A Test of Podcasting Effectiveness for Lecture Revision

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It is important to understand how student performance when higher education is delivered by via new technology. Podcasting is a relatively recent new technology gaining widespread use across the world. We present the results of a quasi-experimental research project that finds when podcasts are used as a revision tool, student performance in Accounting improves. We highlight that aligning podcast use with pedagogical design is important and discuss constraints on and barriers to the use of podcasting in higher education.

**Keywords**: business education; e-learning; management courses; transfer of training

As the use of technology in higher education continues to grow (Martins & Kellermanns, 2004; Proserpio & Gioia, 2007), it is important for academics to understand when and how different technologies are best employed to improve student learning outcomes (Klimoski, 2007) One recent innovation experiencing a rapid uptake in the university and secondary school environment is podcasting (e.g. see McLoughlin & Lee, 2007). Despite the many uses and rapid uptake of podcasts, there is little evidence on whether (or how) podcasting can improve learning.

In this paper, we focus on this gap and present data that suggests podcasting can be used to assist students to review course materials. We begin by defining what we mean by podcasting and briefly reviewing the scale and scope of use of podcasting. We then review the research on podcasting, noting the emphasis on qualitative assessments of student experience in the literature and a recurrent theme that students use podcasts as a safety net or review tool. The few empirical papers on the impact of podcasting on student learning overlook this theme and instead investigate the impact of podcasting as a substitute for or alternative to traditional lectures. We focus on the impact of podcasts as a revision tool and find that podcasts developed as a revision aid improve student performance irrespective of personality type, previous academic performance, English-speaking status, gender or age. We conclude with a discussion of the implications of podcasting for pedagogy, faculty and students.
PODCASTING: DEFINITIONS AND EARLY USE

Students have been generating their own recordings of lectures for decades (White, 2009). What is new is harnessing the advantages of audio-visual materials in a structured, readily accessible way. The term podcast derives from the combination of the words iPod (a portable digital media player produced by Apple Inc.) and broadcasting.

As with many new technologies, there is no universal view on what the term podcast means. For our purposes, we take a podcast to mean “an audio and/or video file that is available as an internet download or online streaming content” (Guertin, Bodek, Zappe & Kim, 2007:134).

There are two reasons why podcasting is a potentially disruptive technology for education compared with previous audio and video mediums. First, podcast files can be downloaded and played at the users discretion, thus providing a step change in convenience for the learner (Boulos, Maramba & Wheeler, 2006; Chan & Lee, 2005; Evans, 2008; Knight, 2006). Coupled with a distribution method that students understand (Evans, 2008), it provides equitable access given its ability to be used in a multiplicity of mobile devices or on computers (Maag, 2006)

Second, the technology behind podcasting is enormously popular. iPods and similar devices are fashionable and appealing to younger students seeking alternative forms of teaching and learning (Chan & Lee, 2005: 64). Consequently, podcasts are considered a transparent technology because learners understand the required behaviors (Wheeler, Kelly & Gale, 2005). In summary, many educators see podcasts as a critical way to connect to students in a way they understand.

Uses and uptake of podcasting in higher education

The many different uses of podcasting by a variety of institutions highlights that podcasting is a tool rather than a strategy for learning (e.g. Dupagne et al., 2009). Variations in the use of podcasting also abound. Podcasts have been used as the basis for a project to stimulate active learning through the development of learner generated content (Dale & Povey, 2009). In this context they have been used to study foreign language phonetics (Lord, 2008), to encourage learning in a multicultural educational setting (Beilke, Stuve & Williams-Hawkin, 2008) or to engage at-risk student groups. Second, podcasts have also
been used as an assessment task (Salend, 2009) and as a means of providing feedback on assessment to students (Davis & McGraw, 2009) rather than as a dyadic instructional medium. Third, podcasts have been used to provide supplemental materials to students (Robinson & Ritzko, 2009) such as listening to historical ballads in a US civil war history class (http://www.itap.purdue.edu/lt/Boilercast/) or to high resolution heart and respiratory sounds for medical students (Boulos et al., 2006). Finally, educational institutions also use podcasts for other outreach purposes, such as engaging constituents. For instance, they are thought to be an avenue to maintain connection and life-long learning with alumni (Pownell, 2004).

