The Role of Podcasts in Students' Learning

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***Abstract*—Podcasts have been employed extensively in some countries and are now being trialed at a number of universities in Australia. They allow ubiquitous learning whereby students can access a variety of educational material anywhere, anytime on iPods, MP3 players or even desktop computers. There remain many questions about the impact of podcasts on students' learning. One issue is how podcasts can be used to support high quality, experiential learning rather than merely perpetuating the old transmission model of education. In this paper, we explore the reasons why students either use, or fail to use, podcasts provided for their education. We report on the motivation of students enrolled in a large first-year information systems subject. These varied considerably and show that podcasts are a useful adjunct for providing for the diverse range of learning styles of our students. However, we also conclude that further research is needed into the use of podcasts to promote deeper learning in our students and how podcasts can act as a support tool for other forms of m-learning.**

***Index Terms*—higher education, m-learning, podcast, ubiquitous learning.**

I. INTRODUCTION

The word "podcasting" comes from combining the word iPod with broadcasting [1]. Currently, the term is no longer limited to broadcasts involving iPods but can also refer to the use of any portable audio player that allows the user to download sound files from the internet [2]. In fact, many "poddies" – users of podcasts – download and listen to these sound files on their computers at home. Typically sound files are compressed to MP3 format to allow for easier download, particularly over dial-up connections or where devices have small capacity. Hence the term MP3 player to describe both iPods and other similar players. Some authors limit the term podcasting to automatic delivery of files to users' devices using RSS (Real Simple Syndication) feeds [3], but often podcasts are accessed by users visiting websites and clicking on links to download podcasts they have chosen individually.

Podcasting is evolving at an amazing rate. In 2004 the number of webpage hits found by the Google search engine containing the term 'podcasts' was 24 [1]. By way of contrast, the number of hits in November 2007 was 124 million.

Podcasts have been used extensively by radio stations for providing access to music and talk shows, and for selling or downloading free music, for example from Apple iTunes. Podcasts have also evolved into vodcasts, used for delivery of television, movies and video [4]. Both podcasts, and to a lesser extent vodcasts, have found a place in university education as part of the new interest in m-learning. Podcasts in the educational setting allow students on-demand access to audio-recordings of lectures or other learning materials at their convenience [3].

At the authors' university a number of faculties are experimenting with podcasts in an effort to support student learning. These trials are attempting to resolve some of the problems which inevitably come with a new mode of educational delivery. This paper reports on one of these experiments. Our research question was whether podcasts would be useful, particularly from the student perspective, and whether different groups of students would find them useful (e.g., international versus local students). We firstly outline findings in the literature about podcasting. Then we describe the implementation of podcasts into a first year information systems subject within the Faculty of Information Technology. The results of our trial are presented and a discussion follows, placing the use of podcasts within the context of current educational theory. Finally, we present an m-learning framework in which to consider podcast implementation.

II. PODCASTING IN EDUCATION

In the United States, podcasts are being used and trialed extensively in universities such as Stanford University [4] and Duke University [5]. A lecturer at Bradford University in the United Kingdom is even using podcasts to completely replace face-to-face lectures [6]. Currently in Australia podcasting initiatives, like other forms of m-learning, are in a state of fragmentation but interest is growing, particularly in higher education [7].

The current generation of students has grown up and lived with digital technology [8]. The fact that most of today's students are very familiar with downloading audio files from the internet and own their own audio players makes the adoption of this method of learning almost automatic.

Podcasts allow anywhere, anytime learning. They permit students to access educational materials at home, while travelling to university or work, or doing any activity they choose. They can play the recordings at any time which is convenient to them rather than be confined to set class times. They have an obvious place in distance education, fulfilling the same role that audiocassettes performed in a previous era. However, through Web delivery, access is much easier, often via e-learning systems already in place at most universities [4].

Podcasts are fairly easy for teachers to generate using audio recorders and commonly available free compression software. For the majority of academics, who are not used to producing sound recordings, podcasts will need preparation to ensure a "compelling listening experience" [1]. This will include editing and post-production. However, once these skills are mastered these difficulties are minimal.

The University of Wisconsin has suggested guidelines for designing educational podcasts [3]:

- Choosing appropriate content
- Setting learning objectives or goals
- Designing the content
- Producing the podcast
- Integrating the podcast into the subject.

