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Podcasting: A new technological tool to facilitate good practice in higher education

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ABSTRACT

The literature has frequently highlighted the usefulness of podcasting in higher education; however, there is an important gap between the theory on good practice in higher education and empirical studies about podcasting. With this in mind, we carried out an empirical study on an undergraduate degree course in Information Systems Management. The study consisted of the creation and broadcast of 13 podcasts, distributed over four months in which ninety distance students took part. The analysis follows the suggestions proposed in previous literature about the evaluation of technologies in a university learning environment. The findings, discussed within the framework of principles for good practice in higher education, suggest some interesting issues in distance courses, such as: (1) podcasting is a powerful tool as a complement to the traditional resources on a course, but not a substitute for them; (2) the characteristics of podcasting increase the impression of permanent contact between students and teachers, increasing students' motivation; (3) the use of podcasting allows for a diverse range of student skills and learning methods. Other secondary findings are discussed and some suggestions for future research are proposed at the end of this paper.

1. Introduction

Many stakeholders in society (e.g. state legislators, university managers, the communication media, students and parents) dedicate their attention to continual improvements in undergraduate higher education. Previous research has proposed a broad range of approaches in order to make such improvements, (e.g. Braxton, Olsen, & Simmons, 1998; Terenzini, 1999), including approaches such as refinements and adjustments to the undergraduate curriculum (Gaff, 1991), organizational changes and improvements to increase teaching performance (Weimer, 1991), and changes in the student learning process (Chickering & Gamson, 1987). Among the strategies used to improve student learning processes, the seven principles for good practice in undergraduate education (Chickering & Gamson, 1987) and the "teacher's dozen" (Angelo, 1993) are essential references. The authors suggest a set of principles addressing the teacher's "how?", not the subject–matter "what?", as good practice in undergraduate education. Recently, the emergence of internet-based technological tools in the student learning process has enhanced and promoted this good practice at various levels (Ritter & Lemke, 2000).

In 2005, a new technological tool was announced by the editors of the New Oxford American Dictionary as the word of the year: podcasting (Skira, 2006). Although the current literature has identified a long list of possible fields where podcasting can be applied, we focus on the use of podcasting in education, where it has received a spectacular increase in attention over the last few years, as shown by the recent creation of iTunesU (by Apple Inc.) and the Higher Education Podcast Repository, as well as various papers that have emphasized the usefulness of podcasting in libraries (Kamel Boulos, Maramba, & Wheeler, 2006; Kreider Eash, 2006), undergraduate education (Evans, 2008; Lim, 2006; Maag, 2006), and organizational training (Donnelly & Berge, 2006; Hargis & Wilson, 2005). However, there is an important gap between the theory related to good practices for undergraduate education and empirical studies about podcasting. Furthermore, there are few published papers that have studied the use of podcasting to generate learning and to empower students and encourage active learning in higher education (Lee, McLoughlin, & Chan, 2008).

In this paper, we analyze the use of podcasting to enhance distance students' personal study. In order to achieve this goal we developed an empirical study on a higher education course, which consisted of the creation and broadcast of thirteen podcasts, distributed over 4 months and in which ninety students took part. We carried out two questionnaires – at the beginning and at the end of the course-, various interviews with students during the semester, and a permanent forum of discussion where the students could propose improvements in the podcasts. The analysis follows the suggestions proposed by Breen, Lindsay, Jenkins, and Smith (2001) in their research about the eval-

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uation of technologies in a university learning environment. Subsequently these results, which are discussed within the framework of the principles for good practice in higher education proposed by Chickering and Gamson, (1987) and Angelo (1993), suggest some interesting issues about podcasting on distance courses.

Firstly, the results of the empirical study suggest that podcasting is a powerful tool as a complement to the traditional resources of a course, but not as a substitute for them. According to students, the podcasts as well as the rest of the teaching materials had combined to help them improve their learning. In a similar way, Copley (2007) proposed that podcast recordings of lectures are not effective in themselves for facilitating distance learning. An interesting finding of the research makes reference to the feeling of proximity to teachers due to the fact that podcasting increases the feeling of a permanent contact between students and teachers. According to students, this occurred due to a variety of different reasons: the voice was more pleasant and closer than printed documents; part of the content and the format of the podcasts was not pre-establish material and could change according to the comments and suggestions that students proposed. The third major finding suggests that the use of podcasting allows for a diverse range of student skills and learning methods from two perspectives: the kind of teaching material and the possibility of studying anytime-anywhere. Although a small group of students preferred to study with just one type of documentation, the rest of the students believed that a combination of different communication/learning media (voice, text, pictures, etc.) could improve the results of their learning processes, which is in agreement with research on the effectiveness of communication (Robert & Dennis, 2005). With regard to the second perspective, many students commented that the characteristics of podcasting (anytime-anywhere) allowed them to devote more time to their studies, making better use of their time. These findings have a common consequence: an increase in student motivation, which constitutes one of the main principles of good practice in higher education. Subsequently, the paper discusses secondary findings (e.g. the success of podcasting is not just due to content, but also to some complementary aspects, such as the tone of voice and background music), and draws some conclusions and suggests future research lines regarding podcasting in higher education.