**CURRENT RESEARCH INTO PODCASTING USE IN EDUCATION**

While there are many potential ways to use podcasting, most educators use the medium to record and/or supplement lectures. Providing lecture recordings allows students to review materials and/or cover materials in classes they may have failed to attend (Gribbins, 2007). There is also an increased flexibility for students who can repeat, pause and forward the materials in a podcast (as opposed to a traditional lecture). Where podcasts are developed separately from a recording lecture, they also have the benefit of being "designed to summarise material in some way..." (Evans, 2008: 493).

**The student experience of podcasting**

Providing the technology for students to listen to podcasts does not necessarily translate into effective learning, however. Research to date has concentrated on how podcasts affect the student experience rather than how podcasting affects learning or student assessment outcomes. Thus, podcasts have been shown to reduce student anxieties (Chan & Lee, 2005; Lee & Chan, 2007), increase student satisfaction ratings (Miller & Piller, 2005), improve student engagement (Edirisingha & Salmon, 2007), increase student reflection (Baird & Fisher, 2006) and to reduce the loss of underrepresented students (Boylan, 2004).

A major theme that emerged from every empirical study we reviewed was the reported support for podcasting attributed to students. For instance, Pilarski, Johnstone, Pettepher & Osheroff (2008: 630) found that medical students reported “universally positive” attitudes to enhanced podcasts with students perceiving that podcasts helped them learn course materials and reduce anxiety and stress. Similarly,
Evans (2008) found that significantly more students report that revisions from a podcast were quicker than revising from notes, more effective than revising from textbooks and that students were more receptive to podcast materials compared to textbooks or revision lectures. Table 1 provides a more comprehensive review of this literature.

Despite this positive perception among students, results suggest that a large proportion (if not the majority) of students do not see podcasts as important to their learning. For instance, Gribbins (2007) reports that fewer than half of the 47 students in their study thought that listening to podcasts would improve their performance. Instead, results suggest that students perceive podcasts as an additional safety net (e.g. podcasts used for review purposes – see Dupagne, Millette & Grinfeder, 2009; Shantikumar, 2009).

This presents an interesting conundrum - students perceive podcasting positively, but do not believe podcasts will improve learning. Consequently, we believe that investigating the difference between perceived usefulness and learning effectiveness is a potentially fruitful area of investigation.

Podcasting and learning effectiveness

Our aim is to begin addressing the criticism that there are few empirical studies into podcasting effectiveness (Guertin et al., 2007). In studies that move beyond the general attractiveness of podcasts to students, most concentrate on aspects of the student experience. Specific evidence on podcasting effectiveness is thin and mixed with most general empirical papers falling into one of three categories.

First, some studies examine the impact of podcasts as a substitute for or alternative to traditional lectures. Early indications are that podcasts used as alternatives or substitutes have a positive or neutral effect.

Students screened a podcast summary of lecture materials performed to the same level as when compared with students who received a “live” summary (Rhoads, 2009). In contrast, McKinney, Dyck & Luber (2009) found that those students provided with a podcast and who took notes during playback outperformed those that took a live lecture.
The second series of studies seek to understand the effects of podcasts when provided in addition to traditional teaching methods (i.e. the main way students view podcasts as useful). This research provides mixed findings on the usefulness of podcasts as a supplementary tool. In a controlled experiment involving 25 students, Pitts (2008) reports those provided podcasts outperformed those who were not. In contrast, Dupangne et al. (2009) reported in their study of 261 students that providing students with podcasts did not improve student outcomes.

