Video-sharing educational tool applied to the teaching in renewable energy subjects

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ABSTRACT

The impact and evaluation of an educational tool "Renewable Energy Video sharing", based on videocast techniques is presented in this paper. This tool arose from a learning innovation project developed in the Electronics and Automation Engineering Department at the University of Jaén. This experience consists of the elaboration of multimedia materials showing different ways of obtaining thermal energy and electricity from renewable resources as well as the equipment and the technology implicated in these process. Thus a video channel, implemented in YouTube™ platform, and an online space were implemented where these multimedia materials can be found and played, bringing technological reality closer to the final user – to the students in this specific case – in an easy, interactive and free way from any device with an internet connection. This learning tool was applied and used as a support in two ambits, face-to-face and non face-to-face education, in two different educational levels: Undergraduate and Postgraduate Education. Three subjects in the field of photovoltaic solar energy experienced the e-learning tool, obtaining a high degree of general satisfaction among students. After analyzing the impact of the implemented tool through personal final questionnaires among students, an improvement of the understanding of the theoretic concepts previously studied as well as the facility of access to the contents being the most appreciated benefits.

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1. Introduction

Visits to industrial plants have a huge importance and interest in the field of technical education. These activities are a chance for the student to obtain a real vision of the industrial processes carried out in those areas with which they will deal throughout their professional career. However, analyzing the data from previous academic years, only a reduced percentage of all the registered students of a specific subject could participate in these visits. The problems associated with participation in these activities are frequently related to the availability of resources, the time involved, and also those problems which appeared at the moment of obtaining the permissions. In particular, three main difficulties were found when planning full visits in the subjects schedule: firstly, these activities required an important amount of time, frequently needing a whole day for the transport and the visit to the industry; in another way, the large number of students registered in these subjects hindered the obtaining of the permissions from the plant and the correct organization of the visit; finally, these tasks might infringe on the industries' premises of security, quality and hygiene, so many times the request for visits were rejected or only accepted for a small group of students.

Despite all these drawbacks it is well known that the experiences at real installations are extremely useful, which justifies the inclusion of these visits to industrial plants in the learning programme of the subjects. The tool described in the present study aims to move these activities, developed in a real environment, to classrooms through the creation of multimedia contents related to several ways of obtaining energy from renewable resources.

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Audiovisual contents (videos) are proposed as an additional support to the lectures developed in Degrees and Masters of Engineering, recently launched at the University of Jaén and International University of Andalucía. The new theoretical concepts related to Renewable Energy introduced in lectures require a practical complement for a better and more global understanding of their final application in a real environment. The main objective of the project presented is to familiarize students with the industrial applications applied to the process of obtaining renewable energy. In order to achieve this objective, and in the framework of the Teaching Innovation Project "Canal Web De Visitas Virtuales Online aplicadas a la docencia de asignaturas de Energías Renovables"/"Web Channel of Online Virtual Visits applied to the teaching of Renewable Energy subjects", a set of videos was created. In these, virtual visits to real installations of energy production by renewable energy sources were carried out, showing the main processes and equipment used in those installations. The achievement of this purpose makes it possible to improve the understanding of the concepts previously explained in theory classes in a quick and easy way, through the use of WEB 2.0 technologies.

Among the available WEB 2.0 technologies in the *Media Sharing* ambit, the *Videocast* technique was selected. The multimedia material developed through this technique is hosted in a video channel created on the YouTube™ platform (http://www.youtube.com/user/renewenergyvs). YouTube™ is one of the most outstanding reference platforms in the sector. The use of this platform is also widespread in higher education, in order to use multimedia contents applied to diverse disciplines, achieving a great degree of acceptance among students (Almécija et al., 2011; García Fernández, 2011). At the same time a web portal was elaborated, where the videos can be searched and played and where additional multimedia material not available through YouTube™ can be visualized. Moreover, and additionally to the video channel and web portal, two of the most extended current social media, Facebook™ and Twitter™ (Tagtmeier, 2010) were used with the aim of disseminating the material updates in the web channel and web portal and exchanging opinions and comments with the followers and subscribers of the contents generated.

