

0161 A taxonomy of podcasts and its application to higher education

Introduction

Podcasts are being well accepted by the general public and by higher education institutions. Podcasting combines the advantages of radio and cassettes, such as flexibility, learner control and personalization afforded by recorded audio (McLoughlin & Lee, 2007). As Campbell (2005, p. 34) points out, what's new about podcasting is the "ease of publication, ease of subscription, and ease of use across multiple environments".

Most podcasts are audio files and listening is instinctive while reading has to be taught. Durbridge (1984) emphasizes the advantages of audio over printed media: comprehension is enhanced by the spoken word, adding clarity and meaning, and improving cognition. Podcasts offer new opportunities for creativity, independent learning, and collaboration (Clothey & Schmidt, 2008). Among other advantages, they focus on issues such as illiteracy and dyslexia, free eyes and hands for other purposes (Clark & Walsh, 2006 in Rosell-Aguiar, 2007). However, they have implications for the different types of learners: visual learners (as opposed to aural) may not find suitable materials or be able to engage with them. Podcasting started with audio but three varieties can be considered, audio-only podcast, enhanced podcast, and video podcast also known as vidcast or vodcast. Enhanced podcasts combine still images with audio files (Liu & McCombs, 2008; Salmon et al., 2008).

There are three perspectives in educational podcasting (Harris & Park, 2008): (i) the perspective of lecturers—they facilitate to emphasize the information which lecturers feel to be critical for their students. It enables direct communication and interaction with students which goes beyond temporal and spatial limitations of conventional face-to-face education. (ii) The perspective of students—it enables repeated learning and offers an opportunity for the effective use of time. (iii) The University's perspective—podcasting is a communication enabler, reaching out to a wider community.

Podcasts may be used to deliver course materials or provide additional resources for students, providing the potential to allow lecturers to focus on interaction. Functionalities such as pause, forward or skip mean that the user is in control of the pace. Students may be attracted to the new format. However, as Dixon & Greeson (2006 in McLoughlin & Lee, 2007) reported, more than 80% of podcasts were never downloaded to a portable player or another device, being simply consumed on the PC. Podcasts have been used in higher education with different purposes. In many cases, lectures are being recorded and podcasted, so that students can listen to them later at their convenience; for example to increase their understanding of material covered in specific lectures (Bongey et al., 2008). However, recording a podcast in the class is not a good option because there is background noise and the podcast is usually long and boring (Carvalho et al., 2008). Podcasting also allows faculty members to offer advanced extra content to highly motivated learners or for remediation to slower learners, although representing an increase in teacher workload for those who create the content (Rosell-Aguiar, 2007), which is often not institutionally recognized (Carvalho et al, 2009).

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Abstract

In this paper we address the uses of podcasts in higher education and we propose a taxonomy for podcasts. We describe results obtained within a study that is being conducted at the University of Minho, in Portugal, focusing on the use of podcasts and their implications towards learning in higher education. The project involves 6 lecturers from different scientific domains – Education, Humanities, Social Sciences, Engineering and Biology. These lecturers created 84 podcasts in order to support their undergraduate and master courses during the 1st and 2nd semesters of 2007/ 2008 and the 1st semester of 2008/ 2009. A total of 479 students – 372 undergraduate and 107 master students – were enrolled in 20 courses. Some students were not only podcasts listeners but they also had the challenge and the opportunity to create their own podcasts (34 episodes). Podcasts were classified in different types (Informative, Feedback, Guidelines and Authentic materials), styles (formal or informal), length (short, moderate or long), purpose and medium (audio or video), according to a taxonomy proposed by the authors. The majority of podcasts was Informative (76), followed by podcasts with Feedback (30), Guidelines (9) and Authentic materials (3). Most podcasts were short (102), mainly in informal style and only 21 were vodcasts.

Students' reactions about podcasts implementation in higher education revealed their acceptance of this new tool and their receptiveness to podcasting in other courses. The majority of students found podcasts a positive resource in learning, although they did not explore one of the main advantages of this technology – portability. Lecturers also found podcasting a useful resource for learning and recognized its great potential as a pedagogical tool but stressed that it is too time consuming.

Most podcasts are created by lecturers, but some lecturers invite their students to create their own (Frydenberg, 2006, Lee et al., 2007, Lee & Tynan, 2008, Carvalho & Aguiar, 2009). At the beginning it was limited to one-way communication from teachers to students, but recently podcasts have been used to provide a two-way communication between both interlocutors (Harris & Park, 2008). McLoughlin & Lee (2007) also argue that podcasts are moving away from didactic methods of teaching and transmission of content to enable learner agency in the learning process. Lee & Tynan (2008) believe that the true potential of podcasting technology lays in its knowledge creation value, and its use as a vehicle for disseminating learner-generated content.