The third group of studies examines the effect of podcasts when they are integrated into class pedagogy. This body of research reports a positive effect on on educational outcomes. For instance Lord’s (2008) use of podcasting in teaching Spanish or Carle, Jaffee & Miller’s (2008) use of podcasts to monitor group discussions and provide student feedback.

The current evidence is summarized in Table 1. The table highlights a key challenge for researchers and educators: controlling the context of the study. There are many important factors at play in the learning environment, not least of which include the differences in podcast type (audio, video, enhanced, etc.), the course type, the pedagogical use and the type of student. These important aspects of study design have been shown to influence outcomes (e.g. Shantikumar, 2009, Abdous, Camarena & Facer, 2009).

In order to move beyond “latching onto the most recent wave of technological advance without considering fundamental practical and evaluative pedagogical issues” (Lane & Shelton, 2001: 241) we decided to focus our research effort on one type of podcast. Specifically, we were interested in understanding if the major use of podcasts as a review tool (Brittain et. al., 2006) affected student performance, so our first hypothesis was that:

**H1: Students who use a review podcast will outperform those students who do not.**

A key challenge for our research was the possible impact of student attributes that may confound our results. Thus, we collected data on previous podcasting experience, personality traits, English language skills, age, and previous academic performance to enable us to assess confounding relationships. Our second hypothesis builds on this work and we propose that:

**H2: Student use of podcasting is related to individual characteristics.**
H2a: Students where English is not the first language are more likely to use review podcasts.

H2b: Students who use podcasts are more likely to be younger than students who do not use podcasts.

H2c: Students with previous experience with podcasts are more likely to use podcasts as a review material.

H2d: Student personality traits are related to podcast use.

H2e: Students with a higher GPA are more likely to access podcasts.

**APPROACH**

We decided to use a quasi-experimental design to overcome the difficulties associated with measuring effects in large lecture settings (Huntsberger & Stavitsky, 2007). Our design involved running two revision classes in accrual accounting for first year undergraduate and postgraduate accounting students.

**Participants**

We invited all students in two introductory accounting subjects (one undergraduate and one postgraduate) to take part in the study. Students were invited to attend two revision lectures on consecutive weeks in addition to their regular course lectures. From a total of 712 students invited, 133 took part in the study. Students who took part in the study benefited from extra tuition in a difficult topic and received refreshments (pizza and soft drink) following the sessions. At each session we also randomly selected one participant to receive a double movie pass.

**Podcast**

We designed the podcast according to “best practice” guidelines from the literature. This suggests that enhanced podcasts (i.e. those with supplemental video content) are more useful than pure audio podcasts. Similarly, most guidelines call for limiting podcast length (e.g. Lee & Chan (2006) recommend 3-5; Frydenberg’s (2008) and Ormond’s (2008) research suggest a 10 minute maximum). Thus, our podcast was not an audio recording of the lecture, but two pre-recorded 10-minute summary podcasts of the key
points. The limited length of our podcasts matched our research design, which was to test the impact of podcasts used as a review mechanism.

**Method and Analysis**

Each participant was required to attend two sessions, each lasting for one hour. At the first session, students were asked to complete a series of questions designed to assess their personality type as well as their experience with and attitudes to podcasting. A 40-minute revision lecture on the topic of accrual accounting followed. We chose accrual accounting as the topic as it is one of the most challenging topics for this cohort of students. We anticipated that a difficult topic would: (1) be more attractive for revision exercises and (2) provide greater dispersion in test results, thus increasing the likelihood of identifying learning differences between conditions.

Each participant was placed into either a control group (who did not receive access to the podcasts) or a treatment group (who did receive access to the podcasts). As indicated, the treatment group received an email with two links, each to a 10-minute narrated powerpoint video summary of the lecture content.

