

Use of Podcasting as an Innovative Asynchronous E-Learning Tool for Students*

Alireza Jalali, John Leddy, Martin Gauthier, Rong Sun, Maxwell Hincke, Jacqueline Carnegie
University of Ottawa, Ottawa, Canada

Podcasting is an innovative, asynchronous communication tool. A pilot study was conducted to assess the utility of podcasting as an educational tool for undergraduate medical students. A paper-and-pencil questionnaire was developed and distributed to the 40 first-year students enrolled in the francophone stream of the medical curriculum at the University of Ottawa, Canada. A majority of participants endorsed the utility of the podcasting of a key-feature focused review of anatomy lecture material. The short length of the podcast, clarity of the content, and guidance with self-paced learning were among the positive aspects noted. The combination of the auditory podcasts and visual PowerPoint slides permitted the students to process information simultaneously using two different modalities. This maximized their use of working memory and facilitated learning. The investigators plan to continue their evaluation of this project by conducting a focus group study in the future.

Keywords: anatomy, podcasting, e-learning, online education

Introduction

During their preclinical years of study, medical students must absorb and comprehend a tremendous volume of basic scientific information pertaining to human anatomy, physiology, pathophysiology and pharmacology (Hay, 2005; Rangachari, 2007). The content of medical lectures is detailed and complex. For this reason, little time remains at the end of each session for in-class review and restructuring of new knowledge. Students might find it difficult to prioritize key concepts and link them with supportive pieces of information. They are further challenged by a lack of study time prior to writing summative examinations.

Context

At the time of this study, the pre-clinical medical curriculum at the University of Ottawa included didactic lectures by invited clinicians, tenure faculty, allied health professionals and members of the community. Other components of the curriculum included weekly PBL (problem-based learning), practical seminars and

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Alireza Jalali, M.D., Faculty of Medicine, University of Ottawa.

John Leddy, Ph.D., Faculty of Medicine, University of Ottawa.

Martin Gauthier, M.D., Faculty of Medicine, University of Ottawa.

Rong Sun, Ph.D., Faculty of Medicine, University of Ottawa.

Maxwell Hincke, Ph.D., Faculty of Medicine, University of Ottawa.

Jacqueline Carnegie, Ph.D. Faculty of Medicine, University of Ottawa.

laboratories (including anatomy, histology and pathology) and tutorials. The entire curriculum is available online to students who download the PowerPoint presentations from a secured Website and access their PBL cases via Internet. These students can access other learning resources on the faculty Website, such as learning objectives, case studies, detailed study notes and visual learning modules. Given this heavy dependence on Web technology, medical students at the University of Ottawa are expected to have a laptop to download and annotate lectures, access their PBL cases and facilitate access to information. The level of technological integration into the curriculum makes it the ideal test population for the implementation of podcasts as educational aids.

Podcasts

What makes a file a podcast is not its contents or its file type but rather the method used to distribute it to the audience. Podcasts are multimedia files distributed online using a standardized structure or code, for information dissemination. This particular Web programming code format is called RSS (really simple syndication) feeds. Every time a new file is added to the feed, it is “pushed” to the feed’s subscribers. Subscribers “catch” podcasts using various RSS readers such as iTunes. These files can be automatically downloaded to the subscribers’ computers or mobile devices and can then be played, replayed, or transferred between devices (with or without the help of media management software, such as iTunes) for replay at an individual’s convenience (Frydenberg, 2006). If a user subscribes to a feed, new episodes will appear in the subscriber’s podcatcher automatically. It is interesting to note that the term “podcast” designates the individual file as well as the entire series of files. A detailed description of the numerous methods for the publication of a podcast series is beyond the scope of this paper, but is easily accessed online.

Literature Review

Podcasts have experienced explosive growth in the medical and educational fields since 2005, when the *New Oxford American Dictionary* declared “podcast” the word of the year. JAMA (Journal of the American Medical Association), Lancet, BMJ (British Medical Journal), NEJM (New England Journal of Medicine) and Annals of Internal Medicine, just to name a few, all have podcasts summarizing current publications, teaching topics or discussions on topics of current interest (all available free online). Many universities’ medical programs also have institutional level podcasts available via iTunes U or on their own sites.

