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## An innovative teaching practice based on online channels: A qualitative approach

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### Abstract

The purpose of this preliminary study was to qualitatively explore the results of using low-cost educational videos, oriented at complementing face-to-face and distance courses of the Degrees in Industrial Engineering, Industrial Organization and Aeronautical Engineering at ETSEIAT (Technical School of Industrial Engineering and Aeronautical Engineering of Terrassa). Qualitative analyses showed that the use of innovative teaching practices enhances students' motivation, promotes dynamism in the classroom, improves students' self-learning and increases the perceived efficiency of the learning and teaching processes, without substantially raising costs.

*Keywords:* student motivation; perceived efficiency; innovative practices; low cost videos; higher education

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### 1. INTRODUCTION

The increasing application of new technologies has been progressively changing teaching-learning methodologies at university. Reduction of attention costs, increase of effectiveness and teaching efficiency are allowed by new virtual tools and resources that Internet provides, as the Moodle platform –a widely used virtual teaching environment. With the appearance of high-speed connections to the Internet and the Web 2.0, video opens up a new range of possibilities, such as

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the reduction of teaching and learning costs, while increasing students' satisfaction and motivation. There are many papers, which present the advantages and disadvantages of the use of videos in the learning processes (Shepard, 2001; Copley, 2007). However, the majority of these researches presents a kind of video that is difficult to create, contains an excess of information, or is independent and not embedded in the rest of materials of the subjects. These limitations have been overcome by the development of 'streaming video' formats that permit video playback to commence, while the file download proceeds concurrently with viewing. Fill and Ottewill (2006) suggest that some advantages of the Web 2.0 and, more especially video stream, are the access speed, the possibility of creating knowledge networks and the active participation of all stakeholders who want to develop them.

In this paper, we introduce the concept "low-cost educational video", which allows us to solve some of the main problems or barriers that lecturers and professors identify as the reasons why they do not use videos in their courses. This kind of video is characterized by low production cost in time and resources. In order to assess this new kind of video and for the great interest in education about 'streaming media' we carry out a research made up by five phases. The first one was a short course to show the advantages and how to create a "low-cost educational video" using free resources such as "AutoScan Recorder 3.0" and Youtube channels. From this course, many academics decided to develop and integrated this kind of videos in their courses. In total, 487 students and 12 teachers from three different degrees (Mechanical Engineering, Industrial Engineering and Management -in a face-to-face and a semi-distance ways- and Aeronautical Engineering) were involved. To assess the results of including this new teaching tool in the courses, the third phase involved the development of an evaluation questionnaire, based on the works of Fernandez et al.(2009), and Breen et al(2001). The fourth phase consisted in semi-structured interviews to gather the opinion of students, lecturers and professors about the usefulness of the videos as a learning tool. The final phase consisted on analysing the data obtained through the questionnaire and interviews to explore the perceived value of video in the learning process. At the end of the paper, some reflections on the advantages of the use of video stream-based educational channels have been highlighted.

## **2. Low cost videos as an innovative learning tool**

The use of video as an innovative tool in higher education has been considered and analyzed by Race, (1995), Whalley (1995) and Strom (2002). Recent developments using streaming video have been considered by Shephard (2003) and Palmer (2007), who asserted that videos are an efficient learning tool. However, in spite of all, the existing literature has also highlighted a long list of problems related to the use of educational videos (Goldman et al., 2007). For instance, the majority of educational videos that we can find demand a high number of resources to be produced: mainly (digital) cameras, lighting and sound devices, and professional software, which are not always easy to understand and to use. As a consequence, upgrading an educational video has a very high cost and, therefore, many of these videos lose value in a short time. From another point of view, the main use of educational videos is to record or capture the live classroom materials. These

educational videos are very long and contain extensive quantities of information, which can confuse students because there is no feedback. In the same line, these educational videos are not embedded in the rest of materials of the course and, therefore, these videos do not emphasize working time of students as the principles of good practice propose.