A week later, participants were asked to participate in a second session where they were invited to complete a short series of questions about their use (or non-use) of the podcast. They were also required to complete a 10 question multiple choice quiz. The remainder of the session was used to provide further instruction using an adapted Team Based Learning approach (Michaelsen, Knight & Fink, 2002).

We were careful to try to control for potential influences on performance. Each session was facilitated by the same research team member, with the two other researchers in support. The same materials were used in the lecture, with the presenter using a tight script to run the class. There were two different opportunities to participate, one scheduled to coincide with day classes and one with night classes to account for differences in when students attended lectures. We also gained consent to access student records, which allowed us to investigate relationships between our results and academic performance, study status (full time or part time), year of study and so on.
Following the completion of the surveys, data were entered into SPSS. We conducted a two-way ANOVA analysis to test if the treatment group outperformed the control. We also ran ANOVA analysis to test for differences between podcast users and non-users based on the attributes of interest.

RESULTS

Characteristics of the participants

Since our research ran across two sessions, we present the characteristics in two stages. For the initial review lecture, we had 133 participants\textsuperscript{ii}. The mean age of participants was 23.4 (6.6), and 36.4\% of the group were male. Some 48.8\% of the group reported English was not their first language and the mean GPA of participants was 4.8 (1.1).

In the second study, we had 54 participants where we assessed their understanding of accrual accounting and administered a survey on their use of podcasting over the previous week. The mean age of this group was 23.6 (6.5) and 38.2\% of the group were male. Some 52.7\% of the group reported English was not their first language and the mean GPA of participants was 5.1 (.97).

Familiarity and use of podcasts and technology.

We quizzed the participants around their current exposure to podcasts in the first session. Of the 125 participants\textsuperscript{iii}, some 40 (30.1\%) had never used podcasts, another 41 (32.8\%) had not used podcasts in the last month and 11 (8.8\%) had not used podcasts in the last few weeks. We found that 33 students (24.8\%) used podcasts weekly or more regularly.

Reported usage differs from reported possible uses of podcasting (multiple responses possible). Only nine participants (6.8\%) stated they would not use podcasts in any form, 82 (65.6\%) indicated that they would use podcasts in a formal education setting and 63 (50.4\%) indicated they would use podcasts for informal education.

Post treatment results

The 54 participants in the post treatment exercise could be broken down into three groups: 16 individuals were not provided a podcast (i.e. the control condition), a further 26 were provided access to the podcasts
but did not download either, 3 individuals downloaded one podcast and 9 individuals downloaded both podcasts.

The survey asked the 26 individuals who were provided podcasts but did not download them, why they did not download. We thematically coded the responses and, as Table 3 highlights, four main reasons emerged. Students did not download the podcasts due to (1) technical problems, (2) a lack of time, (3) unclear instructions or (4) a perception that the podcasts were not important to learning. A full description of the themed responses gather are presented in Table 2

| Insert Table 2 about here |

Use of podcasts.

The ability to access and view the podcast is essential. Therefore we quizzed the participants at various stages of the research for their views on devices they would use, devices they actually had access to, and devices they in fact used to view the podcasts. Results are summarised in Table 3 and indicate that the vast majority of participants use a computer (not a mobile device) to access the podcasts.

| Insert Table 3 about here |

Impact on performance

A one-way ANOVA was used to test for differences in the quiz performance between the two groups (i.e. those who had downloaded the podcasts and those who had not). Performance on the quiz differed significantly between the two groups⁴, F(1, 38) = 6.41, p=.016. Figure 1 highlights that participants who had downloaded podcasts outperformed those who had not. Thus, hypothesis one is supported.

| Insert Figure 1 about here |

The low number of podcast participants raised the possibility that some other attribute of the group that downloaded podcasts was associated with this result. We attempted to exclude other causes and ran a series of one-way ANOVAs around various demographic, psychological and performance measures to isolate any other possible causes. Results indicate there was no significant difference in the two groups
based on GPA, \(F(1,38)= 1.34, p=.254\) where the mean GPA for the podcast group \((4.7)\) was lower than for the non-podcast group \((5.1)\).

