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In this issue:

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# Principles and Pedagogy: The Two Ps of Podcasting in the Information Technology Classroom

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## ABSTRACT

The recent increased popularity of portable media players has made podcasting an attractive option for many college professors to distribute their course lectures to students. This paper describes one information technology course in a business college where the students, rather than the teacher, create podcasts based on the course lectures materials. In the process, students learn to use software tools to create multimedia presentations that convey their understanding of course topics, as well as the technologies required to post them as podcasts. An end-of-semester survey gave insights into how students used the podcasts on their mobile devices to contribute to their learning, and an analysis of web server logs suggested that a majority of the students downloaded the podcasts to their portable media players, laptops, or PDAs.

**Keywords:** podcasting, information technology, mobile learning

## 1. INTRODUCTION

A podcast is an audio or video file distributed to an appropriate media player over the Internet. Podcasting uses the publish/subscribe model, where a media producer publishes content. Users subscribe to a series of podcast episodes known as a feed. At the heart of a podcast feed is a file in XML (eXtensible Markup Language) format that follows the RSS (Really Simple Syndication) specification. This file contains an index of all of the items, or episodes that are available. A podcast feed is simply an RSS file where each item contains a multimedia enclosure. An aggregator program periodically samples subscribed feeds in order to automatically download newly posted podcast episodes as they become available to portable media players or computers.

As many college students own audio or video iPods or other portable MP3 players to listen to music or other multimedia content, pod-

casting has found its way into higher education as a natural way for faculty to disseminate recorded information to students. The ability to listen "on the go" using a portable media player, PDA (personal digital assistant), cell phone, or personal computer has made podcasting an attractive tool for learning.

## 2. PRINCIPLES OF PODCASTING

"It is difficult to define podcasting as a technology or a phenomenon." (Hargis and Wilson, 2005). Rooted in emerging technologies which are often transparent to their users, podcasting in an academic setting has become an accepted one-way channel of communication between teacher and students, as faculty have seen the potential impact of creating podcasts of lectures and other course materials. While first associated with Apple's iPod portable audio player, others have redefined the term "podcast" as an acronym meaning "personal on-demand," re-

flecting the immediate nature of this new form of communication which allows individualized content to be "broadcast" to one's device simply by downloading it. For students as well, the use of iPods or personal media players for learning is an attractive one, since many students already own them. "These devices have a tremendous consumer appeal that works to their advantage, particularly for younger students who may be impatient with other forms of teaching and learning." (Chan and Lee, 2005).

The Chronicle of Higher Education (Reed, 2004) reported that in 2004, Duke University distributed iPods to all of their freshman class, introducing the notion of "coursecasting," where faculty would make their lectures available as podcasts. A similar opportunity was available at Purdue University, where downloading digital audio files replaced the process of checking out cassette tapes from the college library. A support procedure was in place to do all of technical work, so that there would be no extra burden on faculty other than recording the lecture. Several colleges followed suit, and by spring 2006, with the increasing sales of Apple's iPod, podcasting course lectures has become much more widespread. Several software tools are now available that simplify the process of posting podcast files to a web server for download so that additional outside support becomes less necessary.

Hargis and Wilson (2005) discuss the promise that podcasting holds for educators as a tool for promoting conceptual learning. "A podcast allows learners to either listen to others share their ideas - real, raw and spontaneous - which captures their attention and can sustain this attention sufficiently to enable transfer of these concepts into their long term memory. Secondly, learners can create their own audio podcast, which enables them to reflect on their own learning verbally."

Eash (2006) describes other educational uses outside of the classroom. "Librarians ... can create a walking library orientation for students to carry around on an MP3 player, following instructions as they learn about different areas or resources within the library." Students might use digital voice recorders to record interviews, oral histories, or other observations and then produce podcasts sharing what they learned.

Chan and Lee (2005) studied podcasting to address preconceptions and anxiety on student learning, and make the case for the use of audio technologies in teaching and learning in a first undergraduate information technology course at Charles Sturt University. They have raised several issues related to the podcasting of classroom lectures: For how long will students listen to a podast? Will students skip class because they know that podcasts of the lectures will be posted on line? How does podcasting contribute to student learning? To what types of content would students most likely listen?

