Video as a new teaching tool to increase student motivation

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Abstract— **The main objective of this research is to explore the results of the use of videos as an educational tool which helps increasing students' motivation in any discipline. The study is based on several streaming videos created as a support material for learning and used by 12 lecturers with 487 students in three different degrees of engineering (Mechanical, Industrial and Management, and Aeronautical) at the School of Industrial and Aeronautical Engineering of Terrassa (ETSEIAT). The paper describes the different areas and ways in which this innovative learning tool has been used and emphasizes the skills developed in each application. Finally, it presents the results of the impact of the use of videos upon students' motivation.**

Keywords-student motivation; Low Cost videos; Higher Education; teaching; pedagogy

I. INTRODUCTION

It is widely accepted that student motivation is a key element within the learning process [1]. The extant educational literature has proven the positive effect of using new technologies as a support tool for enhancing learning efficacy [2], [3]. These technologies capture students' attention as students are familiarized with them and they can easily use these tools.

Among these tools, video has been used 'off-line' for many years to support student learning in a variety of settings [4]. Nowadays, a new concept called "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 [5]. 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 lecturer paradigm. This shows that learning is created from the interaction between motivational and cognitive variables [6]. The authors who analyze the use of videostreaming as a learning tool have centered their research efforts on analyzing the advantages and the disadvantages of using this new technological tool [7], [8], [9]. Nevertheless, none of these studies have qualitatively examined the effect of the use of these tools upon students´ motivation. An in-depth analysis of this effect may help lecturers develop contents which are compatible with these new technologies, that in addition to meeting the educational objectives of understanding, self-learning and efficiently should also exploit the full potential of motivation, as one of the most important factors for obtaining positive results in the learning process.

Drawing on Shephard's [10] research agenda regarding the use of videos as an innovative teaching tool, this paper is aimed at exploring the effect of the use of videos for assessing the enhancement of students' learning motivation. The remainder of this paper is structured as follows; next section presents a literature review on motivation; third section explains the methodology we drew upon, and finally, fourth section describes the findings of the exploratory qualitative research centered on the effect of the use of videos upon students' motivation.

II. LITERATURE REVIEW

A. Motivation in Learning

There is a link between motivation and learning outcomes. Some authors consider that these results depend both on students' prior knowledge and the factors that motivate them to learn [11]. Motivation is a process that requires students to perform physical or mental activities for achieving their goals [12].

Learning arises from the interaction between cognitive and motivational variables [1], [13]. Motivational variables have been widely studied by the educational theories. These studies have found that students' intrinsic and extrinsic motivations have a high impact upon the learning process. Ryan and Deci [14] defined intrinsic motivation as a motivation that originates within the individual. According to these authors intrinsically motivated students learn because they are driven by an inner sense of satisfaction. Extrinsic motivation refers to motivation that is generated by external factors [15]. Thus, extrinsically motivated students achieve their learning objectives entrusted to receive external rewards.

Several theories on students' motivational behavior have emphasized the constructs of expectancy, value and affect [16], [17], [18]. Expectation refers to students' beliefs regarding what they hope to achieve by performing a certain task. The value construct focuses on the reasons why students agree to perform certain academic tasks. Finally, affect encompasses students' concerns for academic tasks which are directly related to psychological aspects such as the anxiety

experienced when they are taking an exam [19]. These constructs are rooted in social cognitive theory, whose main premise is that motivation influence students' performance and learning process.

B. Low cost educational 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 [5], [8]. 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 lecturer paradigm.

III. 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 Technical University of Catalonia. 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 focused 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 lecturers 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 30 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, subsequently, they were transcribed. Preliminary analysis was produced by reading these transcripts that were subsequently saved in MAXQDA. Data were categorized and codified according to the interpretations and the data reduction regarding the effect of the use of low cost educational videos upon students' motivation. The study follows the full process of grounded theory for data coding and analysis, including theoretical sampling [20]. 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's [21] 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, after several iterations. 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 the effect of videos upon students' motivation

IV. FINDINGS

Our exploratory analysis revealed that participants' general opinion stresses that low-cost videos are innovative teaching tools that have a positive effect on student motivation. This effect is discussed and described in the following section. To this end, we present several applications and results obtained in some of the subjects involved in this experiment based on the use of low-cost videos. These results are further analyzed.

1) Business economics

According to students, the videos captured their interest because they could watch various social psychology experiments and interviews with world-renowned psychologists that enabled them complementing the theoretical concepts of organizational behavior presented in class. Students could watch videos before the class session and this stimulated debate within the classroom.

2) Industrial statistics

This course introduced videos about the methodology of statistical techniques. A classic problem of this subject relies on the complexity of the processes and the difficulty of explaining them a simple and fast manner using a sheet of paper. The use of videos allowed students to rewind and to set the pace of their self-learning. Thus, most students were able to understand the "recipe" of statistical techniques.

3) Quantitative methods

This course is divided into techniques and techniques are subsequently divided into smaller sections. The use of videos allowed lecturers supplementing those sections that were more complicated and used to cause students a lot of problems. The feedback received from students and lecturers was very similar to that obtained in the industrial statistics course.

4) Information systems

The development of an information system is a process which is easy to explain. However, there are some concepts difficult to grasp, so that we developed a "frequently asked questions" document of several pages so that students can understand them better. This document had considerably grown in size in recent years. With the inclusion of low-cost videos, this written document has been replaced by a series of very short videos. For example, an explicit explanation which usually needs two or three pages has been replaced by a video which only lasts 15 seconds.