There were also no differences between the groups in terms of extraversion, \((F(1,35)=.72, p=.40)\), agreeableness \((F(1,36)=.07, p=.79)\), neuroticism \((F(1,34)=.72, p=.40)\), openness \((F(1,35)=.70, p=.41)\) or conscientiousness \((F(1,34)=.01, p=.91)\). There were also no differences based on gender \((F(1,38)=.64, p=.43)\), age \((F(1,38)=.00, p=.97)\) or English as a first language \((F(1,36)=3.95, p=.06)\).

Thus, hypothesis two is not supported. Specifically, differences in English status \((H2a)\), age \((H2b)\), previous use of podcast \((H2c)\), personality traits \((H2d)\) and previous academic performance \((H2e)\) were not evident in the use of podcasts.

**Usefulness and ideas for future development**

We asked all participants from the second workshop to rate their perceived usefulness of podcasts as an educational tool. As figure 2 shows, 96.4% of participants (both those who had and those how had not received the treatment podcasts) rated podcasts as *somewhat useful* (i.e. score of 5) or higher and 52.2% rated the usefulness as 8/10 or higher.

**DISCUSSION**

With the advent of the internet, much has been written about the potential “technological break through[s] that will change the nature of education.” (Baker & White, 1999: 257). The aim of this research was to separate promise from evidence by investigating the effectiveness of podcasting as a teaching and learning tool. While we recognize the limitations of the final sample size and one-topic focus of our research, our quasi-experimental design supports the emerging evidence that podcasts can improve student performance, particularly when employed as a revision or supplemental tool (Carle, Jaffee & Miller, 2008; Frydenberg, 2008; Lord, 2008; McKinney, Dyck & Luber, 2009; Pitts, 2008).

The findings from our ANOVA analyses indicate there is no difference based on the attributes of students. We initially thought that personality attributes such as openness or conscientiousness would influence the uptake of podcasts and represent possible confounds. While we acknowledge a possible
power issue in the data, there was little support for personality type affecting podcast use. Similarly, there were no differences in use based on previous academic performance, nor demographic attributes, although the use of podcasts by students where English is a second language may benefit from further investigation. Further studies that improve on our participation rates and subject matter would provide additional support for these findings.

Our insights into what is required to take podcasting to the next stage would also benefit from further investigation. Specifically, participant responses indicated that most students intend to and actually do use podcasts on computers rather than on mobile devices (see table 3). Thus, despite the potential game changing possibilities provided through the portability of the medium, our results clearly identify that people are not adopting these new possibilities and students frequently listen to academic podcasts on their desktops rather than mobile devices (Brown & Green, 2007; Lonn and Teasley, 2009). Perhaps students segment their educational and entertainment use of media and devices where mobile devices are used to transition between various aspects of their lives (e.g. Kreiner, Hollensbe, and Sheep, 2009)? Perhaps they have not thought of using podcasts in a mobile environment – as suggested by general evidence that 80% of podcasts are not transferred to mobile devices (Dixon & Greeson, 2006)? Clearly a line of enquiry designed to understand whether mobile learning can improve student performance is warranted.

Similarly, there are clear barriers for a number of students surrounding the technological and communication barriers to using new tools. Understanding how to limit these barriers may be a substantial step forward in contributing to the impact of podcasting. Trialing alternative delivery methods (email versus RSS push versus website pull) or even the use of commercial versus standard delivery methods (iTunes U versus Blackboard) offer good opportunities to understand the dynamic involved in student uptake.