2. Good practice in undergraduate education

As we have already mentioned, Chickering and Gamson (1987, 1991) proposed a set of principles for good practice to improve students' learning processes in undergraduate education, which have been widely accepted in the academic environment. According to the authors good practice in undergraduate education: (1) encourages contact between students and faculty, (2) develops reciprocity and cooperation among students, (3) encourages active learning, (4) gives prompt feedback, (5) emphasizes time on task, (6) communicates high expectations, and (7) respects diverse talents and ways of learning. These principles were defined without reference to technology and besides, few studies have focused on how technology facilitates the application of these principles. One of them is Ritter and Lemkés research (2000), where the authors analyzed the use technological tools, and more specifically, Internet tools, to promote good practice in undergraduate education, according to the some of the principles developed by Chickering and Gamson (1987): such as student-faculty contact, active learning, prompt feedback and a more efficient use of the time.

Subsequently, drawing on Chickering and Gamson (1987), Angelo (1993) suggested a new set of principles for improving learning in higher education, namely: (1) active learning is more effective than passive learning, (2) learning requires focused attention, and awareness of the importance of what is to be learned, (3) learning is more effective and efficient when learners have explicit, reasonable, positive goals, and when their goals fit well with the teacher's goals, (4) to be remembered, new information must be meaningfully connected to prior knowledge, and it must first be remembered in order to be learned, (5) unlearning what is already known is often more difficult than learning new information, (6) information organized in personally meaningful ways is more likely to be retained, learned, and used, (7) learners need feedback on their learning, early and often, to learn well, (8) the ways in which learners are assessed and evaluated powerfully affect the ways they study and learn, (9) mastering a skill or body of knowledge takes great amounts of time and effort, (10) learning to transfer, to apply previous knowledge and skills to new contexts, requires a great deal of practice, (11) high expectations encourage high achievement, (12) to be most effective, teachers need to balance levels of intellectual challenge and instructional support, (13) motivation to learn is alterable, and (14) interaction between teachers and learners is one of the most powerful factors in promoting learning. According to Angelo, there is a gap between the theory on learning and teaching practice. This gap is more obvious when conducting research on technologies in a university environment (Breen et al., 2001).

2.1. Podcasting

Meng (2005, p. 1) defines podcasting as "the process of capturing an audio event, song, speech, or mix of sounds and then posting that digital sound object to a web site or blog in a data structure called an RSS 2.0 envelope (or feed). Using specialized news readers, users can subscribe to a web page containing RSS 2.0 tagged audio files on designated web pages and automatically download these files directly into an audio management program on their personal computer. When a user synchronizes their portable audio device with their personal computer, the podcasts are automatically transferred to that device to be listened to at the time and location most convenient for the user". However, nowadays there are new kinds of podcasts: enhanced podcasts and video podcasts, or vodcasting. The enhanced podcast is similar to traditional podcasts; however, this kind of podcast contains multimedia information, such as slides, pictures, images, photographs, short videos, and chapters that help users to increase their perception about the topic. Vodcasting is one of the latest innovations in the podcasting world where it exchanges the audio of traditional podcasts for video. For this reason, it is more usual to play this kind of podcasts on a laptop or on a PDA, with bigger displays than MP3 players.

The increase in the number of portable music players and podcasting has been very significant during the last few years due to five main factors (Campbell, 2005): Internet activity is pervasive; the growth of broadband has been very fast; the widespread availability of the multimedia personal computer; the distinction between streaming and downloading of media content has begun to blur; the rapid adoption of portable MP3 playback devices. Podcasting offers some interesting advantages, compared to others technological tools (Donnelly & Berge, 2006). The most important one is the capability for it to be used anytime-anywhere. In a society where time is the most essential resource, this characteristic has allowed podcasting to reach an exceptional position. The creation of small and portable MP3 and Video players has allowed users to decide where and when they want to listen to podcasts, according to their needs. Moreover, podcasting provides another

interesting advantage: users can do other tasks (e.g. cooking, taking notes, driving, running, strolling, travel to work) while they are listening to them.

