

Using Podcasting to Facilitate Student Learning: A Constructivist Perspective

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ABSTRACT

The paper employs two case studies to develop an approach for using podcasts to enhance student learning. The case studies involve two cohorts of postgraduate students enrolled on a blended course, over two years. In both cases, the institutional learning management system was used as a server to host the podcasts, giving students discretion on how and when to listen to podcasts. The podcasts were integrated in learning design hence tightly coupled in pedagogy in Case One, and optionally used i.e., loosely integrated in Case Two. Semi-structured in-depth interviews were employed to solicit student experiences of using podcasts. Access logs from the podcast server provided insight into frequency of use of podcasts, thereby helping to establish the relation between podcast use and facilitation of learning. The findings suggest that students were confident in using podcasts for academic purposes. This is despite having had to overcome some challenges not limited to institutional policies on limited Internet quota for students. The findings also suggest that use of podcasts within a constructivist learning environment afforded learners control and flexibility, reflection and self-paced learning. The paper concludes that podcasts facilitate learning when tightly coupled to a curriculum and used within constructivist learning environments.

Keywords

Podcasts, Ubiquitous technologies, Constructivism

Introduction

Ubiquitous technologies are technologies that are commonly available and accessible to most in a particular community. The ubiquitous nature of mobile devices explains why students are fairly conversant with using mobile technologies even before entering university. Evidence shows that the majority of university students own at least one or an assortment of mobile devices like mobile phones, MP3 players and iPods. For example, at the University of Cape Town (UCT) over 98 percent of students (<http://www.cet.uct.ac.za/projects>) own mobile phones and other mobile technologies, though the use of these devices in teaching and learning is limited. Although the range of uses of these devices is wide, predominant uses include social interaction and entertainment. This therefore provides educators the opportunity to converge social and entertainment uses of mobile devices to scaffold student learning and foster deep engagement with content. This paper exploits the fact that students can afford mobile devices (Wood, 2003), which are already intricately interwoven into various aspects of students' lives (Traxler, 2009). The thesis of this paper is that listening to podcasts on mobile devices could cognitively scaffold learning, converging students' social and entertainment spaces into the learning space. This paper reports on a study that exploited podcasts and ubiquitous technologies for teaching and learning in a blended postgraduate programme at a South African university.

Motivation

Van Hooft (2008) suggests that the affordances of mobile technologies enable students to be mobile, to be connected and digitally equipped all at the same time. The emphasis, when using ubiquitous technologies for educational purposes, is on how computing and mobile devices share, distribute and enhance engagement with both content and knowledgeable human agents. Thus the affordances of mobile technologies leverages classroom activity and interaction, and is therefore ideal for situating learning and contextualizing it (van Hooft, 2008).

Literature on the use of mobile devices in academia highlights a polarity of views regarding the types of devices commonly used. Some studies indicate that devices with no connectivity have not proved popular or sufficiently useful in education (Faux, McFarlane, Roche & Facer, 2006). Faux et al. (2006) however also observe that non-

connected devices such as iPods and MP3 players are used alongside connected devices such as mobile phones. We saw this an opportunity which could be used to extend learning space for students by enabling them to download podcasts onto non-connected devices (i.e., iPods, or MP3 players) for listening off-line and using connected devices (i.e., mobile phone) to engage with peers on content.

The motivation for this study was drawn from Armstrong and Franklin (2008), who argue that in cases where confidence in students' ability to access Web 2.0 tools is found, academic staff is driving the use of Web 2.0 tools in general by innovating new practices. Armstrong and Franklin (2008) suggest that podcasts and vodcasts are used variously across the institutions surveyed in the UK, the US, the Netherlands, South Africa and Australia. This echoes Armstrong, Tucker, and Massad (2009), who argue that students easily accept integrating podcasts with curriculum content because they are already competent users of MP3 players and iPods. This means that students' entertainment experience with mobile devices could therefore be exploited for educational purposes. However, this is not without challenges. As mobile technologies become ubiquitous and podcasting becomes more acceptable among students, the challenge lies in shifting educators' view from seeing podcasts as a technology, to using podcasts as a teaching tool at pedagogical level. Ng'ambi (2008) stresses that listening to podcasts however does not necessarily translate into learning, adding that podcasts ought to be integrated into the curriculum.