For those interested in implementing podcasts in a pedagogical setting, a thorough review of the rapidly expanding body of literature reveals a relative paucity of empirical evidence-based best practices when using podcasts in higher education. However, the diversity of the subjects covered testifies to the great interest of the education community in this new technology: nursing (Maag, 2006), engineering (Berger, 2007), marine science (Copley, 2007), astronomy (Gay, Bemrose-Fetter, Bracey, & Cain, 2007), computer science (Lee, McLoughlin, & Chan, 2008; Malan, 2007), medicine/critical care (Savel, Goldstein, Perencevich, & Angood, 2007), information and communications technology (Evans, 2008), distance learning/information systems management (Fernandez, Simo, & Sallan, 2009), psychology (McKinney, Dyck, & Luber, 2009), geology (Traphagan, Kucsera, & Kishi, 2010), education (Walls, Kucsera, Walker, Acee, McVaugh, & Robinson, 2010), anatomy and pathology (Jong, de Riedstra, Willems, & Bolk, 2010).

What is being studied? The first aspect study is what technologies are the students using to access and open these data? Despite of the seeming advantage of portability and the dissemination format (RSS) that

facilitates the transmission and viewing of the data on mobile devices, many studies have found that students will most often listen or view the podcasts on their PCs (personal computers) and not their mobile devices (Malan, 2007; Evans, 2008). This usage pattern exists even though the majority of students own and use mobile devices, increasingly with video capability (McKinney, Dyck, & Luber, 2009; Walls, Kucsera, Walker, Acee, McVaugh, & Robinson, 2010; Bell, Cockburn, Wingkvist, & Green, 2007). The second aspect study is how are students consuming this resource? Again, despite of the possibility to listen while commuting, exercising, relaxing or doing any other task that monopolizes motor function, a minority of students are employing pedagogical podcasts in a multitasking situation. The majority of students will use podcasts as a learning tool during dedicated learning time (Copley, 2007; Evans, 2008; Fernandez et al., 2009; Bell, Cockburn, Wingkvist, & Green, 2007). The third aspect study is the pattern of use. Maag (2006) reported that 38% of students listened to the podcasts once from start to finish while 30% listened to them once in their entirety and then re-listened to certain portions as required. A large study at UC (University of California) Berkeley by Harley, Henke, Lawrence, MacMartin, Maher, Gawlik, and Costs (2003) suggested five to ten minutes as the ideal duration because most students were only listening to short segments of the provided course recordings and Frydenberg (2006) had similar results.

As previously stated, students do not seem to exploit the portability of podcasts. Why do they use podcasts? Reasons cited for using podcasts in the learning process include the following: as a method to “slow down” the lecture, as a tool for review, as a source for learning subjects that were missed in the traditional lecture due to absence, preparation for exams, clarification on materials taught in class, examples of typical problem solving procedure, a global summary/orientation of course materials, self-assessment tool and increase in proximity between the teacher and students (distance learning) (Maag, 2006; Berger, 2007; Malan, 2007; Fernandez et al., 2009).

Students do find the podcasts more useful than course notes, according to Copley (2007). However, Evans (2008) clarified: These students found podcasts more effective than textbooks, less effective than personal notes, but more efficient than personal notes. Typical barriers to use cited by students are work overload or time constraints, lack of perceived need or non-auditory learning style (Berger, 2007; Fernandez et al., 2009).

The principal concern of educators is the potential for students to perceive the podcasts as a replacement for traditional lectures, negatively impacting class attendance. Multiple studies have found no impact on attendance or no expectation within the test population that podcasts would impact attendance (Frydenberg, 2006; Maag, 2006; Copley, 2007; Walls et al., 2010; Bongey, Cizadlo, & Kalnbach, 2006). However, Bell et al. (2007) cited a prior study in which the posting of video recordings of lectures resulted in a reduction of attendance. Traphagan et al. (2010) also showed a negative impact on attendance, but no resulting impact on performance.

Heterogeneity in podcast contents and deployment among studies and within studies makes inferring impact on performance difficult. Some examples of podcast contents include the following: five minutes revision lectures (Evans, 2008), solved problems, round table discussions and exam review (Berger, 2007), unedited lecture recordings, short course summaries and topical issues (Bell et al., 2007), student-generated podcasts (Frydenberg, 2006; Lee et al., 2008) and audio tours through a museum for anatomy and pathology (Jong et al., 2010). There is conflicting data on how podcasts impact performance. Examination results after a single podcast when compared to a traditional lecture showed improved performance, only if the student took notes while listening to the podcast (McKinney et al., 2009). Traphagan et al. (2010) found a correlation

between the number of times a student listened to or viewed a podcast with performance. Malan (2007) failed to show any impact on outcomes.