The major implication for practice arising from our study is for the adoption of podcasting (and new technologies) to have a clear pedagogical purpose and implementation strategy (e.g. Maor, 2006). First, our study was carefully designed to test the use of podcasts as a review tool. Different results may follow when it is used as a substitute for lecturing or to provide supplemental materials. Another major
unexplored benefit of podcasting is the additional focus provided to the instructor. While 2-3 hour lectures allow for a broad investigation of the subject matter (including necessary clarifications) the discipline of summarizing that content down into key points that can be delivered in one or two 10 minute broadcasts may more clearly transmit the key facts in the session. The act of podcasting lecture summaries focuses both teacher and learner, leading to clearer transmission of the key points.

Pedagogically, it also addresses concerns that audio is underutilised (Chan & Lee, 2005)

Second, the data collected from students who did not download the podcasts demonstrates that implementation is critical. Most (16/26) comments explaining why participants did not use the podcasts focused on technical issues or problems with the communication of instructions. This suggests that faculty implementing podcasts need to pay clear attention to student behaviours and technical barriers.

Implementing solutions through existing and well used channels would appear to hold promise (for instance using services like iTunes U rather than institution specific solutions).

Similarly, it would be unwise to assume any cohort of students is universally podcasting savvy. Ensuring students know how to use even the simplest technology appears to be important, so initiatives such as podcast use demonstrations would, we contend, prove useful for student uptake and podcasting success.

While there is a clear and positive orientation of students to podcasts and evidence to date is generally supportive of their use, there are concerns raised with the use and implementation of podcasting. Maag (2006) identifies up-take by faculty as a (if not the) key constraint to the adoption of podcasting.

In terms of faculty up-take, educators need support when developing the new skills required to develop podcasts (Brown & Green, 2007). While preparing multimedia may appear daunting to the average academic, so too were typing, preparing powerpoints and word processing. Today, these skills are "simply assumed" (Campbell, 2005: 36). In fact, evidence suggests that podcasts are not onerous on the producers (i.e. academics) (Racatham & Zhang, 2006; Malan, 2007). Podcasts provide a way for educators to answer calls to use technology to improve the delivery of content (Holcomb and Michaelsen, 1996; Nelson, 1996).
The potential benefits of podcasting to higher education are enormous as the ability to deliver on-demand audio and video content has the potential to change higher education. The weight of evidence clearly indicates students have positive perceptions of podcasting. Emerging evidence, including that presented here, suggests that well designed pedagogically sound podcasts improve student performance. The benefits go beyond students, however, and anecdotal evidence suggests they can improve the work experience of academics once new skills are mastered. Overall, the evidence suggests we should be asking “how” rather than “whether” we should be using podcasting.
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### TABLE 1

Summary of Podcast Effectiveness Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Subject</th>
<th>Use of podcast</th>
<th>Participant</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lord (2008)</td>
<td>Spanish language</td>
<td>Students developed their own podcasts</td>
<td>16 Tertiary (undergraduate) students</td>
<td>Improved student attitudes and pronunciation</td>
</tr>
<tr>
<td>Carle, Jaffee &amp; Miller (2008)</td>
<td>Research methods</td>
<td>Student group work was recorded and reviewed by instructor</td>
<td>25 Higher Research Degree students</td>
<td>Improved student engagement and performance in a written assignment</td>
</tr>
<tr>
<td>McKinney, Dyck &amp; Luber (2009)</td>
<td>More effective learning from podcast then from lectures</td>
<td>Podcasts provided instead of lectures</td>
<td>67 college students</td>
<td>When compared with students attending a lecture (control group), students who received a podcast and took notes outperformed those attending a lecture and taking notes</td>
</tr>
<tr>
<td>Dupagne et al., 2009</td>
<td>Video podcast as revision tool</td>
<td>Vodcasts provided to students in addition to traditional materials</td>
<td>261 students across 7 classes over an 18 month period</td>
<td>Providing video podcasts did not assist learning</td>
</tr>
<tr>
<td>Pitts, 2008</td>
<td>communication research methodolgies</td>
<td>Provided podcasts in addition to lecture materials</td>
<td>11 students provided podcast and 14 students not provided</td>
<td>Those students provided podcasts outperformed those that were not.</td>
</tr>
<tr>
<td>Rhoads, 2009</td>
<td>Teacher education</td>
<td>Summary of lecture shown as a podcast to the lecture room rather than live summary</td>
<td>145 undergraduate students enrolled in seven teacher education health classes during the fall semester of 2009</td>
<td>No difference between those shown a podcast and those receiving a “live” summary.</td>
</tr>
<tr>
<td>Frydenberg, 2008</td>
<td>Information Technology</td>
<td>Success of student-created podcasts of lecture materials</td>
<td>54 students studying an IT course at a business college</td>
<td>Podcasting improved student outcomes in exams</td>
</tr>
</tbody>
</table>
### TABLE 2
Themed Responses for Participants who did not use a Podcast