We also need to consider the quality of the learning experience, for example, does the podcast provide formal or informal learning, and does it support current educational theories [9].

Another important issue is whether podcasts improve students' academic performance. Research into this is rare in the literature. One of the few studies to look at this issue found no significant difference overall in students' exam marks between those who used podcasts and those who didn't [10]. However, they did find a significant difference in students' ability on essay-type questions in the exams if English was the language they used at home and if they downloaded the podcasts either in the week immediately after the lecture or in the study period immediately prior to the exam.

There are several downsides with podcasting:

- Students must have enough bandwidth to download the podcast, preferably broadband. Otherwise they will be restricted to accessing the podcasts on university computers.
- Discrimination against the hearing impaired.
- Podcasts are not interactive. It is a one-way delivery which precludes student interaction. Since podcasting is an extension of the traditional didactic model of education, will it lead to deep learning?
- Training may be needed for the teacher to improve the quality of their voice, speech patterns and intonation [2].

Podcasting, like other forms of m-learning, still requires much research to evolve a set of proven educational practices. Sustained podcasting will only occur through trial projects and the sharing of outcomes such as those reported in this paper.

III. THE PODCASTING IMPLEMENTATION

A. Teaching and Learning Context

This experiment in podcasting took place in a core subject, Introduction to Information Systems. There were a total of 340 students undertaking the subject, mostly undergraduates with some postgraduates. The majority of students were enrolled in an IT degree, a combined business/IT double degree, or a business degree with an IT major. Though similar subjects had been taught before, the subject was a new one, introduced with a large-scale revision of the undergraduate IT program.

Because this was a first year, first semester subject, scaffolding and support for students' learning was given the highest priority. Many students have difficulty making the transition from the high school learning environment to university. At school they receive a great deal of one-on-one support from teachers, with whom they have a more intimate relationship, whereas at university the environment is strange, student numbers are large and lecturers have too many teaching, research and administrative duties to take a personal interest in every single student. At university students are expected to be adult learners, with self-directed and self-motivated learning the key to success. The problem is exacerbated with core first-year subjects, which tend to have larger numbers of students and where students are compelled to take the subject whether they are interested in the topic or not. Technology has provided large-scale methods of supporting new students. M-learning, and in particular podcasting, has now joined e-learning as a method of giving support, such as making learning materials accessible to students beyond classroom hours.

Another reason for podcasting was to engage with the students' interest in the latest and most up-to-date technology. Mobile technology and wireless networks would form part of the later study of many of the students during their degrees, so encouraging them to use and start thinking about issues of mobile technology was appropriate. The revision of the subject and the undergraduate IT program seemed a good opportunity to introduce mobile devices into the students' learning for the first time.

It should be noted that the podcasts were not meant to replace lectures but to supplement them. Students were encouraged to attend lectures by awarding 5% for lecture attendance based on spot checks through the semester and by making the lectures interesting and engaging, for example by using videos and interactive discussion activities.

B. Podcasting Production and Use

For this subject specially scripted audio-summaries (AS) of the lectures were recorded by the lecturer in charge of the subject. The lecture was delivered twice each week (once in the morning to full-time students, and then a repeat lecture in the evening of the same day for the part-timers. The lectures were mostly 1 hour 20 minutes long. The audio recording was completed usually the day after the lecture had been delivered using an Olympus Digital Voice Recorder DS-4000. This device allowed editing of the recording before it was converted from a proprietary file format into WAV format and then into compressed MP3 format for more convenient download by students. In order to make the recordings as professional as possible, a script was prepared before recording and this took some time to construct: for an average lecture it took ½ day to script, record, convert and upload the podcasts, but some complex lectures could take a whole day where students were struggling with difficult concepts. Following compression the podcast files were uploaded each week to a folder on the Blackboard e-learning system in use by the university.

Summaries of only 9 of the 12 lectures in the subject were recorded. The 3 lectures that were not recorded included a guest lecture, the content of which was not known to the regular lecturer beforehand; a lecture consisting largely of copyright video material; and a lecture aimed at promoting students' self-reflection on their learning over the duration of the subject. None of these was deemed suitable for summarizing and recording.