According to Caspi, Gorsky and Privman, educational videos can be divided into three categories depending on their use and purposes: demonstration videos, narrative videos and recorded lecture sessions. Demonstration videos are a really good tool to allow and improve autonomous learning, becoming much more effective than other methodologies based on more traditional methods, such as books and written manuals or oral explanations (Wisher and Curnow, 1999). Demonstration videos allow faculty, especially in technology related areas, to develop new teaching and learning strategies, adding a new dimension in the teaching material. Narrative videos are commonly used in the learning process of a language, offering a unique communicative and cultural context. Finally, video recorded lectures are characterized by the content, which receives full attention. Some researchers argue that this kind of video is not more efficient than audio records or other similar resources (Ellis and Childs, 1999). Nevertheless, video recorded lecture sessions have been the most common educational videos during the last decades.

### **2.1 Conceptualization of low cost video**

“Low-cost educational video” has been defined as a short demonstration stream video which has a very specific goal and has been created in a very short period of time, with few resources and that can be combined or embedded within other materials of a course (Simo et al., 2010; Fernández et al., 2009). This kind of video allows lecturers to eliminate a great number of the common problems related to the video: the necessary resources (both budget and time) decrease, the process of upgrading the videos is simplified, and it is possible to efficiently fit the video into the course according to the teacher paradigm.

Low cost video can be described as "click and get" videos, incorporating on-demand strategy for content distribution. Owing to the advantages that are associated with streaming video technology, two very important roles in higher education are identified. On the one hand, video stream becomes an education tool with many future opportunities and ready to explore; on the other, it has become an outreach and institutional advertising tool for universities (Fill and Ottewill, 2006). Moreover, stream video technology is widely well known by students, in terms of entertainment, and allows viewing in multiple devices beyond computer such as iPods, mobile phones with Internet connection, etc.

## **3. METHOD**

Our research design uses data from open-questions questionnaire. The study was conducted with twenty-five courses from three different degrees: Mechanical Engineering, Industrial Engineering

and Management, and Aeronautical Engineering, taught in face-to-face and semi-distance ways, at the School of Industrial and Aeronautic Engineering at Terrassa (ETSEIAT) of the Universitat Politècnica de Catalunya (Spain). The aim of the study was to identify positive and negative aspects related to the use of low cost educational videos in the learning process, in order to gain a better understanding about the effects of these innovative learning tools. This study was conducted during the academic year 2008/2009, introducing low-cost educational videos with a high graphical content and a duration of approximately 4 minutes. The videos focussed on specific contents or techniques of a particular subject, as for example, videos on fabrication processes used for the production management subject or videos on competitiveness conceptualization used in the classes of strategic management. These videos were broadcasted in different ways, such as: web-integrated using the teaching platform of the University (based on Moodle), or directly through YouTube channels for later reproduction. These primary data were complemented by 12 semi-structured interviews conducted with teachers holding a wide range of academic positions and who used low cost videos as a complementary learning tool in class. These interviews were aimed at clarifying the pedagogical objectives that were pursued in each session. Each interview took approximately 20 minutes. Subsequently, the information derived from these interviews and from the questionnaires that included two open questions, so that students could express their opinion about positive and negative aspects related to the use of videos as a learning tool. The questionnaires were distributed to 487 students, who attended the different subjects and degrees at the ETSEIAT, and they were subsequently transcribed. Preliminary analysis was produced by reading these transcripts that were subsequently saved in MaxQda and were categorized and codified according to the four pedagogical objectives that were identified in the interviews conducted with teachers. The study follows the full process of grounded theory for data coding and analysis, including theoretical sampling (Fend and Sachs, 2008). Codes were gradually developed during the first phase of data recollection. Data were validated during the second phase of the interviews. Following Miles and Huberman (1994)'s suggestions, we first transcribed data derived from the questionnaires and subsequently those obtained from the interviews. Subsequently, we analyzed the results and discussed any discrepancies until we reached a consensus. Having unrestricted access to professors was fundamental to follow each detail of the process of video implementation as a learning tool. In this work we present professor and student quotations that are relevant to illustrate that videos are fundamental for achieving the learning objectives proposed by teachers (see Table 1).