Thus, the study reported in this paper aimed at developing a framework for integrating podcasts into the curriculum. The framework was based on empirical findings of an investigation into how postgraduate students used podcasts within a reflective learning context.

Related projects

Developments in podcasting tools have been on the increase and most recently mobile podcasting (<http://www.podcastingnews.com/topics/Mobilecasting.html>) has become possible. With mobile podcasting, the process of audio content creation, formatting and distribution for use on various devices is usually transparent to the user. The need for transparency is important because students traverse between social spaces and educational ones. The University of Minnesota (2006, p. 1) argues that 'Podcasting involves a shift from e-learning to m-learning' as it provides another way of widening student learning experiences beyond campus settings through the use of mobile devices such as laptops, mobile phones, MP3 players and iPods. The challenge for academics and learning designers is to explore ways of how to best integrate podcasting in the curriculum so as to take advantage of the affordances of technologies available to students on and off-campus.

Podcasts have been used at the University of Cape Town, South Africa, at both undergraduate and postgraduate level since 2007. In a study involving postgraduate students, Ng'ambi (2008) reports on how students whose first language was not English struggled to understand lectures during face-to-face sessions where the use of podcasts became an indispensable learning tool. Ng'ambi (2008) contends that effective implementation of podcasts into curricula, particularly in resource constrained contexts happens at two levels: the pedagogical and activity layer. Ng'ambi (2008) explains this to mean generating podcasts becomes part of the teaching strategy and entails designing reflective learning tasks whose accomplishment require listening to a podcast.

Types of Podcasts used in education

In 2007, Rüdél proposed four types of podcasts, which depended on the nature of the content delivered to students. These are: 1) traditional course content such as archives of lectures delivered face-to-face, 2) additional course content which enhances learning by providing material that is relevant to the course, 3) supplemental course content not crucial to passing examinations, and 4) podcasts containing content from students for the lecturer or other students. For purposes of this study, the first three types are classified as lecturer-generated podcasts, while the last is classified as student generated. Harris and Park (2008) contend that the early adoption phase of podcasting by universities tended to focus on podcasts as a technology or tool, implying that little or no emphasis was put into providing podcasts based on pedagogically sound principles.

The shift is now toward providing high quality podcasts with the aim of providing learning resources which are aligned with pedagogy. Tsagkias, Larson, and de Rijke (2010) propose a podcast analysis framework they refer to as PodCred. Though the framework Tsagkias et al. (2010) propose helps podcast users assess both the quality and credibility of podcasts, it however provides no guidance on teaching with podcasts. The research by Tsagkias et al. (2010) follows the work done by several institutions in the UK on academic podcasting, which culminated in the proposition of a model by Edirisingha, Salmon and Nie (2008) for effective academic podcasting. The model sets out ten-step guidelines for use in implementing podcasting in academic settings. While the model by Edirisingha et al. (2010) served as a guiding framework for developing a podcast implementation strategy, it did not provide a pedagogical strategy for teaching with podcasts. We sought to understand patterns of use when podcasts are tightly integrated (i.e., tasks designed that require listening to podcasts) with curriculum and when loosely integrated (i.e., podcasts made available for discretionally use, not informed by a learning task). The assumption guiding the study was that by providing students with podcasts, students gained control of their own learning, were empowered to make choices on time, place and frequency of playback thereby increasing learner control. As podcasts enabled learner control and flexibility, podcasts were useful in helping to shift the focus from knowledge transmission to knowledge creation, a tenet of constructivism.