Clothey & Schmitt (2008) synthesized three categories of authorship: faculty can direct their students to primary sources found on the Internet, they can create their own presentations for students or ask students to create their own materials to share with their classmates. Rosell-Aguiar (2007) distinguishes two categories of authorship in language learning: authentic content provided by native speakers of the target language and to be used by native speakers, such as news feeds or radio programming, and teaching materials specifically designed for language learning.

A taxonomy of podcasts

A taxonomy of podcast may help teachers create and use podcasts in their courses. There are evaluation criteria for podcasts (Austria, 2008, Schrock,

Table 1: Students enrolled in the study and respective courses (n=479)

Cycle	Program	Courses	Students		
			Female	Male	Total
Undergraduate	Applied Languages	Conversational Analyzes (CA)	6	0	6
		Descriptive Linguistics (DL)	13	6	19
	Education	Multimedia Educational Materials (MEM 2007/8)	14	0	14
		Multimedia Educational Materials (MEM 2008/9)	8	3	11
		Technology and Educational Communication (TEC)	23	0	23
	Applied Biology	Heredity and Evolution (HE-AB 2007/8)	29	18	47
		Heredity and Evolution (HE-AB 2008/9)	27	9	36
		Genes and Genomes (GG)	29	18	47
	Biology and Geology	Heredity and Evolution (HE-BG 2008/9)	20	10	30
	Computer Science	Operational Systems (OS)	10	33	43
Communication Sciences	Research Methods (RM 2007/8)	31	12	43	
	Research Methods (RM 2008/9)	28	10	38	
	Social Psychology (SP)	14	1	15	
Postgraduate	Educational Technology	Hypertext (HY)	18	12	30
		Multimedia Systems (MS 2007/8)	16	9	25
		Multimedia Systems (MS 2008/9)	9	8	17
	Pedagogical Supervision	Education and Multimedia Technologies (EMT)	7	3	10
	Technologies and Digital Art	Usability Assessment (UA)	5	8	13
	Adults Education and Communitarian Interv	Learning and Social Network (LSN)	10	1	11
Educatoinal Mediation and Supervision	Leadership and Groups' Dynamics (LGD)	6	0	6	

2009), podcast rubric (Bell, 2007), guidelines for podcast production and use (Avgerinou et al., 2007, Hendron, 2008, Ross et al., 2008), and a podcast development model (Edirisingha et al., 2008), but not a taxonomy.

We developed a taxonomy of podcasts, based on literature review (Geoghegan & Klass, 2005, Cebeci & Tekdal, 2006, Lee et al., 2007, Rosell-Aguiar, 2007, Clothey & Schmidt, 2008, Edirisingha et al., 2008, Hendron, 2008, Lee & Tynan, 2008) and from our own experience as podcasts producers (Carvalho et al., 2008, 2009, Carvalho & Aguiar, 2009). It has the following assumptions: (i) podcasts are not for use in the classroom; (ii) podcasts are not lectures recorded in the class during face-to-face sessions; and (iii) podcasts should be reusable. Note however that, although reusability is important for any learning object, it depends on its purpose: if the podcast gives feedback to students, it cannot be reused with other students.

The taxonomy we propose has six dimensions: type, medium, length, author, style and purpose.

