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Articles

Use of Short Podcasts to Reinforce Learning Outcomes in Biology

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Podcasts are audio or video files which can be automatically downloaded to one's computer when the episodes become available, then later transferred to a portable player for listening. The technology thereby enables the user to listen to and/or watch the content anywhere at any time. Formerly popular as radio shows, podcasting was rapidly explored and used in different areas and with several purposes, due to the facility of its production, editing, and distribution. Higher education was no exception and several universities around the world, aware of the audio power of easy online access, have been stimulating the use of podcasts [1–4]. Most of the studies have been using audio files [5–7] but video files (vodcasts or vidcasts) or a record with images (enhanced podcast) can also be produced. Another type of podcast is a screen capture with a recorded voice (screencast) generally used for demonstrating a task or tutorial on a computer screen.

Some authors claim that it is a renaissance of audio for learning, though digital audio content would never replace reading, listening to live presentations, or the multitude of other ways of obtaining information [2, 6, 8]. Audio can effectively be a great way to deliver information especially for auditory learners [8, 9] and the possibility to stop, start, and replay makes it very appropriate for students with special needs or different learning paces. According to several authors [2, 6, 10, 11] audio can have pedagogical advantages because the spoken word can influence both cognition and motivation. Furthermore, voice is personal and its frequencies allow the adjustment of intonation, inflection, phrasing, pacing, volume, loudness, and timbre.

In higher education, podcasts may be created for several purposes such as vocabulary revision, listening exercises, interviews with native speakers, summaries of a lecture or lectures, describing homework assignments, giving feedback, guidelines, reducing the effects of isolation, promoting inclusivity, developing students' study skills through collaborative learning, providing guidance, and so on [1, 5–7, 12–14]. Also, podcasting has been proposed as a way of changing teacher practices and to motivate students through innovation [2, 6, 8].

Several recommendations should be followed when producing podcasts. Podcast length should undoubtedly be related to its content and purpose. However, to avoid the loss of attention in listening, a general rule would be to produce short podcasts [5–7], around 1 to 5 min length [15]. Podcasts should have technical quality, being important to produce episodes free of background noise, tinny-sounding, and verbal mistakes that interrupt the flow of the podcast. It is also important to engage listeners and keep their attention through the entire episode, preferably by keeping podcasts short and simple, clear and concise, lively and entertaining [5, 16, 17].

RESEARCH

In 2007, we started a project at the University of Minho, in Portugal, regarding the implementation of podcasts in higher education and the evaluation of its impacts on students and teachers from different scientific domains. The present work describes the exploratory study conducted in 2007/ 2008, in Heredity and Evolution, a curricular unit of the second year of Graduation in Applied Biology, which enrolled 47 students.

Since 2004/2005, this Biology program was involved in a pedagogical project aiming the short-term integration of new methodologies of teaching, learning, and evaluation, following Bologna guidelines. The project also implied program reorganization and courses were designed as sequential modules lasting from four to eight weeks. In 2007/2008, Heredity and Evolution (HE) spanned 6 weeks, between the 14th of November and the 21st of December. Classroom sessions included several plenary lectures, seminars, laboratory activities, and four brainstorming sessions, adding up to a minimum of 62 contact hours. These hours did not include other student tasks like reading, research/ searching, problem solving, group work, or study/ preparation time.

Four of the topics covered in HE were not taught in classical lectures; instead, they were presented as learning outcomes (LO), which should be achieved by

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TABLE I
Podcasts produced in Heredity and Evolution (2007/2008)

Podcasts	Subject	Length	Purpose
LO1	Genetic and chromosomal mutations	1′ 08″	Give learning outcomes and information about useful study resources to students, so that they can prepare each topic and be able to comment and discuss each subject in the next brainstorming session
LO2	Genetics of bacteria and their viruses	40″	
LO3	Population genetics	45″	
LO4	Evolutionary genetics	1′ 02″	

the students after a certain period of research and self-study. Thus, after the first half of the course, the plenary lessons gave place to the so-called brainstorming sessions, where students explained, analyzed, and discussed the given topics with the lecturer and their classmates.

The four subjects were delivered at least 2 days before the brainstorming session, as well as the learning outcomes to be achieved and some study guidelines to help student preparation. The lecturer also recommended a specific book chapter, articles, or websites that would be useful to prepare each particular subject, guiding students work and study. After a time period of search and study (about 2 days), students enrolled in the brainstorming session.