Constructivism

Theories of knowledge construction and acquisition emphasise the centrality of cultural and social factors in cognitive development. Constructivism is a set of concepts regarding human learning tracing it's roots to eminent scholars including Dewey, Piaget and Vygotsky. Perkins (1999) argues that because constructivism is a composite of different views incorporating active, social and creative aspects of learning, different kinds of knowledge are elicited from different constructive perspectives and there is thus no single constructive approach. Constructivism positions learning as the active construction of knowledge structures through experience. This is particularly relevant to this study in that the process of making meaning from listening to podcasts is an active reflective process which requires students to bring prior knowledge to the process. Campbell (2008) quotes Merriam and Caffarella (2001), who define constructivism as "...an array of perspectives, posits that learners construct their own knowledge from their experiences. The cognitive process of making meaning is emphasized as both an individual mental activity and a social interactive interchange" (2008, p. 75). Campbell adds that Merriam and Caffarella have managed to advance "...a well articulated teaching philosophy" (2008, p. 5), with a range of application in various learning contexts. For Mayes and de Freitas (2004) constructivism conceives learning as the realization of understanding through active discovery, dialogue and collaboration. Constructivism, Mayes and de Freitas (2004) argue, is concerned with the internalization of knowledge and skills, their integration into existing structures and the effect of support on their emergence. They add that effective learning can be applied to different contexts, expressed in new ways, including the use of technologies which provide opportunity for reflection, self-paced and independent learning.

Atherton (2005) argues that the "...the learner is much more actively involved in a joint enterprise with the educator of creating ("constructing") new meanings" (emphasis in original). Atherton adds that constructivism's emphasis on students' prior knowledge and understanding can benefit higher education particularly in the areas of resistance to learning and learning through reflection as constructivist assumptions are implicit in reflective practices. Within constructivist environments, the role of academics according to Atherton (2005), is to initiate discourse, with the primary objective of helping students to reach understanding. Perkins (1999, p. 11) suggests that in constructivism, "active learning is the common denominator." This is in agreement with Hung (2001, p. 282), who points out that the different views of constructivism hold that "... learning is an active process of constructing knowledge rather than acquiring knowledge." Hung also argues that the key concepts underlying constructivism are personal discovery, usually from first principles, the uncovering of alternative perspectives and making sense of them. These concepts are quite problematic to achieve in learning environments which assume that learning is the transmission of knowledge to students. Kanuka and Anderson (1999) identified four constructivist positions from literature, whose common themes they summarized as follows:

- I. new knowledge is built upon the foundation of previous learning;
- II. learning is an active rather than a passive process;
- III. language is an important component of the learning process; and
- IV. the learning environment should be learner-centric.

The common constructivist themes suggested by Kanuka and Anderson provide a way of viewing listening to lecturer-generated podcasts and encouraging students to generate their own podcasts as opportunities for creating new knowledge built on previous learning. It also engages students actively and places students at the centre of the learning process. Phillips (1995) provides three ways of understanding knowledge acquisition based on constructivist philosophy namely, active acquisition of knowledge and understanding; social construction of knowledge and understanding; and finally, the creation/recreation of knowledge and understanding. In other words, knowledge and understanding are actively created and recreated within particular social contexts. It therefore follows that use of educational podcasts would allow students to engage in constructing knowledge and understanding while using the same devices already used for social and entertainment purposes.

Methodology and description of case study

The study adopted an interpretive approach to investigate how students enrolled on a blended postgraduate programme in Educational Technology used podcasts for reflective learning. A blended learning approach integrated on-line and face-to-face teaching strategies, where students worked on pre-contact tasks online, then spent six full-days (from 09h00 - 16h00) in face-to-face sessions, and finally completed an individual task post-contact. The pre-contact session lasted for two to three weeks and post-contact task four weeks. Podcasts were created and made available at the end of each day during face-to-face sessions.

Alvarez (2002) contends that an interpretive approach allows researchers to view participants in a study as active knowledge constructors within their contexts. Using students' narratives of their experiences, the researchers gained understanding of how students used podcasts and their reflective process mediated by podcasts. The postgraduate students already used e-learning in all modules. The Web 2.0 tools such as blogs, wikis, and maps were used within the institutional learning management system (LMS). The University of Cape Town uses Sakai (<http://sakaiproject.org>) branded as Vula. The aim of this study was to use devices available and accessible to most students, and to use a familiar e-learning platform. The researchers therefore decided to use Vula as a Podcast Server. While on campus, students could download podcasts from Vula to their mobile devices and MP3 players to listen to off-line. On-campus most students had little or no access to high broadband and downloading of podcasts off-campus was expensive. Students also subscribed to different aggregators which they used download podcasts using Really Simple Syndication (RSS). With the use of RSS feeds, some students downloaded podcasts to mobile devices.