The results of this increase of podcasting are observed in many universities where podcasting has been implemented at institutional level (Lee et al., 2008). From 2002, Georgia College and State University have been introducing podcasting in some courses to include audio material. In 2004, Duke University distributed MP3 players to its 1650 first-year students, preloaded with orientation information. Moreover, the servers of Duke University offer administrative and academic materials in digital format via iTunesU. Later, in 2005 Drexel distributed MP3 players with photo capabilities to its students in their first academic year. Other universities that have implemented podcasting at an institutional level are University of California, Berkeley, Princeton University and Stanford University.

Nowadays, existing literature has identified three academic uses of podcasting (Donnelly & Berge, 2006), which are to disseminate course content, to capture live classroom material, and to enhance studying. Moreover, MP3 players also offer other academic uses, such as recording field notes and supporting file transfer and storage. Although the initial research conducted on the use of podcasting had mainly focused on three educational areas: nursing education (e.g. Skira, 2006), medical education (e.g. Savel, Goldstein, Perencevich, & Angood, 2007), and geography education (e.g. Lim, 2006); nowadays we find much recent research on podcasting in the majority of educational sectors, such as engineering and management education (e.g. Berger, 2007; Kao, 2008; Nataatmadja & Dyson, 2008; Palmer & Hall, 2008). However, there have been very few published examples of podcasting in higher education sector to empower students, and even fewer based around learner-generated podcasts (Lee et al., 2008). Much of this research is limited to the process of creation of podcasting and to some general results, without considering whether the use of podcasting fits the rest of materials on the course or the principles for good practice in higher education. Some aspects studied by this small number of publications are the motivation of students and their attitudes for using podcasting (Kao, 2008; Nataatmadja & Dyson, 2008; Shim, Shropshire, Park, Harris, & Campbell, 2007), the improvement in the efficiency of lectures after listening to podcasts (Copley, 2007), the difference between podcasts and traditional teaching materials in the learning processes (Copley, 2007), and the production of podcasts by students to generate knowledge (Lee et al., 2008). However, the main usefulness of podcasting in higher education is still its ability to disseminate course content, as illustrated in iTunesU and Higher Education Podcast Repository (http://ed-cast.org/), which are the most important repositories of podcasts in education. The use of podcasting with other goals has not been completely developed, and there are still few empirical studies focusing on their impact upon the learning process of students.

3. Methodology

The empirical study consists of a longitudinal study on a course of Information Systems Management that was coordinated by the authors of this article. We developed thirteen podcasts during the semester and evaluated the feelings, the perceptions, the reactions, and the suggestions of students and other teachers in relation to this tool through a permanent forum of discussion, emails, interviews and questionnaires, based on work by Breen et al. (2001). Established from the information obtained from all these sources, we analyzed the use of podcasting in relation to the principles for good practice in higher education.

3.1. Context

Information Systems Management was a compulsory subject worth 4.5 credits (comparable to 45 class hours) taken during the first year of the degree in Industrial Engineering, and taught on a distance basis during the fall semester. This course was offered by the Universitat Politècnica de Catalunya at the School of Engineering ETSEIAT.

Although the course had some attended classes (only 10 h), the main part of the teaching and learning process was carried out through the course intranet, which was made up of three parts: documentation, communication, and assessment. The first section allowed students to download the guide and the calendar of the course, the textbook, some summaries, FAQ, open-source software, slides, some exams of previous semesters, and a set of exercises. The communication section was divided into three tools: the teacher's bulletin board, the course forum and personal communication. On the teacher's bulletin board, teachers uploaded important information about the course, which the students could access freely. The course forum offered the students the opportunity to ask or suggest any questions or comments related to the course. In this section, both students and teachers could answer the input from students. The goal was to create a virtual space where students and teachers could discuss anything about the course. Finally, students could ask questions or make comments related to personal matters in the personal communication area. The third part of the intranet was the assessment. The intranet allowed teachers to carry out some on-line exercises and to upload the students' marks for additional off-line assessments.