Recordings varied in length from 11 minutes 51 seconds to 23 minutes 56 seconds, depending on the complexity of the lecture material being delivered. The average length was 18 minutes 36 seconds.

It was decided to record *summaries* instead of the usual practice of podcasting the whole lecture for several reasons:

- *Incorporation of extra material*: the recording of the audio-summaries after the lecture allowed the lecturer to add more material where it was believed this would assist students' understanding. For example, when students had asked questions during or at the end of the lecture, or posted questions on an online discussion board set up specially for the purpose, the lecturer would try to clarify concepts that had not been clearly understood by all the students. In addition, where the length of the lecture was insufficient to cover all important concepts, a discussion of this extra material would be included in the recording. The summaries allowed links to the students' set of lecture notes by referring to numbered slides, and also included references to helpful places in the readings which were included with the lecture slides in a combined book of Notes and Readings which all students purchased as part of their course in lieu of a textbook.
- *Quicker lecture review*: the length of the audio-summaries was on average a quarter of the length of the lectures. This meant that students would be able to review the lecture material much more quickly than listening to an entire recording of the lecture. It was hoped that this would make the podcasting more attractive to the students.
- *Smaller file download*: the shorter length of the summaries also meant a file size on average about a quarter the file size of the original lectures. This would be expected to make it quicker and easier for students to download the podcasts onto their devices, particularly if their iPods or MP3 players had smaller capacity (for example, with iPod "shuffle" models), or if they were downloading to PCs at home over a dial-up connection or with limited download contracts with their provider.
- *Avoidance of copyright issues*: all of the lectures incorporated one, or occasionally more, videos. These were copyright, so recording summaries avoided the problem of editing out the video soundtrack and the inevitable "jumps" in the audio track that would result.

Automatic RSS feeds were not available for use by the lecturer. Instead, students went online and downloaded the podcasts individually when and if they wanted to. They could download them to their PC at home, their laptop or to their iPod or MP3 player. Students were advised of the availability of the podcasts several times in lectures or via emails sent to all students enrolled in the subject.

IV. EVALUATION AND RESULTS

The podcasting trial was evaluated at the end of semester along with other features of the new subject. Out of a total ten questions about the subject, the one on podcasting presented to the student was: "Did you use the audio-summaries of the lectures? If so, what did you find useful about them? If not, why didn't you use them?" All students present in the lab the week when the evaluation was administered were asked to complete the form. However, it was not obligatory and some students may have chosen not to complete it. We received 247 survey forms from the student cohort. Of these, 6 students did not answer the question on podcasting. So 241 responses were received, giving a response rate of 71%.

From the survey forms completed, 87 students (36%) said they used the podcasts while 154 students (64%) said that they did not use them. Answers for the students who used them and the students who said they didn't use them were first separated. Then answers in each group were categorized and tallied up. The results are presented in Figures 1 and 2.