Students used podcasts within a reflective learning approach. The researchers investigated two cohorts of students, Case Study 1 and Case Study 2, with 16 and 18 participants respectively. The teaching strategies were the same in both cases, though the pedagogies were slightly different. In Case Study 1, podcasts were tightly coupled into pedagogy; learning tasks were designed such that students were required to listen to podcasts in order to complete the tasks. In Case Study 2, podcasts were available but tasks did not require using podcasts, making podcast use optional. In both cases, students' podcasts (student-generated podcasts) of presentations, seminars and group report-back sessions were recorded and uploaded on to the course site, making them available for use to support reflection. Each student maintained a personal and private daily reflective blog on their learning. Lecturer-generated podcasts consisted of lecture recordings and lecturer recommended podcasts from other sources. The details of the two cases are outlined below:

Case study 1: 2008

Contact week

Number of participants: 16

Teaching strategy:

- Guest lectures
- Group tasks
- Student-led seminar
- Reflective blogs

Pedagogy

- Podcasts tightly coupled into pedagogy
- Constructive learning approach
- Lecturer-generated podcasts
- Student-generated podcasts
- Students' daily blog reflections

Case study 2: 2009

Contact week

Number of participants: 18

Teaching strategy:

- Guest lectures
- Group tasks
- Student-led seminar
- Reflective blogs

Pedagogy

- Podcasts loosely coupled into pedagogy
- Constructive learning approach
- Lecturer-generated podcasts
- Student-generated podcasts
- Students' daily blog reflections
- Podcast to accompany research paper at end of module

In addition to using podcasts provided by lecturers and those created by students to facilitate reflection, students in Case Study 2 were each required to create a 10 minute podcast as part of an assessment task to accompany a research paper. Students were expected to use software like Audacity, to create a podcast and upload it on to the course site.

According to Schmit (2007b), giving students the opportunity to create their own podcasts enables them to co-construct knowledge and engage in high-level cognitive processes. Thus student-generated podcasts are ideal for use in constructivist teaching approaches as the podcast production process facilitates critical engagement with content, which can lead to effective learning as students use the knowledge acquired in class as the foundation for subsequent learning as they put the content for their podcast together. Student-generated podcasts also provide students with the opportunity for active involvement in learning and enable students to use high-level cognitive processes as they conduct research and formulate the concepts/ideas which comprise the podcast content. (Schmit, 2007a, p. 16) argues that student-generated podcasts provide authentic artifacts which academics can use to assess student knowledge as these can be used to "observe factual and conceptual understanding in the cognitive domain." Using podcasts in this way also helps to make learning an active process and created a more learner-centric environment.

All student-led seminars including student report-back sessions from group tasks were recorded and uploaded onto the learning management system (LMS) Vula, which was used as a Podcast Server. The rationale for distributing the podcasts via the LMS was to ensure equitable access, as all students enrolled on a course had access to all resources on the LMS. The audio was first edited using Audacity with the aim of providing podcasts of not more than thirty minutes in length for a lecture. The nature of the seminars and student report-back sessions determined the style of presentation, content organization, the frequency and timing, as well as the authors, and medium used. It was the Course Convenor's contention that providing podcasts, in addition to other recourses, such as handouts and Power Points of all presentations, would provide students the opportunity for enhanced reflection, self-paced and independent learning, all of which played a critical role in ensuring effective learning.

Data analysis

Data was gathered from two main sources, namely face-to-face interviews with students and access logs generated by Vula. Detailed interviews were conducted with eight of the eighteen students on Case Study 2. The researchers sent invitations to students to participate in the interviews to eighteen (18) students. Ten (10) students initially agreed to be interviewed but only eight were available for interviews. Interview data were analyzed using thematic analysis. Table 1 below gives a summary of the themes, and categories that emerged from interview data.