Before this research, the teachers had carried out various questionnaires to evaluate the subject and students' learning processes, looking for possible problems at the end of each course. Over the last two years, the teachers of the subject had identified two main problems. First, some students had shown an increasing concern regarding the contact between students and teachers. Both the reduced number of classes and the great quantity of on-line and press documentation had created a certain "distance" between students, teachers and the university. Due to this fact, some students interpreted this as being abandoned somewhat by the teachers and the university. The second problem was related to the huge quantity of documentation. Time is a very important resource for students, who also have to dedicate it to work responsibilities and their family activities. These students had highlighted the difficulty in reading all the documentation, learning it, and assimilating it, mostly due to two reasons: on the one hand, they lacked the necessary time to structure all the knowledge of the course and on the other hand, they were not used to studying only using printed documents and without classes.

3.2. Podcasts of the course

To deal with these problems, the coordinators decided to introduce a new technological tool in order to enhance the rest of the course teaching materials and contact between students and teachers. In 2002, Laurillard analyzed 26 teaching media and their mapping using an evaluation template. This involved the examination of activities on the conversational framework in terms of which media could support which teaching/learning activities. This framework was used in different stages in the interaction between the lecturer (or the technology

tool) and the learner using 12 criteria from which any learning dialogue could be assessed. From this framework, Laurillard (2002) proposed five principal media forms according to the type of learning experiences they supported: narrative, interactive, communicative, adaptive and productive. According to Kibby (1994), Laurillard's conversational framework is one of the most potent tools for examining any teaching/learning situation for its effectiveness, and it use is crucial in selecting the media appropriate for any given teaching/learning activity. Conole and Fill (2005) also observed that each of the media forms could be combined to produce better results; for instance, Interactive Web resources are enhanced by the inclusion of a communicative environment.

From this framework, the coordinators decided to introduce podcasting on the course. The podcasts were created by Garageband software (by Apple Inc.) and uploaded to iTunesStore with the name "*ETSEIAT SI 2007*" and free of charge. As not all students had MP3 players with image playing capabilities, the teachers decided to create two podcasts in parallel. The first one consisted of a traditional podcast, and the second one contained enhanced podcasts with power point slides. A preliminary questionnaire revealed that a large amount of students (51.1%) did not know what podcasting was. Therefore, the teachers created a pdf file providing basic information related to podcasting (e.g. what podcasting is, what kinds of podcasts there are, the original structure of the podcasts of the course, how to use the podcasts of the course as a learning tool, how to subscribe to these podcasts, etc.) and encouraging students to propose new ways to improve the podcasts.

Before the beginning of the course, the teachers proposed the creation of nine podcasts, one for each chapter of the textbook. However, in the end thirteen podcasts were produced which were divided into three groups: (1) the first nine original podcasts related to the chapters of the textbook, (2) two special podcasts to be distributed before the mid-semester and the final assessment, and (3) two general podcasts where the teachers reviewed some important topics and exercises during the course. The podcasts were modified and improved according to the students' comments. Some of the suggestions were related to the features of the podcasts and others to their content. As regards to the features of the podcast, the changes covered various aspects: the length was increased from five to ten minutes, the original sounds were changed to softer ones, the type and the number of pictures were modified, other broadcasters were introduced in the podcasts, the rhythm and the tone of the broadcaster were adapted to the students' requests, and background music was introduced.

The scripts for the nine original podcasts were made up of three parts: the first one introduced the global framework of the chapter, specifying its goals and objectives. In the second section, the broadcaster explained the key topics of the chapter and offered some suggestions about how to read and work on the exercises in the chapter. Finally, in the last section, students could listen to the most interesting questions and answers that teachers had received since the previous podcast had been uploaded. Teachers proposed that students listen to these podcasts before beginning to study every chapter in order to get a global perspective of the chapter and to start to familiarize themselves with the vocabulary used. The two podcasts to be distributed before the mid-semester and final assessment had a different script. The first part of these podcasts introduced the rules that students had to follow during the assessments. The second section focused on explaining the typical mistakes that students had made in these assessments in previous semesters and on reviewing the most important topics of the course. Finally, there were two general podcasts that were published during the course following students' requests. In these two podcasts, the broadcaster commented some students' questions and explained aspects that many students had not understood.

3.3. Measurements

The information needed to carry out a study of this nature was not readily available from secondary sources. We therefore collected information from primary sources such as interviews with ten students and two teachers during the course, a permanent forum on the intranet of the course, emails, and two global questionnaires provided to students. The interviews were personal and private, following a non-structured script. The interviewees were asked to narrate how they perceived the usefulness of podcasting in their learning process and in relation to the presentation and the contents included in the podcasts. With this aim in mind we also asked for their opinion about the relation between the podcasts and the rest of materials on the course, such as the textbook, slides, the proposed exercises and the intranet forum. We received many comments and suggestions regarding the improvement of the podcasts through the forum and by email, which enabled us to introduce changes in subsequent course podcasts.