For students listening to podcasts of entire course lectures, many of which may be an hour or longer, one difficulty in their being a useful study tool is the inability to search the audio for a key term, in order to listen to only that section that a student wishes to review. One web site, podzinger.com, has developed a process that converts audio to text, and determines the location within the audio where each term occurs. Shorter podcasts with accurate descriptions may also simplify this process, although that puts an additional burden on the individual creating and posting the podcast to listen to, edit, and trim or splice the audio prior to posting it. This timely process detracts from the ability of being able to record and post multimedia almost immediately after a class has ended.

Table 1 summarizes many of the pros and cons of using podcasting in the classroom.

**Table 1. Issues related to Podcasting in the Classroom**

Pro
Many students have iPods or portable media players and Internet access, making podcasting a natural for disseminating information.
Good for recording lectures with little student involvement
Great for distance learning when students don't need to be in the classroom
Useful for supplementary material or explanations

<b>Con</b>
Who's going to listen again for an hour?
Podcasts are not easily searchable
Hard to record many voices in highly interactive courses with lots of discussion
Searching is difficult (shorter is better)
Video quality poor for demonstrations
Will the availability of podcasts impact classroom attendance?
It takes additional time for the instructor to edit audio and post it.

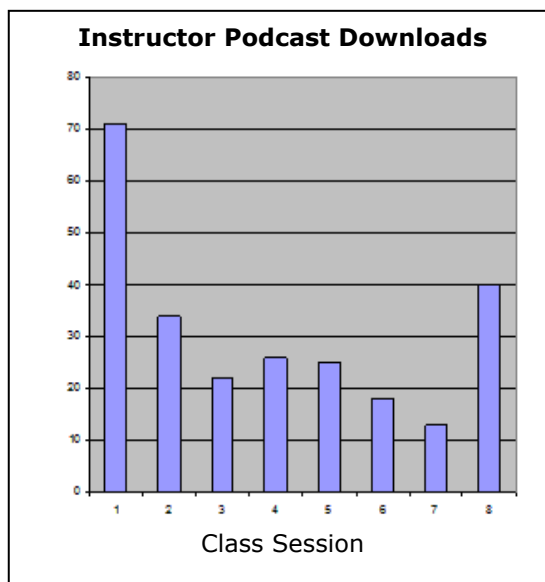
**3. PEDAGOGY: INTRODUCING PODCASTING IN IT 101**

IT 101 is an introductory technology course at a business college. This course includes topics such as how to use the Internet, maintaining a personal computer, hardware and software, creating and posting web pages, multimedia, spreadsheets, and emerging topics in information technology. Because podcasting applies and unites several concepts presented earlier in the course (multimedia, FTP, understanding file sizes, URL's) and introduces several new ones (RSS readers, aggregation services, publish/subscribe model, and XML), it seemed appropriate to add this topic to the IT 101 syllabus.

In the two sections of IT 101 introducing podcasting, all of the 54 students own laptop computers and purchase Pocket PCs instead of textbooks, as part of the course. Students use their Pocket PCs to explore technology concepts in a hands-on approach to learning. The use of Pocket PCs makes portable video podcasting possible without requiring the use of a video iPod, as students could download and install software that enables their handheld devices to function as a portable video player. Almost all of the students in the class already owned iPods or other portable MP3 (audio) players. Approximately ten percent of the students owned video iPods as well.

Like many other college instructors in the spring, 2006 semester, this instructor started podcasting IT 101 course lectures by posting unedited audio recordings to a feed

on a web server shortly after each class session. This lasted for the first five or six weeks of the semester. As the semester went on, and the novelty wore off, another informal survey suggested that the number of students listening to the instructor's podcasts was dropping. As shown in Figure 1, an evaluation of the web server logs showing the number of downloads confirmed this trend. With the exception of the instructor's podcast of class # 8, containing a recording of a review session prior to an exam, the number of downloads was declining. It is important to note that the web server logs show the number of times a file was downloaded, but do not guarantee that students actually listened to the downloaded files.



