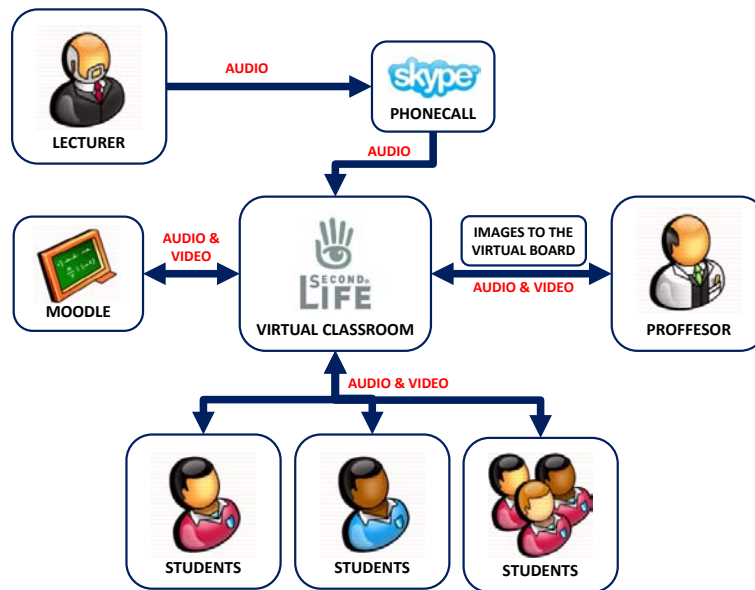


Figure 3: Integrating virtual classroom for use in on-line education

### 3.7 Other activities

Distance learning methodology foresees development of other activities that can demonstrate evolution in students learning progress. Regarding this, some voluntary activities are considered for those students who want to increase their knowledge about a special subject. Those students can get extra grades on the final assessment.

As an additional learning process and as part of the methodology some blogs are created. In these blogs both teacher and participant's students can add information. Besides being voluntary activities it is also a guideline of the learning process.

### 3.8 Communication tools

In all distance education methods and particularly in the area of the UNESCO Chair of Mining and Industrial Heritage, in which, as mentioned, education is international, multidisciplinary and multicultural, it is very important to keep channels of communication clear and close to them. That will allow learning for students from different backgrounds.

Regarding this, emails and videoconference are two important tools. Both included in the widely spread tool such as Skype. Within the virtual learning platform chat and forums are set up as communication tools, so you can answer questions and concepts in real-time and deferred. Also tutorial schedules can be set at convenience.

In order to assist student-teacher communication, a Twitter module has been added. Thus, to improve instruction, teachers can send relevant information concerning their teaching subject. Hence, students can register to this Twitter channel and see the latest course news, interest matters, additional resources, etc, without being connected to the virtual platform since they can receive information directly through their mobiles. [5,6]

## **4 CONCLUSION**

Results will indicate the degree of success of the methodology developed in the implementation of the courses promoted by the UNESCO Chair of Mining and Industrial Heritage. Success will not come driven by qualifications, since it wouldn't be an indicator of right training. However, for the verification of the model developed by the group of educational innovation "Innovatio Educativa Tertio Millennio" it will take into account grades from UPM official career subjects. In this case, we have compared the results obtained with this methodology by contrast with results of a final exam, and found direct correlation in all of them.

In the case of official career subjects, there were two groups of students: those who made continuous assessment and passed a final and those who prepared exclusively the subject and succeed in the same final exam.

So man can remark that students who followed the subject with the Distance Methodology evaluation had better grades in the final assessment than those who didn't.

Thus we can observe an analogy with students who benefit from the ongoing assessment and reach the objectives through a reliable learning process. So we understand that the methodology is suitable for application at distance.

Today we are organizing courses with this technology for UNESCO Chair of Mining and Industrial Heritage. These technologies have been tested for IETM in other subjects. We have studied for each activity all the results and have compared the grades with those obtained in traditional examinations. It has been demonstrated that with these technologies students obtain better knowledge, since these activities have a positive correlation with a final exam. (Figure 4)

## **5 FUTURE INVESTIGATIONS**

The IETM group will support UNESCO Chair of Mining and Industrial Heritage. It will also study and improve all new technologies projected in the future.

The IETM Group is investigating the application of these technologies in other areas and for larger groups of students (over 200). Also investigates new automatic computer commands, to ease teacher's work. [4]

## **6 CONCLUSIONS**

The particularities and necessities for training given by UNESCO Chair of Mining and Industrial Heritage make a total on line teaching fully necessary. This guarantees a quality learning and an evaluation that reflects each students real work.

The educational innovation group "Innovatio Educativa Tertio Millennio" with wide experience in regular teaching in the Universidad Politécnica de Madrid has developed a methodology that can be applied to on line education, using wide diffusion and free tools. These tools, if combined adequately, can be adapted to any educational subject.



New forms of motivation and for accessibility have been introduced for students to achieve a better use of study time in an international, multicultural and multidisciplinary way.

Due to the particularities of engineering for heritage, in which previous experiences and also particular case studies are the key factor, a new communication procedure has been established. This procedure facilitates lectures and on line participation to conferences both in local and in remote.

Experience achieved by the educational innovation group "Innovatio Educativa Tertio Millennio" in combining conventional real education with on line technologies has reached new goals in achieving better learning than conventional courses.

## REFERENCES

- [1] Ramírez Masferrer J.A, Jarillo López P, Castejón Mochón J.F, Moraño Rodríguez A, J. Herrera Herbert, Domingo Perlado J.F, Velázquez Iturbide A, D. Fernández-Ordoñez Hernández (2010). Experimentación continuada en Innovación educativa y adaptación al Espacio de Enseñanza Europeo. IV Jornadas de innovación y experimentación educativa. Universidad de Zaragoza.
- [2] Ramírez Masferrer, J.A. et al. (2010). Experimentación continuada en innovación educativa y adaptación al Espacio de Enseñanza Europeo. IV Jornada de Innovación e Investigación educativa. ISBN: 978-84-15031-49-9.
- [3] Iribas Rudín, Ana Eva (2008) Enseñanza virtual en Second Life: una opción online animada para las universidades y las artes. In IV Jornada Campus Virtual UCM: Experiencias en el Campus Virtual (Resultados). Editorial Complutense, Madrid, pp. 125-142. ISBN 978-84-7491-905-9
- [4] Ramírez Masferrer, J.A. et al. (2011). Use of 3D worlds in teaching, Teaching in Metaverses. INTED2011 Abstracts CD. ISBN: 978-84-614-7422-6.
- [5] García Laborda, J. (2010). Cambios en los estilos de aprendizaje inducidos por el uso de la web social. RED - Revista de Educación a Distancia. Número 22. 15 de mayo de 2010.
- [6] VV.AA. (2011). Experiencias Educativas en las Aulas del Siglo XXI. Innovación educativa. Ariel-Telefónica. (ISBN: 978-84-08-10551-0).