Table 1. Themes emerging from interview data

Theme	Category
Critical engagement	Memory aid Reflection
Extending the learning space	Traditional setting Informal setting
Technical aspect	Bandwidth Awareness

Interview transcripts were emailed to interviewees for verification before being analysed. The analysis involved reading through the transcripts to develop themes, and then re-reading the transcripts to identify categories specific to each theme. Transcripts and categories were analysed to identify data relating to each category. The transcripts were then coded according to categories. Access logs generated automatically by Vula were used to determine the frequency of access of podcasts. These show which podcast was accessed how many times and by whom.

Interview data

Critical engagement with content

Phillips (1995) stresses that knowledge construction and meaning making are active processes. This implies critical engagement with content. Podcast content should be designed to recruit student attention and provoke thought and be embedded in the curriculum so as to enable students to discern the academic value of using them. Using podcasts enable students to critically engage with content as they build upon previous knowledge by consolidating concepts discussed during lectures, take reflective notes and help to formulate questions for further exploration with the educator and or peers. Six of the eight students said they benefited from using podcasts to support their learning, as the comments below illustrate (unedited):

I did use it [podcast] in distance education, where podcasts were an important part of the educational programme... You had to study a video first, then the theory, and then do the test... (02MR/2)

...it's [podcast] really useful especially when it comes to what has been said before that in a class set sometimes, there are things which will... you won't aah really grasp for the first time... I cannot concentrate for two... my mind always wanders... when I use podcasts some of those things I can actually get hold of (05MU/2)

...if you talk about reflections... you may have very little. But now with the podcasts with you, then you can be able to replay it, actually capture what is outstanding for you... (06MU/2)

Two inter-related categories emerge here, those of using podcasts as an aid to memory and as an aid to reflection. Reflection is a post-event process of meaning making and is dependent on one's ability to remember details of the event in order to relive an experience. Thus improving students' ability to recall details increases the chances of effective reflection. Effective reflection is the result of critical engagement with post-event details (content) and is highlighted by how well students are able to restructure their views and integrate multiple perspectives.

Extending the learning space

Mayes and de Freitas (2004) contend that technologies which provide opportunity for reflection, self-paced learning and independent learning have a critical role to play in ensuring that learning is effective. Once downloaded, podcasts can be used in various settings, with devices of students' choice and at students' discretion. This implies that podcasts lend themselves well to facilitating self-paced and independent learning. Students can use podcasts in traditional academic settings but are confined to specific physical spaces or time. Podcasts can also be used to widen students' learning space into informal settings as academic content can be used beyond campus settings, what is referred to as "time shifting." Six of the students interviewed used podcasts to extend the learning space, though the concept of extending the learning space is specific to individual students. Making use of odd bits of time, such as the commute to and from campus and guiding further research are some ways podcasts can extend the learning space. Interview data shows that students used both portable and fixed devices to listen to podcasts, including "cell-phone," "computer" and "laptop," which shows that learning takes place across settings, both formal and informal:

...when I listen to the podcasts, I normally just listen on a computer. And I have listened on a cell-phone as well...you can listen whilst you are walking or you can listen...the period between... when I'm in between places is lost time (05MU/3 - 4)

...I use my laptop...can't do away with paper, pen and paper...I jot down some of the things I think I missed and I would want to research further (06MU/3)

Traditional settings are where students "can't do away with...pen and paper...jot down," and "research further" is necessary. Informal settings include "in between places" where podcasts could be used for self-paced and independent learning. This echoes Armstrong and Franklin (2008) who argue that the nature of learning boundaries are altered by using podcasts. This is in addition to enabling "new flexible virtual spaces without walls or time constraints" (Armstrong & Franklin, 2008, p. 22).

Technical aspect

This theme is concerned with technical execution as proposed by Tsagkias, Larson & de Rijke (2010) in their framework. It is centred on issues relating to production, packaging and distribution of content. Students' highlighted issues relating to file size "the podcast files are large," and bandwidth "worried about how much." In the South African context, broadband Internet access and bandwidth is a major challenge to the educational use of podcasts. As students move away from campus, they have limited or no access to broadband Internet. While podcasts can be downloaded using dial up Internet, the process is slow and costly. This makes downloading podcasts time consuming, which by extension means that time-constrained students are unlikely to use dial up Internet to get podcasts. Though this is not the case, students assume downloading podcasts or vodcasts (video podcasts) uses up their Internet quota and they therefore would rather use it for other purposes such as 'research for my assignment':