There is no consensus on ideal format for educational podcasts. Other than previously cited data, Copley (2007) found that video podcasts are subjectively preferred as a medium with the caveat that audio files are smaller and adequate when coupled with printouts. McKinney et al. (2009) added that chapters are useful for navigating within an episode, and Walls et al. (2010) found that students felt repeating course material verbatim contributed more to learning than supplemental material, although the supplemental material garnered more appreciation as the study progressed.

Aim

In this preliminary study, the podcasting process was applied to the anatomy curriculum. Podcasts were provided as targeted review sessions that linked to PowerPoint slides that students had previously viewed during lectures. The combination of podcasts and online PowerPoint slides allowed students to process simultaneously new information using two different modalities (i.e., audio and video). In this way, students could maximize their use of working memory while studying. Short-term (working) memory can organize and process a limited number of new pieces of information when using a single modality (Kirschner, 2002). However, because audio and video modalities are processed separately by short-term memory, a significantly larger volume of new information can be organized and assessed per unit time as the working memory prepares the new knowledge for transfer to long-term memory (Kirschner, 2002; Moreno & Mayer, 2000).

This approach also offers the advantage of convenience. Students can access the review sessions according to their schedules. They can study at home, in the library, or even while taking the bus to and from the university. Further, they are not limited to a single exposure for that review session. They can listen to each recording as often as needed to obtain a complete understanding of a given topic.

Finally, this approach offers the advantage of hearing the instructor's voice highlighting the key features of a particular lecture. This provides guidance as to what the instructor deemed important in that lecture, helps with the pronunciation of new terminology and provides the reassurance associated with hearing a familiar voice during the stressful time of studying for summative examinations.

In this paper, the investigators describe the design and development of selected anatomy review podcasts for first-year francophone medical students. They also provide data pertaining to the timing and extent of use of these podcasts, as well as student feedback collected during this pilot study.

Methods

This preliminary study used the anatomy curriculum. Podcasts were developed to provide anatomy review sessions to first-year francophone medical students studying the cardiovascular, respiratory and renal systems. Each podcast was approximately 20 minutes in length and was made available to students at the Website (<http://www.ianatomie.com> free of charge). Students' use of the podcasts was tracked and they assessed these review sessions to evaluate both the extent and timing of use as well as appraisals of this innovative educational tool.

In designing this project, the investigators followed the five steps of the instructional design process: define, design, develop, deliver and demonstrate (Cennamo & Kalk, 2005). First, the learners' characteristics and perceived needs were identified. Medical students are adult learners with finite quantities of time available

to study. Therefore, they require concise reviews that focus on the key-features of difficult concepts and lectures that provide a flexible and repeatable form of review that is well suited for individual study. Because 100% of the medical students at the University of Ottawa used tablet PCs, the dissemination of innovative review sessions to student computers was possible. Audio recording of lectures is a proven strategy that allows students to repeat the session many times (Deal, 2007). It was clear that distributing audio files in MP3 format of review sessions would be an innovative method attractive to this generation of students.

The investigators had to choose between distributing the entire lecture and recording key points for a shorter review. In his study, Frydenberg (2006) found that students tended to listen to the portion of the lecture that covered a topic that they did not understand (i.e., 10 to 20 minutes). Therefore, the investigators decided to record short, topic-based review sessions of 15 to 20 minutes that included only key features of the lecture. The choice of including only key features of clinical anatomy—which were considered as the most practical to a future physician—was adapted from the use of key features problems in clinical decision-making assessments by Page and Bordage (1995).

Because timely posting of sessions is important (Jong et al., 2010; Deal, 2007), each review session was recorded in MP3 format immediately following each lecture and posted on the Website (<http://www.ianatomie.com>) as a podcast. Students previously had access to the relevant PowerPoint lecture slides, so they had the option to simply download the audio files or also to use them in conjunction with the lecture slides.

The recording process required simple equipment. The audio recording was accomplished in a standard office with a laptop using a headset equipped with a microphone. The script of the recording was derived from a short review of the key features from each slide. Audacity®, an open source software, was used for recording and post-production editing of the audio files. The review session was saved in MP3 format.