5) Design of production and logistics systems

Several students decided to present their final work through a video instead of a written document followed by oral presentation. They considered that videos allowed them explaining more efficiently some parts of their assignment. Students also commented that by means of videos lecturers gave them a better feedback than by email when complex technological issues were addressed.

6) Material technologies

The lecturer summarized the benefits of using low cost educational videos in a very suggestive manner: "A picture is worth a thousand words; a video is worth a thousand pictures, so, from this point of view, a video is worth a million words." The use of video prior to the class session generated fewer doubts from students.

7) Continuum mechanics

The lecturer replaced the classic text instructions by low cost educational videos so that students could better understand from the begging the simulation problems to be solved. Thus, the number of questions about what exactly had to be done has drastically decreased.

Next paragraphs present the overall results derived from all the subjects involved in this educational experience on innovation.

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 [22]. Within the context of the knowledge economy, Marx and Frost, [23] 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 [10]. 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 professors for their efforts to prepare the videos. By using different tools to present contents, lecturers 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 lecturer's interest for supporting and increasing students' learning process".

Sellani and Harrington [24] 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 lecturer of Materials Technology explained that "videos facilitate the assimilation of contents, thus improving the efficiency of the learning process. In terms of motivation, the fact that after watching a video in class, students send me one that complements the subject matter is a clear evidence of their motivation and involvement".

According to Shepard [10], students should also be encouraged to learn actively from the video, by 'interacting' with it. In that sense, a Quantitative Methods lecturer mentioned that: "the videos I used worked very well because this course is divided into techniques and these in turn are dived into smaller sections. Due to these features, I created short videos explaining these fractions of information. It was also nice to see that the students watched these videos on their iPods". Another lecturer of the degree in Business Administration said that after posting the first videos he was pleased to receive congratulations emails from students. One of these mails is literally transcribed below:

"I just wanted to congratulate you for the videos you posted last week. They have been very helpful and if I did well the exercises was thanks to them. Congratulations".

These congratulations motivated lecturers to create more videos especially in quantitative subjects in which students had difficulties in understanding certain solutions of the problems. Several lecturers of mathematical methods argued that videos reinforced those traditional step by step explanations based on a spreadsheet. The biggest advantage was that students could play the videos as often as they deemed necessary to understand the resolution of the problem. This type of video demonstration has been very successful among students. In addition to express their congratulations, students also asked lecturers to create more videos, stressing that the videos supported their learning process, by providing complementing material.

Some lecturers observed that in the session in which they used videos students had fewer doubts. This determined them to create a "material block" for each session, encompassing basic and complementary materials, as well as videos related to the topics to be discussed.

A "continuum mechanics" lecturer conducted a survey on students' opinion regarding the use of videos in the virtual campus of the university. The results revealed that on a Likert scale ranging from one to five, the majority rated with a 5, and only some of them with a 4 respectively, their satisfaction with the use of videos. Hence, videos turned out to be an effective learning tool, as reflected by students' perceptions.

Nevertheless, we should also bear in mind that videos must be short and synthesize the concept or concepts presented in class. Several lecturers commented that it is also important to include (if possible) within the video contents some humor in order to re-capture students' interest.

Continuous data analysis and iteration identified a pattern in the lecturers' narratives. This pattern was used to classify the types of motivation generated by the use of low-cost videos as a complementing teaching material. The first type of motivation is generated by the "novelty" brought about by the use of the videos. The second type of motivation is derived from the "recognition" of the lecturers' effort that encouraged students to respond them in the same way and thus, effectively use low-cost videos to supplement their learning process. Several students valued lecturers' efforts which, in their

opinion, showed their commitment and interest in facilitating students' learning. Finally, the third type of motivation is "understandability". During the course many students are unable to comply with the requirements of continuous assessment. Others fail to have a conceptual map of all the topics covered in the course, due to their different learning rhythm. In order to guide these students, some lecturers created videos that incorporated a synthesis of all the issues generated during the course. One of the lecturers of the business organization department referred to these videos as "update knowledge capsules".

Although the main pedagogical objectives initially set by professors only comprised efficiency and comprehension, the majority of lecturers have also made reference to the impact of videos upon the enhancement of students' motivation. In that sense, a Mechanics professor comments:

"Student satisfaction surveys on lecturers' work that are conducted at the end of the course showed that students considered that videos are a more enjoyable way to introduce the subject and a mean to increase their motivation. Videos enabled students to watch graphic and practical applications of the concepts seen in class and thus contributed at enhancing their interest in the contents".

V. CONCLUSION

This research demonstrated that the use of videos has a positive effect upon students' perception regarding the enhancement of their learning motivation.

As discussed throughout this paper, the lecturers followed up the process of videos implementation and received positive feedback from students throughout the process.

This paper emphasizes the need to properly define the content and the amount of information transmitted through videos, as well as their duration, in order to increase their effectiveness. As exposed by lecturers in different interviews, these videos allow providing more rapid explanations as compared to verbal or written forms. Besides the ease of creating these videos as compared to the enormous benefits derived from their use and the great support they provide to the learning process compared to time spent in developing them, reflects a high profitability derived from lecturers' efforts.

Furthermore, this study underlines that the use of new technologies increases students' motivation and facilitates the transmission of information to students, as already discussed in other papers cited above.

The 12 lecturers who participated in the study noticed an increased level of students' motivation and interest in the subject. This gave them a sense of satisfaction for a well done job and encouraged them to continue working on educational innovation, fostering continuous improvement.

For all of 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 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 lecturer training [8]; (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 [25]; (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 [9].

Therefore, 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.

The qualitative analysis revealed that lecturers 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.

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 lecturers and thus, it would have brought more soundness to the analytical generalizations proposed.

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