Although both the interviews and the course forum were very useful in order to improve the course podcasts, the two questionnaires sent to students at the beginning and at the end of the course were the main tools used to evaluate the usefulness of podcasting in the learning process. Evaluation is an activity that requires judgements to be made about what counts as added value to a learning process (Scanlon & Issroff, 2005).

Table 1
Podcasting features and their definitions.

Features	Definitions
Specificity	Belief or judgement that podcasting provides results of direct relevance to the learning process accompanied by little irrelevant information
Efficiency	Belief or judgement that the podcast and its information can be accessed without wasting time or effort
Consolidation convenience	Belief or judgement that the podcasts can be accessed via one place or device
Accessibility convenience	Belief or judgement that the podcasts can be used at any chosen time
Interest	Belief or judgement that intellectual stimulation results from using the podcasts
Serendipity	Belief or judgement that accidental discovery occurs when the podcasts are used
Interactivity	Belief or judgement that the podcasts respond to characteristics of a user or query
Currency	Belief or judgement that the podcasts produce up-to-date results
Information overload	Belief or judgement that learning is impaired by the quantity of irrelevant material
Information quality	Belief or judgement that the podcasts produce results that are valid
Failure	Belief or judgement that learning is impaired by malfunction of the podcasts
Preparedness	Belief or judgement that use of the podcasts is impaired by absent or incomplete learner skills
Competition for access	Belief or judgement that the use of the podcasts disadvantages other learners
Real time	Belief or judgement that the information about a learning domain captured by the podcasts is complete
Appeal	Belief or judgement that the use of the podcasts is intrinsically pleasurable

In that sense, the work of Breen et al. (2001) suggested an interesting proposal for evaluating technological tools in university learning environments, through a feature list of sixteen attributes of technology-based teaching. Drawing on Breen et al. (2001), we developed two questionnaires to evaluate the usefulness of podcasting in higher education. Table 1 shows the features and their definitions, which were used to evaluate this research.

4. Results and discussion

At the beginning of the course, ninety students agreed to participate in this research and evaluate the usefulness of podcasting in education. However, only sixty students took part in the whole evaluation process during the course. Twenty students who had used the podcasts on the course apologized for not answering the final questionnaire or participating in the interviews due to various reasons. The remaining ten students decided to give up using podcasts during the course. We asked them to participate in an interview to identify the reasons for ceasing their participation in this research. After analyzing their answers, we identified two reasons. On one hand, some of them were overloaded (work, studies, family, etc.) and did not have enough time to use all the course materials. On the other hand, some students mentioned that they did not like using oral material, preferring to use only printed material.

As we have already mentioned, we carried out two questionnaires to evaluate the use of the podcasts during the course, based on the features proposed by Breen et al. (2001). Table 2 shows the results of both questionnaires, specifying their average and standard deviation between parentheses. Students filled out the first questionnaire after listening to the first podcast. The numbers show that the expectations of students regarding each feature of podcasting were very high at the beginning of the course. These results were expected due to the fact that it was the first contact with podcasting for many students (51.1%) and, more especially, with educational podcasting (93.34%). The second questionnaire was completed after the penultimate podcast on the course. Students then knew how to use the course podcasts perfectly, and were aware of their usefulness to achieve the goals of the course. The numbers in Table 2 reveal how the students' perceptions of some features of podcasting were changing over time.

The first feature that we analyzed was 'specificity'. We observed an important descent in the results for this feature when comparing the first and the last questionnaire. We investigated the reasons for this phenomenon through student interviews and a content analysis of the open questions that we carried out in the last questionnaire. We discovered that many students had hoped that podcasts could replace traditional classes and the individual textbook study. However, the main goal of podcasting was just to simplify the learning process by offering a structured and general vision of the chapters of the textbook; therefore, the podcasts could not generate learning independently, but it was necessary to combine them with the rest of the course materials. For this reason, the students' perception about its 'specificity' was not as high as at the beginning of the course. We identified the same reasons for the results of the 'currency' feature. In conclusion, these findings suggest that the results of the use of podcasting do not appear as an independent product of the course, but as a part of the whole learning process.