Table 1 Main Pedagogical objectives aimed to be achieved with the use of videos

Subject Code	Main Academic Objective
27852	Comprehension
27816	Comprehension
27801	Comprehension
25123	Comprehension
30041	Self-Learning
25024	Self-Learning
25032	Comprehension
25014	Comprehension

25125	Comprehension
27857	Comprehension
27852	Motivation
27816	Efficiency

#### 4. FINDINGS

Our exploratory analysis revealed that the use of low cost videos contributes at achieving the following learning objectives: comprehension, self-learning, motivation and efficiency which are needed for an effective learning process. The fundamental role that videos play for achieving these objectives is discussed and described in the following sections.

##### 4.1. Comprehension

The most important feature of the various types of media is that they allow the presentation of knowledge in different ways. Thus, students can learn about difficult principles through text and can see the use of those principles through an animation or a video example. This implies deeper levels of understanding, particularly if the presentational qualities are fully and deliberately exploited to achieve this purpose and are complemented with other learning tools. This can be illustrated by the following comment made by a student:

*“You can see real processes without having to imagine them in wrong ways”*

*“Videos complement very well difficult subjects, which can be better understood when graphically represented”*

Previous research has proposed that using video may lead to a better description by the lecturer and better visualisation, recognition and identification by the student. For example, Shephard, (2003) affirms that lecturers use video to tell a story, convey emotions and provide 'real life' examples with which learners can identify. One of the students illustrated these advantages very clearly in his narrative:

*“Concepts can be visually and clearly understood by using videos”.*

Interviewed teachers repeatedly alluded to what they called information hard to transmit, referring to certain concepts which could not be understood without the use of videos or other more costly learning tools. This can be illustrated by the following comment made by a production system design teacher:

*“The use of videos allowed students to understand the concept of Kanban. In previous years, we used to visit plants so that students could observe the application of lean manufacturing tools in real contexts. However, this practice used to incur various costs, such as, for example, transport cost. The use of videos has helped us to overcome these limitations”.*

In the preceding section, we argued that the use of videos contribute at achieving a better comprehension of the concepts to be transmitted, this being one of the pedagogical objectives proposed by teachers. Thus, we propose that:

**P1. The use of videos has a positive effect upon the students' perception regarding a better comprehension of complex concepts.**

**Efficiency**

Breen et al. (2001) define efficiency within the learning context as the belief or judgment that information can be accessed without wasting time or effort. One of the students illustrated this definition very clearly in his quotation:

*"Videos allow a more rapid learning of a new concept"*

According to Schnotz and Kürschner (2008) the two main applications of media tools, such as low cost videos, consist in: enabling learners to come to understandings more quickly than through more conventional classroom or textual media; and perhaps more significant, they can change how we come to know or to understand and hence what we know and understand. In other words, these authors argue videos can provide students an image or a mental "construction" that is far richer than an abstract verbal understanding. From an educational perspective, it is essential that learners can move confidently between concrete and abstract understandings and not become locked into one or the other.

Other teachers made reference to the efficiency oriented at enhancing operability in the classroom and at using videos for minimizing the time spent to prepare the next sessions. A management professor explained:

*"In the sessions that included business case studies we used videos that were aimed at familiarizing students with the concepts to be discussed in the next session. The students were asked to watch videos that included interviews with CEOs and identify the strategic variables that were previously discussed in the theoretical sessions"*

A 74% of the students indicated that the use of videos represented an easy and efficient way for enhancing and complementing knowledge, by providing a practical view of the concepts explained in classroom.