Unfortunately you find that the files, the podcast files are large. I would want to have them on my phone and then listen even on the bus so given the opportunity to have the other nice devices I would listen almost anywhere. (05MU/3)

It also takes too long to download. I was quite excited about using the podcasts...it is frustrating to wait for everything to download. I was also worried about how much bandwidth it was using since I still needed to do a lot of research for my assignment. (07FE/1 - 2)

Awareness of podcasts and the use of RSS feeds is another theme that emerged from the data. All students interviewed admit to either being familiar with podcasting or using aggregators, such as iTunes and newsfeeds for non-academic purposes. Data indicates that students are aware of RSS feeds—"do my downloads through iTunes," and podcasting "seeing it on the net," as well as the possibilities it offers in terms of automatic acquisition of content. Podcast access logs show that two of the interviewees tried using podcasts but gave up, while two were top users of podcasts provided on the course. Students often do not think of learning resources as content and may thus not be taking full advantage of academic podcasting, including the use of RSS feeds:

...I do my downloads through iTunes...I use it more for news and other issues. (02MR/2)

...I guess it's a matter of seeing it on the net...but you never think about it...or bothered much about it...I actually heard about it for the first time officially in that course. (05MU/1)

Most postgraduate students commute to campus and hence have no access to broadband Internet access at home and are in most cases, unable to pay Internet service providers, as these services require signing contracts with the service providers. They are therefore unable to subscribe to RSS feeds of academic content.

Data from access logs

Access logs were useful in comparing patterns of access to learning resources over time. Access logs for both case studies were compared to highlight variations over time. All students enrolled on and all lecturers on teaching on the programme had access to the podcasts. However access logs analysed did not include the downloading frequency of podcasts by lecturers. It is important to note that though downloading resources from Vula did not affect monthly Internet quota, many students assumed this was the case, which may have negatively affected podcast use.

Data from the two case studies is presented in a frequency table (see Figure 1 and Table 2). The frequency tables compared the number and percentage of podcasts downloaded for both case studies in terms of student- and lecturer generated podcasts. Table 2 presents a comparison of access patterns for the two case studies. Data from the access logs were arranged into categories in order to compare the distribution of access across the two cases. Since the data set ran up to 69 and 60 for Case Study 1 and 2 respectively, the data was broken into segments of ten, giving a total of seven categories.

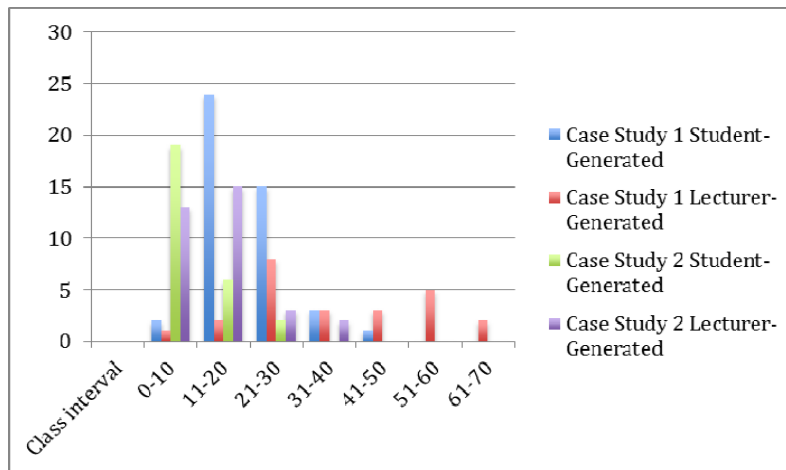


Figure 1. Comparison of the two case studies

Table 2. Comparison of podcast access for case study 1 and 2

Class interval	Case Study 1		Case Study 2	
	Student-Generated	Lecturer-Generated	Student-Generated	Lecturer-Generated
0-10	2	1	19	13
11-20	24	2	6	15
21-30	15	8	2	3
31-40	3	3	0	2
41-50	1	3	0	0
51-60	0	5	0	0
61-70	0	2	0	0
Total	45	24	27	33
Access Ratio	65%	35%	45%	55%

The data illustrated that frequency of access across the various class intervals, of podcasts was not equitably distributed during both years. This suggested a ranking trend based on the frequency of access. The data also revealed that there was better distribution of access in Case Study 1 compared to Case Study 2, as shown in the Figure 2 below.