As regards to the 'efficiency' of podcasting, we obtained the opposite effect. In this case the students' assessment of this feature increased due to two reasons, according to the information obtained in the interviews: (1) at the beginning of the course, many students did not know how podcasting worked; and (2) they had some doubts about the time needed to obtain results from podcasts (e.g. did they have to take notes from the podcasts? or was listening to the podcasts enough?). After the first podcast, students noticed that downloading podcasts was automatic, and they could use them anytime-anywhere, without wasting time or effort. Moreover, the information contained on the podcasts was easy to assimilate because their goal was only to introduce students to the content of the course. These reasons helped us to understand the results of the 'information overload' and 'competition access' features. At the beginning of the course, students considered the podcasts to be a new way to provide more information about the topics of the course; however, they discovered that the podcasts did not add more information, but rather allowed them to manage the rest of the course materials in a more efficient manner. Consequently, the course podcasts allowed for a decrease in the feeling of information overload and an increase in the importance of the rest of the course materials.

A very important feature of podcasting was its 'accessibility'. Many students suggested that one of the most interesting characteristics of podcasting was that they could listen at any time and in the most convenient location. The majority of the students were undertaking a distance course because their jobs did not enable them to attend traditional courses with weekly classes. In this context, many students commented that they did not have a permanent place to study, so they appreciated all kinds of materials that could be used in different

Table 2
Results of the questionnaires about the use of podcasting at the beginning and the end of the course.

Features	First questionnaire ($N = 90$)	Last questionnaire ($N = 60$)
Specificity	4.03 (0.74)	3.32 (0.92)
Efficiency	4.07 (0.96)	4.27 (0.85)
Consolidation convenience	4.09 (0.96)	3.32 (1.32)
Accessibility convenience	4.27 (0.79)	4.00 (0.95)
Interest	3.98 (0.84)	3.40 (0.99)
Serendipity	4.05 (0.82)	3.86 (1.03)
Interactivity	3.94 (0.81)	3.51 (0.92)
Currency	3.70 (0.95)	3.02 (0.80)
Information overload	2.43 (0.95)	1.94 (1.14)
Information quality	3.74 (1.03)	4.01 (0.94)
Failure	1.71 (0.91)	1.37 (0.55)
Preparedness	3.21 (0.96)	2.40 (0.92)
Competition for access	2.18 (0.98)	1.49 (0.76)
Real time	3.21 (0.94)	3.49 (0.78)
Appeal	3.80 (0.88)	3.66 (0.85)

places, for example while using public transport. For instance, 16% of students listened to the podcasts in their workplaces, 16% in libraries, 23.3% on their journeys home or to the university, 36.6% of students at home, and the rest in other non-specific places.

The results of the 'serendipity' feature surprised us because we did not expect the podcasts to get such a high value. Many students explained that they used the podcasts in two different ways: (1) before beginning to study the chapters of the textbook in order to get a global idea about their main topics and the structure of the chapter, and (2) after studying the chapter of the textbook. According to the interviews and the questionnaires, the students commented that the use of the podcasts after studying a chapter of the textbook allowed them to check if they had understood the main topics of the chapter. In other words, the podcasts helped students to auto-assess their learning and to improve their assimilation of the content of the chapter.

The 'interest' and 'interactivity' features also obtained interesting values, but to a lesser degree than we had imagined. Analyzing the students' comments and their suggestions received through the forum and interviews, we found that the students' preferences regarding the podcasts were very different. Some students had asked us for longer podcasts, while others had demanded shorter podcasts. Some students had preferred a faster delivery, while other group of students had required a slower one. Finally, some students had asked us for podcasts for different goals. We concluded that the results of these features were on account of this diverse range of students' preferences.

The results in Table 2 show that the 'information quality' was valid in relation to the main goal of the podcasts: to offer a global vision of the chapters of the textbook. We had some problems with that point because some students had not distinguished the goal of the podcasts from the goals of the course. Nevertheless, we solved this misunderstanding by explaining this difference before completing the last questionnaire. As regards to the 'real time' feature, the results matched our expectations for the same reason explained in the previous feature: the goal of the podcasts was not to exhaustively capture the whole information of the course, but to establish a global vision of it.