This methodology attempted to help students develop autonomous learning and, by simultaneously providing study guidelines and information about study resources, students could feel greater confidence and autonomy in their own knowledge search and building. The 2007/2008 HE course had four evaluation tasks, one of which was designed to assess students' knowledge and skills acquired during this active learning process. The novelty was the delivery of each set of learning outcomes and the respective study guidelines in an audio file as podcast.

METHODOLOGIES

Short podcasts (about 1 min long), structured in four different episodes (Table I) according to the different topics of the learning subject, were recorded to present the learning outcomes (LO) and provide study guidelines and search tips for each topic. An E-learning Blackboard was used as a platform for publishing and distributing these podcasts, recorded, and edited with the Audacity software.

Every podcast contained a list of what students should study and learn about a particular topic. As an example, podcast LO1 informed the students that after studying that particular content they should define and distinguish genetic and chromosomal mutations, they should give examples of each class, explain how a particular mutation can arise, describe mutation consequences, and so on. For that, students could use the book, articles, or other material recommended by the lecturer in the audio file. To achieve the learning outcomes, students attended brainstorming sessions to discuss the learning outcomes with their lecturer and their classmates. Therefore, by listening to the compulsory podcasts students would know what and how they should study the next subject, to be prepared to participate in the classroom activities programmed after podcast listening.

EVALUATION OF PODCASTS USE

Students' attitudes towards the implementation and integration of podcasting technology to support teaching and learning in Heredity and Evolution were examined by a survey designed to elicit their feedback on this podcasting experience. A Digital Literacy Questionnaire (DLQ) was set to characterize students' knowledge and skills about Web 2.0 tools as well as the use of mobile technology. This DLQ was filled in at the beginning of the course. A second questionnaire—the Opinion Questionnaire (OQ)—was delivered at the end of the course to inquire students' reactions to the use of podcasts and the devices used for its listening. Both questionnaires were developed in the scope of the main project and mainly contained yes or no and multiple choice questions.

SAMPLE CHARACTERIZATION

Data collected from DLQ showed that a little more than a half of HE students were familiar with podcasts at the beginning of the course (53%). The great majority of them owned a personal computer (89%) and MP3 players (68%). They had access to the Internet at home (81%) and they could also use a computer lab on the University Campus anytime during the day.

RESULTS

The majority of students listened to the delivered podcasts (77%)—preferentially at home, in the afternoon or at night—and 81% of these showed interest in listening to other podcasts in other courses, leading to the conclusion of podcast acceptance. This was precisely the main goal of the present study: to evaluate the way students saw podcasting integration in teaching/learning as well as their interest in having podcasts in future courses. Although receptive to podcasting technology and its use in learning, students did not explore one of its main advantages–portability. Despite the fact that most of the students owned a MP3 player (68%), all of them chose to listen to the lecturer recordings on their personal computers rather than transfer the podcasts to portable devices.

HE students also stated that the best and more useful podcasts would be the ones giving summaries (28% of

the students' answers) or news (22%), besides those with study guidelines (84%), and showed their preference towards short podcasts (5 min). In terms of podcast quality, most of the students considered the podcasts audible (87%), clear (89%), and their lecturer's voice friendly (83%). They also stressed the sensation of proximity that can be experienced with the lecturer while listening to podcasts.

In the lecturer's perspective, the use of podcasts to guide student study is an approach that can be maintained but that would be enriched, for example, by providing podcasts with some information or explanation concerning the topics for which the learning outcomes were designed. This kind of podcast would certainly help student learning and will probably motivate them to study. In this work, podcasts were mainly created to explore this teaching tool and its innovation in pedagogical contexts. It was also important to test the podcast impact on both students and the lecturer: acceptance, usability, and utility. Several authors have been emphasizing the potential and the advantages of audio media in learning, pointing out the role of podcasting to help in establishing social presence, and to improve teacher–student relationships [6, 18, 19]. Given students' acceptance to podcasts, other studies are under way to explore different podcast types and purposes.

CONCLUDING REMARKS

This exploratory study, developed to evaluate the impact and the acceptance of podcasts in learning contexts, showed that its use was an accepted innovation for students, and supports further and new uses of this resource in pedagogical environments. The experience was also considered positive by the lecturer, who intends to continue using this tool as well as to explore other podcasts potentialities. Podcasts may be used with multiple purposes thus allowing lecturers to focus on interaction in order to motivate students and develop other in class activities. Furthermore, as podcasts are permanently available, students can listen to their content at any time, whenever needed or wanted. Podcasts may be a useful kind of resource to be considered in learning in higher education, but further research is under development to provide answers to these questions.

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