1. Type: we consider four types of podcasts. Informative (it presents concepts, analysis, synthesis, description of tools or equipments, reading of excerpts/poems, etc.); Feedback/Comments (to students assignments and group work); Guidelines (to field work and to practical work; recommendations about studying, group dynamics, reflective learning etc.), and Authentic materials, this means, materials created for the public and not for a specific course or students, such as interviews, news, radio programming, etc.
2. Medium: audio or video (audiocast, enhanced podcast, vodcast and screencast). Audio podcast is the most common, and enhanced podcast is gaining popularity, which combines images and audio. Video podcast is also mentioned as vodcast, and if it is a screen captured with audio, it is called screencast (Edirisingha et al., 2008).
3. Length: Short (1–5 minutes), Moderate (6–15 minutes) or Long (>15 minutes). Podcasts should not take more than 30 minutes if conveying detail and facts, as suggested the Scottish Council for Educational Technology (1994). Cebeci and Tekdal (2006) proposed podcasts no longer than 15 minutes, because long podcasts generally cause a loss of attention and a subsequent decrease in comprehension. Lee and Chang (2007) created podcasts of 3–5 minutes in a radio style version and recommended short, lively and entertaining podcasts. The rule should also be that podcasts' purpose and content determine podcast length.
4. Author: Lecturer, Student, and other (experts, local community, and representatives). Lecturers can create their own podcasts for students, they may use authentic materials found on the Internet, such as interviews, or they can also ask students to create their own podcasts to share with their classmates.
5. Style: Formal or informal. Style is related to the degree of formality adopted. Edirisingha et al. (2008) mentioned that to make podcasts more interesting, they may incorporate informal learning content such as people's experiences, opinions, and so on. "A friendly tone invites students to learn and helps to build intimacy with the speaker" (Edirisingha et al., 2008, p. 165). A podcast should have a beginning, middle and an end, three important parts in keeping students' attention. Audiences like structure applied in a new and surprising way (Geoghegan & Klass, 2005). It is important to engage students and is better to keep content short and simple, clear and concise (Hendron, 2008).
6. Purpose: described as an action verb (inform, analyze, develop, motivate, mediate for reflective learning, etc.).

Research

This paper reports the use of podcasts in higher education and describes results obtained in the context of a project that is being conducted in Portugal, at the University of Minho. The project aims to implement podcasts in learning contexts and to evaluate its implications for learning while assessing students' and lecturers' reactions to this new pedagogical tool. This study involved 20 courses and 6 lecturers, who produced and used 118 podcasts during 3 semesters (1st and 2nd semesters of 2007/ 2008 and 1st semester of 2008/2009).

Table 2: Characteristics of informative podcasts (n=76)

Cycle	Author	Courses	Number	Length	Purpose	Style	Medium		
Undergraduate	L _A	CA	1	Short	Apply a specific knowledge acquired in the classroom	I	Audio		
			1	Moderate	Complete and develop a subject discussed in class				
	Students (L _A)	DL	4	Short	Synthesis of a subject matter	I	Audio		
	L _B	MEM 2007/8	1	Short	Information about how to use the forum in the blackboard	I	Audio		
	L _C	HE-AB 2007/8	4	Short	Give learning outcomes and information about study resources	I	Audio		
			1	Short	Give extra content by reading a text				
		HE-AB 2008/9	2	Short	Give course content	F			
			3	Moderate	Give course content				
		GG	6	Short	Give learning outcomes and information about study resources	I			
			1	Short	Give extra content by reading a text				
			HE-BG 2008/9	1	Short			Explain the resolution of an heredity exercise	I
				1	Short			Give course content	
	2	Moderate	Give course content	F					
	L _D	OS	1	Moderate	Describe concepts and technology	I	Audio		
	L _E	TEC	1	Short	Clarification on the project and about voluntary participation	I	Audio		
			2		Clarify evaluation rules				
5			Motivate to read a book						
L _F	SP	1	Short	Develop extra course contents	I	Audio			
		1	Moderate						
		2	Long						
Postgraduate	L _B	MS 2007/8	1	Short	Indicate aspects to be focused during next session	I	Audio		
	L _E	LSN	1	Short	Clarification on the project and about voluntary participation	I	Audio		
			3		Clarify evaluation rules				
			5		Motivate to read a book				
	Students (L _E)	HY	21	Short	Present oneself to a friend, to the family or to an employer	I	Video		
	L _F	LGD	1	Short	Develop extra course contents	I	Audio		
			2	Moderate					
3			Long						

Data collection instruments

Data was collected by two previously developed questionnaires. A Digital Literacy Questionnaire (DLQ) was filled in by students at the beginning of each course and was set to characterize students' knowledge and uses of web 2.0 tools. The second questionnaire—an Opinion Questionnaire (OQ)—was filled in at the end of each course to inquire students' reactions to the use of podcasts. Interviews were also conducted with some students and lecturers.

Sample characterisation

Students and courses

A total of 479 students—372 undergraduate and 107 master students—participated in this research, being enrolled in 20 courses. The majority of students was female (67%) and this was the case in almost every course (Table 1) except in Operational Systems (OS), where males were overrepresented (77%).

The undergraduate students were enrolled in 13 courses belonging to different programmes: Biology (4), Engineering (1), Communication Sciences (3), Portuguese Studies (2) and Education Sciences (3). Almost all masters students were teachers enrolled in masters courses in Education (6) and Digital Art (1) (Table 1).