Based on these considerations, we propose that:

**P2. The use of videos has a positive effect upon the students' perception regarding the increase of the efficiency of the learning process.**

**Self learning**

Self-learning is learning by oneself or self-assisted learning, which corresponds to the model of self-teaching (Xingwei, 2004). It is a process in which students take initiative and diagnose their learning needs and select the necessary time to fulfil these needs. Compared to traditional learning forms, videos allow greater interactivity and control, as video elements can be quickly selected by the user, or controlled by a computer program, in any desired sequence (Palmer, 2009). Online channels offer practical benefits such as accessibility of practices and flexibility in updating information (Leijen et al., 2009). This can be illustrated in by the following student's comment:

*“Videos are always available and you can watch them many times and stop them when needing to check the explanations”*

Teachers of “Mathematical methods” and “Economics” subjects argued that videos enhanced self-learning when, for instance, they did not have enough time for explaining students the whole process for the development of a mathematical problem. In this situation, the use of videos contributed to significantly reduce tutoring, as students could revise the solution proposed with the use of videos and specifically focus on those parts of the process that they considered more difficult to understand. In that sense, a student remarked that:

*“Videos allow me to revise concepts as if I were watching teacher explaining them in class and I can repeat watching them anytime I need”*

Based on these considerations, we propose that:

**P3.The use of videos has a positive effect upon students’ perception of the increase in the self-learning efficiency.**

#### **Motivation**

The term motivation is derived from the Latin verb *movere*, which means to move. Motivation in the academic context has been defined as the motivational value of the content itself without the provision of external incentives to induce participation (Rieber, 1991). Within the context of the knowledge economy, Marx and Frost, (1998) suggest that video can be a powerful motivator and context setter for student learning, citing examples of Martin Luther King’s ‘I have a dream’ speech or the Challenger space shuttle disaster. Moreover, most educational experts agree that video is best shown in short segments so as to maximize learners’ concentration (Shephard, 2003). As one student stated:

*“Videos are entertaining and help me studying some technical concepts which are difficult to understand without a graphical representation”.*

Most students used the space allocated at filling in the positive aspects related to the use of videos to thank teachers for their efforts to prepare the videos. By using different tools to present contents, teachers succeeded in enhancing students’ intrinsic motivation and encouraged them to improve their learning outcomes. As a student explains:

*“The use of different learning tools such as videos, Power Point presentations and scholarly paper shows teacher’s interest for supporting and increasing students’ learning process”*

Sellani and Harrington (2002) emphasize that motivated students can access the video in their own time. Therefore, teaching tools must approach students from an angle that seems interesting and relevant to them. A teacher of “Materials Technology” explained that videos allowed him to provide real-life examples that caught student’s attention. In that sense, a student remarked that:

*“Video case study is better than just reading theory”*

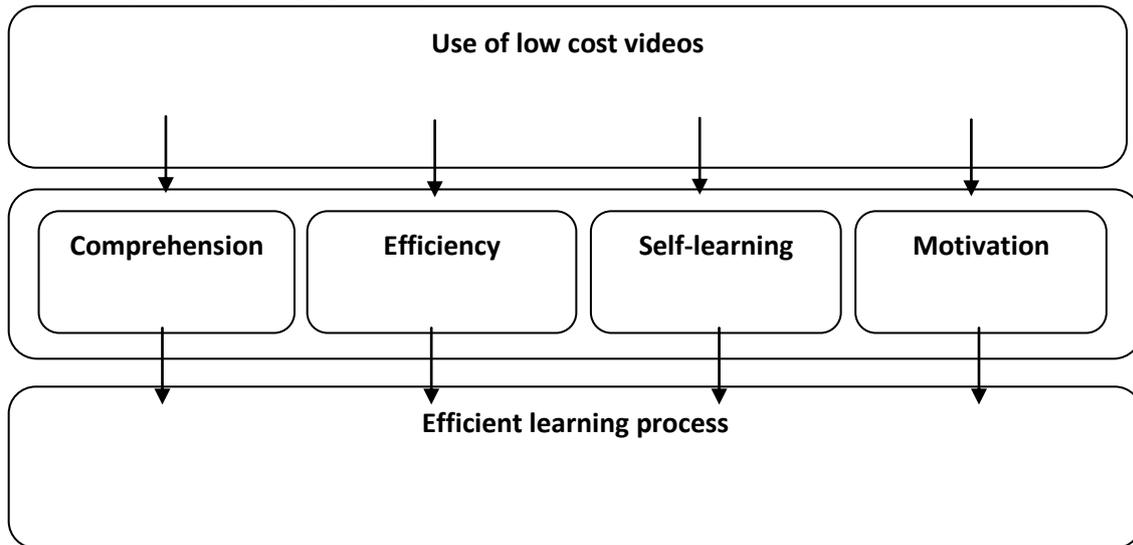
Although the main pedagogical objective was “comprehension” (See Table 1), the majority of teachers also made reference to the impact of videos upon the enhancement of students’