The feature that received the most extreme assessment was 'failure'. Only a very small group of students believed that their learning was impaired by the malfunction of the podcasts. This result was consistent with the results for the final question of the second questionnaire that asked students to assess the course podcasts from a global perspective. The average mark for podcasting was 3.95, with a standard deviation of 0.79. Finally, we observed that the use of the podcasts was intrinsically pleasurable. Nevertheless, the result is lower than we expected, although it is explained by some suggestions that we had received during the course regarding delivery, sounds and music. We had to change some aspects of the podcasts to make them more pleasant, such as: including soft background music, or eliminating some sounds that were used to divide the sections of the podcasts. After that, the podcasts registered a higher level of appeal according to the students.

In order to complete the analysis on the use of podcasting, we analyzed a great quantity of information that we had gathered during the course from different sources: interviews with students, the course forum, emails and open questions from the second questionnaire. The collected data were reduced and processed following the strategies proposed by Miles and Huberman (1994). The reduction of data centred on identifying the positive (how podcasting has helped students from their point of view) and negative aspects (which characteristics of podcasting did students believe we should have modified). After reducing and analyzing this information, we identified five ways in which the podcasts had helped students in their learning process: (1) giving an overall or global vision of the chapters, reducing the time required to study and assimilate the contents, and allowing them to efficiently manage their time; (2) offering a new tool to review concepts that they had learnt during the week and during the course before the exams; (3) increasing the feeling of proximity between students and teachers, (4) enhancing students' motivation; and (5) allowing students to learn in different ways.

Angelo (1993) proposed that teachers should focus their attention on being aware of the basic structure of what is to be learned, and prioritize course content elements. The results gathered show that podcasts succeeded in applying this principle to the course. According to the students, the most important advantage of the podcasts during the course was that they allowed them to identify the most important aspects and topics on the course, as well as to structure the content of the chapters in the textbook. For example, the last podcasts distributed before the mid-term and the final exams helped students to prepare for these assessments by identifying common mistakes. The goal of these two podcasts was also consistent with Angelo's eighth principle. Along the same line, some students highlighted the fact that the podcasts allowed them to review the contents of the course, as a reminder or a way to increase their level of assimilation of the contents. Some students even said that they had re-listened to the podcasts more than ten times in order to remember the most important concepts of the course, while they were carrying out other activities (see the results of the feature 'accessibility convenience' in Table 2).

The results of the study suggest that there is a relationship between the main goal of the podcasts (to offer a global vision of the chapters) and the students' efficient use of time, which constitutes one of the principles of good practices in higher education (Angelo, 1993; Chickering & Gamson, 1987). In addition, Krygier, Reeves, DiBiase, and Cupp (1997) observed that students consider that on-line tools and courseware can help them to learn more efficiently when the course has many and diverse contents and topics to study. In these situations, complementary on-line materials, such as the podcasts, give students the feeling that the concepts of the course are easier to assimilate. More specifically, Ritter and Lemke (2000) suggested that Internet material helps students to work more efficiently with their time compared to traditional lecture materials. In this research, the majority of the students were enrolled on a distance course due to the fact that time was their most critical resource, because of intense work and family responsibilities. This point of view is consistent with the results of the 'efficiency', 'accessibility convenience' and 'information overload' features, illustrated in Table 2.

Charman and Elmes (1998) found that multimedia and technological course materials could help to enhance satisfaction, stimulation and student-interest. According to the students, the podcasts increased their levels of motivation in two ways. On one hand, students noticed that the podcasts were not fixed and pre-establish material, as teachers changed the characteristics and the contents of the podcasts according to the comments and suggestions that students made during the course. Moreover, the teacher's voice gave them an increased feeling of proximity than other materials. These facts enhanced the feeling of a permanent contact between students and teachers, as well as of teacher's concern regarding students' needs. Therefore, we can consider that the course podcasts took up part of the role of face-to-face lectures, increasing the feeling of contact between students and teachers. In other words, podcasting allowed for the movement of some characteristics or roles of traditional lectures to distance courses, which had previously been forgotten or disregarded on this kind of course. As we have mentioned before, one of the main problems that we had detected was that some students had interpreted that there had been a slight abandonment by the teachers and the university on previous courses (a common problem in many distance courses). According to these results, the use of podcasting allowed us to partially resolve this important problem, which was consistent with the principle about contact between students and teachers and partially consistent with the principle of feedback (Angelo, 1993; Chickering & Gamson, 1987). This effect is highlighted by the results of the 'information quality' and 'appeal' features, shown in Table 2. On the other

hand, a secondary goal of the podcasts, from the teachers' point of view, was to create high expectations in the students (Chickering & Gamson, 1987). This fact was underlined in the interviews and in the forum of the course.