2. Previous research of innovative technologies applied to education

The new technology based on WEB 2.0 (Hew & Cheung, 2013) has provoked the interest of teachers from different educative fields (Judd & Kennedy, 2010; Matschke, Moskaliuk, & Cress, 2012; O'Bannon, Lubke, Beard, & Britt, 2011; Su, Yang, Hwang, & Zhang, 2010). These e-learning technologies are based on the use of the personal computer with Internet access as an additional resource in the learning process (Forsyth, Pizzica, Laxton, & Mahony, 2010). The widespread inclusion of virtual tools as a complement to traditional teaching techniques is due to their numerous benefits, as well as the diffusion potential that they have demonstrated for over a decade (Dunlap & Lowenthal, 2011; Wang, 2009; Wang, Cowie, & Jones, 2009; Ward & Newlands, 1998). Particularly, the application of these technologies to Higher Education is outstanding (Gilroy, 2009; Kunicina, Zhiravecka, Patlins, Chaiko, & Ribickis, 2012). The WEB 2.0 technologies propose a bidirectional communication between teacher and students, so there always exists a constant exchange of ideas and information between them. It is important to highlight the possibility offered by the web technologies of publishing contents instantaneously, allowing regular updating and encouraging, in this sense, the participation of multiple authors (Alexander, 2006).

The most well-known WEB 2.0 technologies, and those which have demonstrated the greatest repercussion in the educational areas during recent years, are described below:

Weblog: Publication of contents and experiences in a blog available at virtual level. It is based on a diary structure, in which each new post is chronologically ordered, allowing, in most cases, the additional publication of comments made by a person different to the author of the entry. The weblog has a great popularity for educational applications due to the simplicity of its use as well as the possibility of inclusion of different multimedia material: videos, images, hyperlinks…hosted in external serves. Many experiences are described in the literature, which show blogging as a powerful tool applied to the teaching field (Chong, 2010; Du & Wagner, 2006; Williams & Jacobs, 2004)

Wiki: Creation of a full content through the global and massive participation and diverse contributions made by different authors (Spoerri, 2007). The virtual character of this tool permits the constant exchange of information and ideas between the students, allowing them to develop a critical attitude and clarifying the concepts previously acquired (Moskaliuk, Kimmerle, & Cress, 2012). As evidence of the enormous potential of development of this tool, multiple contributions related to Wikipedia™ can be highlighted (Chen, 2009, 2010; Knight & Pryke, 2012).

Media sharing: Platforms that host different multimedia materials: audio, video, images, etc., allowing their real-time reproduction and download. This kind of tool has experienced a great evolution and development in recent years, now being one of the main motors of information in all fields. The technologies which stand out are audio podcast and video sharing. Video-based teaching material is a rich and powerful medium being used in the learning process (Rabab & Samar, 2013). As the main diffusion media for video contents, the YouTube™ platform (http://www.youtube.com) is considered as the main reference (Cheng, Dale, & Liu, 2007, 2008) in a general way and in a learning ambit (Asselin, Dobson, Meyers, Teixiera, & Ham, 2011; Burke, Snyder, & Rager, 2009; Clifton & Mann, 2011; May, Wedgeworth, & Bigham, 2013). Data information which summarizes the potential of this platform are the following: It is reported that more than one billion users visit the YouTube™ platform each month, with 100 h of material uploaded each minute (http://www.youtube.com/yt/press/en/statistics.html). It is also important to highlight a percentage of over 50% of videos with comments given by the users, which allows interaction in real time between the video developers and the final user who reproduces them (Chen & Burns, 2013; Prensky, 2010).

Social networks: These permit the diffusion of material in a personal or a corporative way, as well as access to all those topics previously defined as part of one's interest subscriptions. This is the tool which has most recently appeared and that has revolutionized the world of technology and communication, thanks to an enormous volume of transmission and high speed in the access to the information. The social networks allow communication and interaction among users directly, through the diffusion of messages and diverse content. The recent development of high-technology mobile devices as communication tools has turned the social networks into a powerful motor of communication, whose applicability has been widely demonstrated in the educational ambit (Everson, Gundlach, & Miller, 2013; Roblyer, McDaniel, Webb, Herman, & Witty, 2010; Wang, Woo, Quek, Yang, & Liu, 2012; Wright, 2010). The most popular current social networks are Twitter™ and Facebook™ (Arteaga Sánchez, Cortijo, & Javed, 2014).