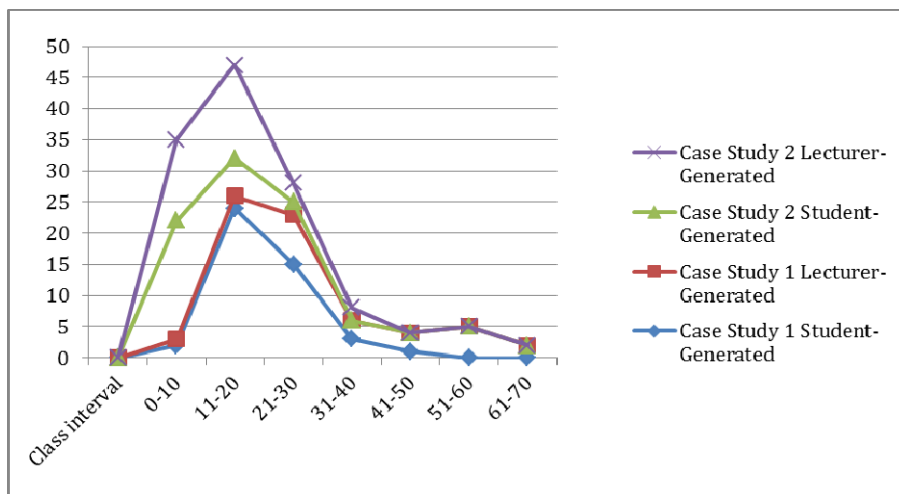


Figure 2. Access patterns of podcasts for both case studies

In Case Study 1, podcasts accessed the most fell in the 11-21 and 21-30 class intervals, which accounted for 38% and 33% of total podcasts. In Case Study 2, the most accessed podcasts accessed fell in the 0-10 and 11-21 class intervals, which accounted for 53% and 35% of total podcasts. This translated into 71% and 88% for the class intervals with podcasts accessed the most for Case Study 1 and 2 respectively. Overall, student-generated podcasts were downloaded the most in Case Study 1, while lecturer podcasts were used the most in Case Study 2. One of the tasks given to Case Study 1 required students to cite at least three other students in discussing how peers' reflections affected theirs. They had to listen to other student-generated podcasts in order to complete the task, which was not the Case Study 2.

Table 3. Comparison of average downloads for case studies

	Total number of podcast users	Total number of students	Total number of podcasts	Total RSS feed downloads	Total number of downloads
Case Study 1	23	16	69	417	1831
Case Study 2	21	18	60	245	673

Both lecturers and students had access to the course site and all resources, including podcasts. The total number of podcast users include seven lecturers and one research assistant in Case Study 1 and four lecturers and one research assistant in Case Study 2.

In both case studies, two lecturers on the postgraduate course did not teach on the course. It is assumed that these lecturers expressed interest in how podcasts were used on the courses and were added to the course sites by the course convener. In additional, some students chose to download podcasts anonymously using RSS feeds. These figures stand at 417 and 245 in Case Study 1 and 2 respectively. RSS feeds make podcasts available to students automatically. The fact that few students on the course accessed podcasts via RSS feed is indicative of the possible digital divide, in particular the fact that access to internet connectivity off campus was uneven. It could also suggest that students preferred to access podcasts from the course site as they could look at other resources while downloading podcasts.