Chickering and Gamson (1987) and Terenzini (1999) suggested that teachers should respect and consider students' diverse talents and ways of learning. Nowadays, the existing literature has identified different kinds of student according to their learning processes (Conner et al., 1996): (1) visual learners, who assimilate knowledge more efficiently through vision; (2) auditory learners, who prefer to listen to the course in order to learn; (3) kinaesthetic learners, whose skills allow them to learn better by sensing movements and position and finally (4) tactile learners, who learn better through touch and the manipulation of objects. In previous courses, all teaching course materials were made up of visual materials, such as the textbook, slides of the chapters, the pack of exercises in pdf format, the forum of the course, etc. However, many students used to learn on traditional courses where the main contents of the course were communicated through the voice of the teachers in class. With the introduction of podcasts, students had different kinds of teaching material at their disposal for the first time. According to students' comments, the combination of different kinds of teaching materials (auditory, visual and kinaesthetic materials) allowed them to improve and enhance their learning process. This fact partially corroborated the results obtained regarding the 'accessibility convenience' and 'serendipity' features, which are illustrated in Table 2.

5. Conclusions

This paper has analyzed the use of podcasting to enhance the learning processes of distance students in higher education, evaluating a broad range of podcasting characteristics and determining how podcasting could improve students' personal study according to the principles of good practice in higher education. Drawing on the knowledge gleaned from the review of existing literature, we decided to follow the suggestions proposed by Breen et al. (2001) in order to analyse the characteristics of podcasting in university environments and because of the great amount of proposed features and the possibility of comparing the results of this paper with future studies focussed on other technological tools. After that, the results and discussion regarding the 'efficiency', 'accessibility', 'serendipity', 'information overload', 'information quality', 'failure', 'competition for access' and 'appeal' features suggest that podcasting is an interesting tool to be used in distance courses in higher education.

From these results, we analyzed if a technological tool, such as podcasting, could promote good practice in higher education in accordance with Angelo (1993) and Chickering and Gamson's (1991) findings. To achieve this goal, we gathered information from different sources: interviews, emails, the course forum, and two questionnaires. The findings revealed that podcasting was fully consistent with three principles (time on task, high expectations, and respecting diverse ways of learning) and partially consistent with two other principles (contact between students and teachers, and feedback) proposed by Chickering and Gamson (1991). Drawing on Angelo (1993)'s work, the findings suggested that podcasting completely satisfied four of these principles (the focus on the important aspects, explicit goals, high expectations, and motivation) and partially three of them (feedback, evaluation or assessment, and interaction between students and teachers). These results suggest that the use of podcasting allows for the promotion of good practice in distance courses in higher education. However, these results must be considered with caution for several reasons. We have used podcasting to enhance students' personal study; however, Donnelly and Berge (2006) identified other academic uses for podcasting. The results of this research could have varied significantly if podcasting had been used in a different way. For example, podcasts that capture live classroom materials are not aimed at emphasizing time on task, while the podcasts in this research highlighted it. An interesting avenue for future research is to examine the differences among the academic uses for podcasting, and how these different uses can be combined on the same course.

In conclusion, these results suggest some interesting issues about distance courses: podcasting is a powerful tool as complement to traditional course resources, but not regardless of them; the features of podcasting increase the feeling of permanent contact between students and teachers, increasing students' motivation; and the use of podcasting allows us to respect diverse talents and students' ways of learning. From these findings, motivation has been the aspect most highlighted by students on the course. They identified several reasons why podcasting had motivated them: it was the first time that they used this technological tool; it provided a different approach to study the contents of the course; it reflected a concern of teachers to students, it increased the feeling of proximity between students to teachers, etc. New questions arise from these comments: How would the use of podcasting motivate students if it were common practice on the rest of distance courses? Could podcasting turn into a commodity and thus lose its capability to enhance motivation? As regards to motivation, there is another characteristic of this research that is important to highlight: the sample in this study was composed of students on a distance course. This kind of students is used to expressing their concern about how the time they dedicate to their studies can affect their job and family responsibilities. Hence, we consider that distance courses could represent an important factor affecting perception about the use of podcasting in higher education. In-depth research on these differences would allow us to improve our knowledge about how podcasting affects the efficiency of students' learning process between students on traditional courses and distance courses.

Based on the research findings and the future research lines suggested, we encourage teachers to introduce different uses of podcasting and analyze them using the methodology proposed in this paper, with the aim of creating a knowledge base regarding the use of podcasting in higher education. We believe that different uses of podcasting can offer different advantages to students' learning processes.

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