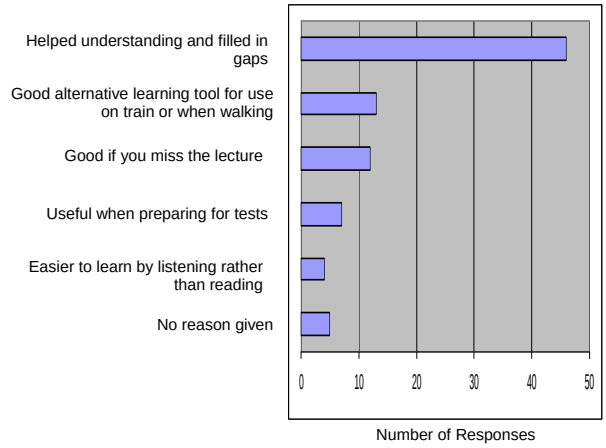

Figure 1. Reasons why students used the podcasts

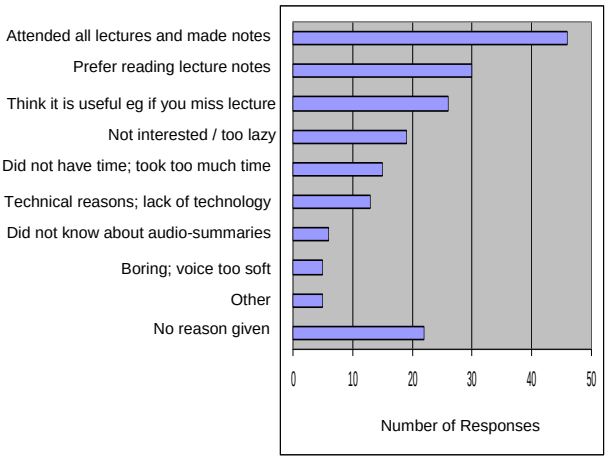

Figure 2. Reasons why students did not use the podcasts

V. DISCUSSION OF RESULTS

A. *Motivations for Using Podcasts*

Generally, the comments by students who used the podcasts were very encouraging. For example, one student commented, "Yes, more, more, they are so helpful. I am a person who gets the idea of readings easily". Other comments included "They were very useful and I wish she posted all of the lectures in that form, cause that was the main way I used to study", "Yes, before the first lecture, I copied all the AS in my MP4 player", "Yes, it is useful. You can transfer the file into MP3/MP4 and you can always enjoy with it".

Overwhelmingly, the main reason why students used the podcasts was to help their understanding: 53% of responses. A typical comment was "Sometimes I can

repeat the part that I don't understand. It helps the lecture notes to become more understandable."

One of the chief uses of podcasting quoted in the literature – anytime, anywhere learning – was supported by our survey. A number of students mentioned that they were very handy for studying on the train, while walking or running, and in fact much easier than studying from the book of lecture notes and readings when travelling.

Other motivations given were to catch up with lectures that had been missed and preparation for tests: "they were useful in picking-out the more important sections of our test, rather than us spending hours trying to remember it all". An interesting finding was that some students found they fitted with their learning style: for their private study they preferred listening rather than reading.

Given the large numbers of international students at our university and in our faculty, it is worth noting that several international students mentioned that podcasts really helped them overcome their language difficulties: "I am an international students, I cannot understand everything in the class. So I can listen the AS after class. It is useful"; "Yes, it help me to review the lecture when I was confused with some point. And it help me to enhance the ability of English listening because I am Chinese."

B. Challenges to Podcast Use

In contrast to the limited range of motivations of those who used the podcasts, there were many reasons why students did not use the podcasts.

The number one reason was that many students (25%) were regular lecture attendees. A couple of comments from the students were: "No, I didn't need them as I didn't miss any lectures, the content was well laid out so for me it was not necessary"; "I didn't use them because I attended all the lectures and understood most to all of the content".

The second reason given was that a number of students (16%) have preference for reading rather than listening to audio tapes: "Aural learning I did not find useful as a medium. Especially as they lacked the … clarification that text has. A transcript of the summary would be ideal." This is the exact opposite of those students who liked to use the podcasts. This shows that students have different learning styles which affect their decision whether to use podcasts or not.

Other reasons given included that it was useful if you missed a lecture, the recordings were boring or they just were not interested. They also mentioned that they were time poor: "I actually downloaded once then I forgot about it because of all the other homework and assignments. Do not have time to listen to them".

There were a few students who tried to access the podcasts but failed for a variety of technical reasons. These included the fact that the file was too big to download, problems with dial-up connections with low bandwidth, taking too long to download, the student's download limit, and the fact that downloading did not work on the students' PC or iPod. One student did not have an internet connection and another did not have an iPod or other device to listen to the podcasts. One student had an unidentified PC issue. Another student had a combined technical and multitasking issue: "No, I am unable to download them. They come up as embedded players on my browser. It was hard to listen to them since I was doing other work at the time I was on my PC."

C. Other Points of Interest

Some of the students who never used the podcasts nevertheless thought they were a very good idea. For example, one student said "however I regret not using them. They are an excellent tool for those who use them." Another confessed that "from deep down I can see that it will help in studying", and another "but I would have liked to. I am sure they would have helped me learn more."

Likewise, some of the students who used the podcasts mentioned problems or areas for improvement. These generally overlapped with the problems raised by the non-users. The main issues listed were that the podcasts were either too long or too boring, that students preferred reading rather than listening, and finally three students experienced technical difficulties. These problems may have led to discontinued use or lower use than might otherwise be expected.