Discussion

Analysis of access patterns suggests that podcasts provided different learning opportunities to students on the two case studies provided. In Case Study 1, podcasts were tightly coupled with pedagogy and this led to high usage of

podcasts. In Case Study 2, although podcasts were not tightly coupled with pedagogy, it modelled the effective use of podcasts to students in supporting teaching and learning. To the extent that students were required to prepare a podcast to support their project essay, students were provided with learning opportunities to reflect on the task at hand, and to construct new knowledge through active learning. The use of podcasts in both cases was therefore in alignment with constructivist principles espoused by Mayes and de Fretas (2004), Atherton (2005), Perkins (1999) and Kanuka and Anderson (1999). Some of the educational benefits accrued from using podcasts include facilitating the meaning making process, directing learning through facilitating question formulation, facilitating critical engagement with content and effective communication of ideas through students' reflection on peer's podcasts. Podcasts also augmented consultation space by affording deep engagement in question-based consultations that was often a setback of traditional face-to-face sessions. Lecturers can structure podcast content, including lecture archives to give students the opportunity to make comprehensive notes while they listen, formulate questions for exploration for consultation with lecturers and peers, thus directing further learning. Table 4 below summarises the benefits observed from the case studies:

Table 4. Summary of benefits accrued from using podcasts

Teaching Strategy (Facilitate reflective learning)	Pedagogy (Podcasts)	Benefits
Lecturer-generated podcasts Design learning tasks to involve students in knowledge production (use Student-generated podcasts)	Tightly coupled with pedagogy Constructive learning approach Build on existing competencies and skills Encourage collaborative and active learning Augment presentation with reflection	Scaffold meaning-making process Formulate questions to direct further learning Facilitate critical engagement with content (i.e., provide cues to enable purposeful listening to podcasts)

Since only students enrolled on the course had access to resources, including podcasts, it can be inferred that frequently accessed podcasts could be indicative of a topic students had difficulty understanding hence the need to listen to it again, or a topic that generated interest. Students may want to share or recommend such podcasts to others. This suggests that educational podcasts would be shared among students like they already share music (e.g., using Bluetooth). Tsagkias et al. (2010) observe that many students own mobile devices with sufficient capacity to store and playback music, which suggests readiness for using podcasts in education on the student side. This could be achieved through mobile devices leveraging institutionally provided computers. Thus, this paper has focused on the readiness of the educators and through the case studies, illustrated two strategies of integrating podcasts as a teaching and learning tool.

Conclusion

This paper has illustrated podcasts' potential to transform student's social and entertainment spaces into learning spaces. It has shown that such transformative change requires tight coupling of podcasts into pedagogy. The study has demonstrated that students accessed and used podcasts more when integrated with pedagogy, as with Case Study 1. Both case studies indicate the need to take into consideration when embedding technologies in educational programmes and make the following recommendation:

- I. Effective educational use of podcasts requires that educators integrate podcasts in the task design. This has illustrated two approaches—requiring students to perform a reflective task where podcasts play a scaffolding role; or modelling the creation and use of podcasts with the view to asking students to create their own podcasts.
- II. Ensure that technologies required to engage with a podcasting task are ubiquitous, reducing lack of access to technology which allows students to focus on the required task. This paper has illustrated how the LMS served as a podcast server, and students used devices they already owned and used for social and entertainment purposes.

- III. Exploit students existing competencies and create learning environments where students teach and learn from one another. In this paper student drew on their existing competencies of using devices (MP3 players and iPods) to download, playback and share music, and applied same skills to using podcasts. The use of RSS feeds by students is an example of transferable skills.
- IV. Teaching strategies are informed by assumptions about learning that educators hold. These assumptions/theories ought to be made explicit in order for the educator to stay focused. In this paper, podcasts were used to mediate reflective learning in a constructivist learning paradigm. This influenced the task designs, both in integration and use of podcasts.

The researchers conclude that podcasts can be used as learning resources for facilitating student learning. The extent to which this is done is dependent on environmental and pedagogical factors. Using podcasts within a constructivist paradigm encourages scholarly knowledge construction as students are given the opportunity to engage with content critically. We also conclude that the value of using ubiquitous tools in education is two-fold; namely:

- 1) Cost-effectiveness as there are no additional costs in acquiring and training students to use new tools, and
- 2) Ensuring more equitable access to content and by extension, widening students' learning space.

Based on students' preference of listening to podcasts on personal computers and laptops, and multiple download of specific podcasts by the same users, we conclude that student ownership of mobile devices able to play podcasts is yet to support mobile podcasting as the primary means of academic podcasting.

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