A total of 118 podcasts (56 in undergraduate and 62 within master courses) of varied types, lengths and with several purposes were created by different authors in the podcasts project. Most students (57%), either undergraduate (58%) or graduates (51%), did not know what a podcast was, though they were used to downloading music and files (64%) or software (55%).

Data analysis

Podcasts uses

Podcasts were recorded and delivered with different types, lengths, purposes, authorships, media and style. Podcasts characteristics are summarised in Tables 2 to 5, where information about the cycle of studies, courses' names

Table 3: Characteristics of podcasts with feedback/comments (n=30)

Cycle	Author	Courses	Number	Length	Purpose	Style	Medium
Undergraduate	L _A	MEM 2008/9	1	Short	Comment the corrections done about the analysis of educational multimedia software or videogames	I	Audio
	L _C	HE-AB 2008/9	4	Short	Personalized feedback to group assignments	I	Audio
		HE-BG 2008/9	3	Short	Personalized feedback to group assignments	I	Audio
Postgraduate	L _B	MS 2007/8	1	Short	Comment about students posts in the forum	I	Audio
			1		Comment students presentation about the learning theories		
			1		Comment contributions to the forum (about 3 grids of software analysis)		
	L _B	MS 2008/9	1	Short	Comment about students' answers to DLQ	I	Audio
			1		Comment podcasts created by students		
			1		Comment students' answers to some questions about module 1		
			1		Comment students analysis of Vercial Project		
	UA	1	Short	Comment students analysis of Vercial Project	I	Audio	
EMT	6	Short	Personalized feedbacks	I	Audio		
Students (L _F)	EMT	9	Short	Comment peer work on educational software analysis	F	Audio	

and the podcasts used in each course is also available.

Informative podcasts were created by all the lecturers either for undergraduate or masters students (Table 2). This is actually the most used podcast category, with 76 episodes. Most of them were only audio files (55) and 21 were vodcasts. The majority was of an informal style, but 4 were of a formal style. Informative podcasts were mainly short (63), some moderate (9) and 4 were long. Their purposes were very diverse: to give several kinds of instructions/information, to motivate students, to present and further develop course contents. Students were also challenged to create their own episodes producing 25 informative podcasts. Such podcasts were either short audiocasts (4) recorded informally to make a synthesis of a particular course subject, or short videos (21) in a free style (depending on own's choice) and with a common purpose: to present students to someone they wish to (friends, family, employer).

Podcasts designed to give feedback to students were the second most used podcast type in this study, with a total of 21 audiocasts delivered by lecturers and 9 episodes recorded by students. All were short and mainly informal (Table 3).

Only 2 lecturers adopted podcasting to give feedback to their students, mainly to comment assignments of several kinds. This podcast type, which could be seen as a powerful one, as it can be applied by every teacher in every course, does not seem to be very popular, as inferred by the lecturers' reaction to the implementation of podcasts in University of Minho (Carvalho et al., 2008). Actually, the possibility of reusing podcasts is a concern shared by such lecturers, who wish to "make our efforts and work with this tool worthwhile". Podcasts used to give personalised feedback or comments — to a particular student or a certain group — are not attractive because they can not be reused in other courses or in another year. Students also had to produce podcasts of this type to comment their classmates' assignments on educational software analysis. Such episodes were all short and formal audio files.

Podcasts to guide students' work or to give recommendations were also created: a total of 9 short audio files of both styles, all produced by lecturers (Table 4).

The longer podcasts used in this project were: 3 interviews with experts in an informal style (Table 5). They were delivered by Lecturer F, who also created 3 long informative podcasts (Table 2). The purpose here was to motivate students and inform them about the potential of the interview method or of the non-intrusive methods of research, again in an audio format of informal style.

Table 4: Characteristics of podcasts with guidelines (n=9)

Cycle	Author	Courses	Number	Length	Purpose	Style	Medium
Undergraduate	L _A	CA	1	Short	Guidelines to assignment	I	Audio
	L _B	MEM 2008/9	1	Short	Recommendation to the next session	I	Audio
			1		Orientation to website analysis, group work and about the upload of group work in the Blackboard		
L _C	HE-AB 2008/9	2	Short	Give orientations to study	F	Audio	
Postgraduate	L _B	EMT	1	Short	Guide the group work	F	Audio
			1		Guide the WebQuest report		
			1		Guides the final assignment		
	UA	1	Short	Guidelines to assignment (a critical review of a paper about usability evaluation)	F	Audio	

Students' reactions to podcasts

Podcast listening

The majority of students, either from undergraduate courses (87%) or from masters courses (96%), listened to the podcasts delivered by their lecturers, mainly through the Blackboard e-learning platform (50%) or on personal computers (49%)—owned by 96% of all the students—and very rarely a MP3 player (4%) or other mobile devices. Such results are in agreement with the ones achieved by other authors (Dixon & Greeson 2006 in McLoughlin & Lee, 2007; Young, 2007). Students had to listen to podcasts again (73% undergraduate and 81% master students), and they did so mainly to revise its contents (80%) or to take notes (23%). Besides listening to podcasts, several students also felt the necessity to write down their contents, either totally (7%) or partially (31%).