VI. PODCASTS AND THE LEARNING EXPERIENCE

The fact that only one third of students used the podcasts shows the latter should not be regarded as a replacement for traditional lecturer delivery. In addition, there may be many good reasons why on-campus students should be encouraged to attend lectures. These include the ability to ask the lecturer questions, the social value of getting to know their lecturer and meeting their fellow students, and the opportunity for the lecturer to gauge how well the students are coping with the curriculum. Podcasts do not provide these features: they are a one-way, non-interactive transmission mode of learning and a solitary activity.

While podcasting is a useful adjunct to the classroom experience, providing flexibility and catering to different learning styles, we must question whether it results in learning of the highest quality. If m-learning is to transform our educational practices then it needs to foster deep approaches to learning, that is an orientation in the student towards understanding, personal sense-making and active learning. This will achieve better learning outcomes than surface approaches such as memorization of lecture material and the reproduction of the lecturer's knowledge [11] [12] [13].

In Figure 3, we range a number of different m-learning activities against a continuum of shallow to deep learning. Podcasting of lectures is at the shallow end of the spectrum. Ubiquitous access to resource materials also lies here if it consists purely of content delivery and rote learning, although it *can* foster deeper learning if students are encouraged to combine the resources with other sources of knowledge and so use them in the construction of new meanings for themselves. Likewise, interactive classroom activities, usually using clickers and personal responses systems, have been criticized as following a behaviourist educational paradigm if they focus on drill [14], but have been seen by others as improving students' attention and providing student feedback to the lecturer [15], as well as promoting social, collaborative learning [16]. Forms of m-learning which engage students most, allowing them to contextualize their new knowledge and to construct new meanings by incorporating rich learning experiences into their personal knowledge framework,

include mobile-supported fieldwork and active simulations [14].

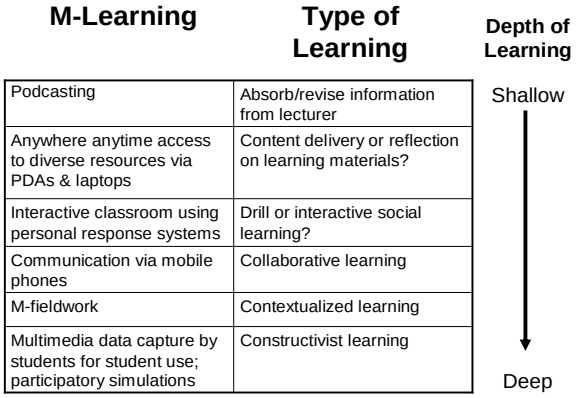

Figure 3. M-Learning Framework

From this framework for considering m-learning, we can see that podcasting alone will not revolutionize education in the twenty-first century since it largely perpetuates the traditional didactic, teacher-centred approach. However, it can be used to lay the foundation of knowledge from the lecturer, on which the student can then discover and build their own knowledge, using more engaged m-learning approaches.

VII. CONCLUSION

The study revealed a range of motivations behind the students' decision to use the podcast lecture summaries or not to use them. Despite the fact that only slightly more than a third of the students decided to use the podcasts, the extremely positive comments from many of them have encourage us to continue to provide podcasts for this subject. We, as educators need to take into account the different learning styles of our students and provide a choice in the format of the learning materials we make available to them.

In particular, the favourable comments from international students, who comprise a significant proportion of students in our faculty, suggest that podcasts are a valuable additional learning resource. Our next research project in this area will be to thoroughly investigate the use of m-learning by this student cohort.

While podcasts should be accepted as a normal part of education today – providing, as they do, an additional learning tool for many of our students – at the same time we must remember that podcasts are only a small part of m-learning. If we acknowledge that the focus of learning should be on the student and not on the teacher, podcasts do not fulfill this aim, at least not in their present form of downloadable audio-lectures. More investigation needs to be carried out of how we could improve podcasts to include activities to promote deeper thinking in our students. Research is also needed into how podcasting might support those forms of m-learning which have already been demonstrated to provide high quality collaborative, contextualized and active learning. We must look for ways of how m-learning as a whole can be used to encourage students to adopt deep approaches to study and therefore improve their learning experience and outcomes.

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