motivation. The results show that the pedagogical objectives are not mutually exclusive; however, some of them are more significant than others.

Based on these considerations, we propose that:

**P4. The use of videos has a positive effect upon students' perception regarding the enhancement of their learning motivation.**

Figure 2 depicts the pedagogical objectives achieved with the use of videos in the learning process.



## 5. CONCLUSIONS AND FUTURE DEVELOPMENTS

The use of the low cost educational videos are an invaluable support in the teaching of the technical Engineering concepts, in addition is effective because of the following: (i) low cost tool; (ii) relative ease of handling, without the necessity of intensive and specific teacher training (Fernandez et al., 2009); (iii) effectiveness in facilitating comprehension of the abstract concepts involved in the Engineering principles; (iv) contribution to make the classes more motivational and, consequently, the improvement in the teaching-learning processes (Tang and Austin, 2009); (v) reduce significantly face-to-face students' tutoring; (vi) improves students' ability to learn in an autonomous way, and (vii) encourage discussions and cooperative learning, because dynamic teaching materials can promote searching for new audiovisual materials by students (Palmer, 2009).

Audiovisual contents promote dynamism in classes, helping subjects' comprehension, making contents more attractive and reducing absenteeism in classrooms, because many students prefer short videos rather than long paragraphs written in response to particular questions. This replacement is considered adequate only if it is associated with a complementary process, because

videos do not offer a global vision of a topic. The number of questions is greatly reduced, because students can improve their ability of self learning. Moreover, it must be noticed that videos allow quick and easy viewing, but they only provide very specific contents and therefore they must not be considered themselves the main element of training. So, written explanations associated with audiovisual content are excellent teaching material, as they can provide a clear and complete idea of a particular event or process.

For all these reasons, the authors recommend the use of educational videos as a common practice in different universities, given the very positive results obtained in this research. The use of short videos represented a new way to motivate and maintain the interest of large classes. Moreover, it is important to develop new videos aimed at achieving specific learning tools. The qualitative analysis revealed that teachers who used videos aimed at fulfilling a basic learning need, which could not be met with traditional learning tools, obtained a positive feedback from students, who remarked the flexibility and versatility that videos brought into the class dynamic.

Grounded theory is a research methodology that, through iterative cycles of data collection and constant comparative analysis for emergent themes, develops theoretical explanations of social phenomena that are grounded in practical experience. This research has several limitations, which are mainly derived from the inability of interviewing all the students who contributed with their responses to the open-questions regarding positive aspects related to the use of videos to support the leaning process. This information would have allowed us realizing a deeper analysis and a comparison with the narratives of the 12 interviewed teachers and thus, it would have brought more soundness to the analytical generalizations proposed.

Given the importance of conducting more research on the efficacy of new learning tools, such as videos and their impact upon students' learning process, future studies should focus on the good practices related to the use of these tools to enhance students' motivation to get actively involved in their learning process. Finally, an interesting future avenue for research is analyzing the relation between the four learning objectives proposed in this study: comprehension, efficacy, self-learning and motivation.

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