Students think that the best and more useful podcasts are the ones which give summaries (51% of the students' answers), guidelines (46%) or those which deliver contents (43%) and news (40%). These categories can be classified according to our taxonomy in the informative (summaries, news, contents) and guidelines types. Students also showed their preference towards short (29%) or moderate (38%) podcasts. The great majority of them regarded the integration of podcasts in learning as an advantage (90%), independently of being undergraduate or graduate students, and were receptive to having podcasts in other courses (81% undergraduate and 92% master students).

Podcast quality

When asked about podcast quality parameters, students who listened to the podcasts mainly pointed out its audibility (95% of undergraduate and 93% of master students) and noted almost without exception that they were clear (89% of undergraduate and 93% of graduate students) and that the lecturer voice was a friendly one (89% of undergraduate and 93% of master students).

Students mentioned that they listened to podcasts carefully and attentively (44%). Some of them also stressed the sensation of proximity they felt with their lecturers while listening to podcasts (28%). However, they would still like to have podcast content in a written format, a preference more frequent in undergraduate (48%) than in masters (36%) students. Generally, students did not consider podcasts long except the ones enrolled in Research Methods (RM) courses. These podcasts were interviews with experts and were the longest episodes. In students' opinions not only were they "difficult to pay attention and keep listening the recorded file, but we had to take notes and stop/ restart the record often in order to achieve a full comprehension or to write down the necessary notes".

Students as podcast creators

As creators, students (n=34) seem to have appreciated the experience of producing a podcast. In fact, all of them referred "*it has been an interesting, new, innovative, useful and also funny experience*". Some of them (33%) reported some technical problems in recording and a few stressed

Table 5: Characteristics of podcasts of authentic materials (n=3)

Cycle	Author	Courses	Number	Length	Purpose	Style	Medium
	Experts (L _T)	RM 2007/8	1	Long	Motivate students and inform about the potentialities of the interview method	I	Audio
			1	Long			
		RM 2008/9	1	Long	Motivate students and inform about the potentialities of the non-intrusive methods of research		

the strangeness felt when they heard their voices (22%). However, the pedagogical potential offered by this new tool was undoubtedly recognized by 56% of the students who produced episodes.

Lecturers' opinions about podcasts

The lecturers enrolled in this project concluded that creating podcasts is difficult and can be a very time-consuming task: besides “the need to get familiar with the adequate software”, it is necessary “to write, rehearse and record what one wants to say”. Most of them also referred that “the time spent and the effort made are not recognized by the institution” and the possibility of reusing podcasts in other teaching/ learning contexts is a major concern for those who want to continue using this tool. Nevertheless, all the lecturers considered their participation in the project “a very positive experience” and they all recognized a great potential in this pedagogical resource. Podcasting can actually be a very useful and powerful strategy for improving classes and motivating students: they still are a pedagogical innovation and they may allow time for the development of other activities in class. Also, podcasts are permanently available, allowing students to listen to their content at any time, whenever they need or want it.

In conclusion, and in spite of the drawbacks identified, lecturers considered the introduction of podcasts in their courses a very positive experience and they plan to continue using podcasts, with the goals of minimizing the required production time, reusing podcasts in other pedagogical experiences and enlarging its use to other contents and other podcast dimensions.

Conclusion

Podcasts were adopted by learning institutions and are being increasingly used to support pedagogical environments in higher education, making a taxonomy of podcasts in teaching and learning useful and necessary. We proposed a taxonomy based on a literature review and on our own research with podcasting implementation in higher education.

Within our project we created 118 podcasts spanning all the possibilities in every dimension proposed in the taxonomy. Thus the episodes had variable type, style, length and medium, being created by different authors and with different purposes. The taxonomy proved to be simple, easy to use and allowed to classify all the podcasts created or reused.

Students and lectures were receptive to the use and creation of podcasts. However, students did not take full advantage of this technology as they do not use mobile devices to listen to podcasts. Further research is needed to understand this limitation.

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