<table>
<thead>
<tr>
<th>Reason</th>
<th>Number</th>
<th>Percentage (of those in condition)</th>
<th>Sample comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical problems</td>
<td>8</td>
<td>21.1</td>
<td>• I downloaded them, but couldn't play them.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• File would not download despite repeated attempts.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Did not work. sorry I did not have time to ring to IT help.</td>
</tr>
<tr>
<td>Lack of time</td>
<td>8</td>
<td>21.1</td>
<td>• I didn't get the chance to do.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Haven't had time to sit down &amp; watch. Was waiting till last workshop was held.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• No time.</td>
</tr>
<tr>
<td>Unclear instructions</td>
<td>6</td>
<td>15.8</td>
<td>• I didn't realise to download them</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• I don't know where to download them</td>
</tr>
<tr>
<td>No interest or saw no benefit</td>
<td>4</td>
<td>10.5</td>
<td>• Because I don't need them yet. If I have more adverse problems, I will use them as a last resort. they are a bit inconvenient &amp; boring to use especially on my iPod.</td>
</tr>
<tr>
<td>Total provided podcast but not downloading</td>
<td>26</td>
<td>68.5</td>
<td></td>
</tr>
</tbody>
</table>
TABLE 3

Intended versus Actual Use of Podcasting Playing Device

<table>
<thead>
<tr>
<th>Device</th>
<th>Which device you use to use a podcast (pre-treatment)</th>
<th>Which devices did you have access to during period (post-treatment)</th>
<th>Which device did you use to view the podcast (post-treatment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>83.2%</td>
<td>72.2%</td>
<td>91.7%</td>
</tr>
<tr>
<td>iPod</td>
<td>45.6%</td>
<td>20.4%</td>
<td>8.3%</td>
</tr>
<tr>
<td>MP3</td>
<td>19.2%</td>
<td>13.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Other</td>
<td>24.0%</td>
<td>1.9%</td>
<td>0.0%</td>
</tr>
<tr>
<td>n</td>
<td>133</td>
<td>54</td>
<td>12</td>
</tr>
</tbody>
</table>
FIGURE 1
Comparison of Results of Podcast Treatment versus No Podcast Treatment

Mean test results

Podcast
No Podcast
FIGURE 2

Overall Perception of Usefulness of Podcasting

Overall, on a scale of 1 to 10, how useful do you think podcasts are as an educational tool?

Rating (1=not at all useful; 5=somewhat useful; 10=extremely useful)
We used supplementary lectures to meet research ethics requirements. Using an experimental, treatment design in a live course would deny some students access to materials that could affect their educational outcomes. Therefore our entire design was based on a series of voluntary, supplemental activities.

There were actually more students who took part in these sessions. All participant figures are based on those that returned an informed consent form.

Participant numbers for various elements of the results section differ due to some participants not returning each instrument we administered. The total number of student participants was based on the number of informed consent forms. The participant numbers for other reports are based on the usable responses we received in the full instrument that we administered.

While we had 55 participants in the second sessions, there were only 39 usable responses to the survey. There were no statistical differences in student attributes between those that had a usable response and those that did not.