Although it is possible to post podcasts on a traditional Web page so that students can click to download each individual episode, students reported that, “The convenience of obtaining files via RSS increases the likelihood” that they would use the recorded lecture for review (Frydenberg, 2006). Therefore, the investigators utilized RSS-enabled dissemination technology, effectively transforming these MP3 review sessions into a podcast. Podcasting enabled the students to subscribe to the review through RSS, which allowed their computer or PDA (personal digital assistant) to automatically download newly posted review sessions.

The MP3 file corresponding to each lecture was uploaded to the Internet on a host server: a provider of free, Web-based tools and services for podcasting (e.g., PodOmatic® and Podbean®). Each podcast could then be retrieved by different podcatchers (e.g., iTunes and Google Podcast) through the host server. Podcasts were also linked to the main site (<http://www.ianatomie.com>), so that students could easily locate and download them at their convenience.

Data Collection

To explore the ways in which students used the podcasts and gather their feedback about this study tool, a paper-and-pencil questionnaire was developed and distributed to the 40 first-year students enrolled in the francophone stream of the medical curriculum. The questionnaire was distributed at the end of the academic year. Students were informed that survey data would be kept anonymous. In addition, they were told that participation in the study was completely voluntary and their access to the review podcasts would not be impacted by their decision to participate. The survey consisted of ten questions that collected information pertaining to student demographics and timing and extent of use of the podcasts, as well as student assessment

of podcast length, clarity, relevance and general utility as a study tool. An additional question provided students with the opportunity to make comments and provide suggestions for improvement. Attendance was monitored via in-class head count.

Results

The questionnaire was completed by 92% of the francophone medical student population at the end of the academic year. The feedbacks from the students were overwhelmingly positive. When asked about their use of the podcasts, 73% of the students responded that they listened to the podcasts. Of those students, 33% listened to each podcast twice and 15% listened to the podcasts three or more times. Of those students who utilized the podcasts, 67% listened to the entire podcast whereas the remaining 33% of students listened to only the part of the podcast that covered materials that they did not understand in class or that they felt would be important material on which to focus for the upcoming examination. The most common reasons cited by students (27%) who did not listen to the podcasts were lack of time, more traditional study habits and clarity of the lectures alone.

When the students were asked to comment on the length of the podcast, they were unanimous in their assessment that the length of each podcast was optimal. Ninety-three percent of the students reported being satisfied with the amount of contents associated with each podcast-supported PowerPoint slide. A majority of students believed that a short lecture review in the form of a podcast was a useful educational tool. They found the tool to be clear, well-paced and supportive of their preparations for summative examinations. A majority of students (67%) reported that a useful addition to the podcasts would be the inclusion of an answer session dealing with frequently asked questions.

It is noteworthy that there was no significant decrease in lecture attendance during the period that the podcasts were available. This supports the contention that most students perceive lecture podcasts as a tool for review, rather than as a replacement for lectures (Malan, 2007).

Discussion and Conclusions

Student and faculty responses to podcasting have been encouraging. A majority of students found the podcasting of a short lecture review to be a useful educational tool. The short length of the podcasts, clarity of the content and ability of podcasts to support self-paced learning were among the positive aspects noted. The most common reasons cited for not listening to the podcasts included lack of time, more traditional study habits and perceived lack of need due to the clarity of the lectures alone. The combination of the auditory podcasts and visual PowerPoint slides permitted the students to process information simultaneously using two different modalities. This maximized their use of working memory and facilitated their learning.

A noticeable benefit associated with the use of podcasting as a form of asynchronous learning is the ability to manage personal learning and maximize convenience. Students can access the review sessions at their leisure and are not limited to a single exposure of the review session. Another benefit is the ability to select materials according to learning needs. The "canned talk" (self-supporting educational moment) format of podcasts allows students to pick and choose which material will help them learn most effectively for their time investment, empowering students with further ownership of their learning process. The investigators also believed that podcasting achieves the aforementioned educational objectives in an economical way, as the equipment needed for their preparation is relatively simple.

The results of this preliminary study suggest that continued, formal evaluation of the effectiveness and benefits of this method are warranted. The investigators planned to continue their examination, using questionnaires and focus groups to understanding further the best practices in medical education podcasting. The remainder of the anatomy curriculum is being adapted to the podcast format and two medical students are producing podcasts concerning other aspects of the medical curriculum to explore the usefulness of peer-to-peer medical pedagogy. Future directions might include variations on the format (i.e., question and answer, case-based) and the timing and method of distribution.

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