**Figure 1. Instructor Podcast Downloads**

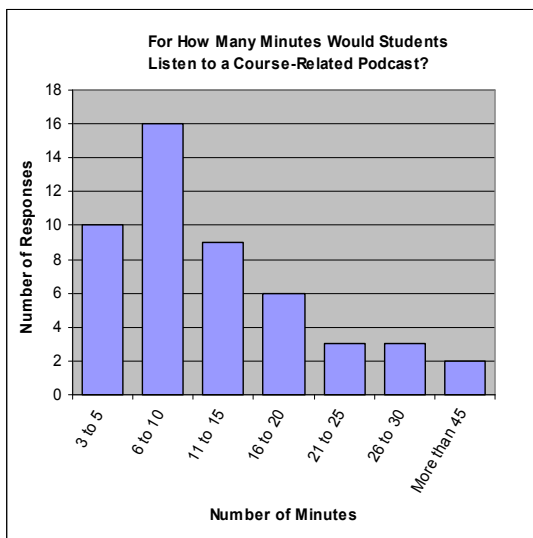
A few students who missed class or wanted to review for an exam said that they found it useful to have the class lecture available as a podcast, to listen as they reviewed the accompanying PowerPoint slides. The majority of the students, however, did not have, or would not take the time to listen to a 60-minute podcast of a lecture that they had already heard, all over again.

Chan and Lee (2005) asked twenty-six students in an introductory technology course to specify "how many minutes [they would] be willing to listen" to a recording that supplemented the class lecture per week. 29% said between three and five minutes; 25%

between six and eight minutes, and 45% said nine to ten minutes. This study asks similar questions of first year students in IT 101. In our survey asking a similar question, six to ten minutes also emerged as the most reasonable duration. (See Figure 2.)

After students agreed that six to ten minutes was a reasonable duration, the instructor then asked the students how many of them would be willing to create a podcast based on one of the remaining class sessions, to post and share with their classmates. Since the instructor's podcasts earlier in the semester were mostly in audio format, the students agreed that they would create their own podcasts using video.

For each of the remaining sessions during the second half of the semester, students chose a partner and signed up for one class session for which they were responsible to create a six-to-ten minute video podcast sharing something that they learned during that session.



**Figure 2. For How Many Minutes Would Students Listen to a Course-Related Podcast?**

Podcasts had to be completed and posted to the web server within 48 hours of the class, so that their classmates could download and review the podcasts prior to the start of the next class. Other than that, and the suggested time limit, there were no other requirements as to format, style, or content.

To encourage students to participate simply because it would be a fun thing to do without the pressure of trying to get a good grade, (and to simplify grading on the part of the instructor) the assignment to create a podcast was offered as extra credit, and every student accepted the challenge. Students quickly paired off and signed up for the sessions for which they would be responsible to create video podcasts sharing their new found knowledge.

In the process, students learned the technology behind podcasting and how to use it effectively as a tool to communicate their ideas. They also demonstrated their understanding of a topic by combining voice and video.. In order to accomplish this, they had to understand the processes involved in creating and combining audio and video, compressing them, posting the files to a web server, and updating the XML file containing the list of available podcast episodes.

The additional hardware required to complete this exercise was very inexpensive: the instructor purchased two \$20 webcams, one for each class section. Students passed the webcams to the next pair when they completed their podcasts. In addition, some students used other equipment that they already owned (digital cameras and cell phones) to create their videos.

In class, the instructor provided training on two software applications that were critical for the process of creating podcasts. Students needed to download and use (the trial version of) FeedForAll ([www.feedforall.com](http://www.feedforall.com)), a software application that manages the creation and posting to a web server of the required XML file that indexes the individual podcast episodes.

They also had to use a multimedia conversion program to convert video from native AVI or MOV format to compressed MP4 format for viewing on a video iPod or Pocket PC multimedia player. (The instructor had tried several available programs and settled on the trial version of CucuSoft's Video Converter, available from [www.cucusoft.com](http://www.cucusoft.com), because the trial version places no time limit on the file being converted. Instead, it embeds a watermark on the resulting file, which was fine for academic purposes.) Students used TCPMP (The Core Pocket Media Player), a media player for playing the

MP4 files on their Pocket PCs. For a podcast aggregator, students also used Apple's iTunes, a free download already installed on their laptops as part of the standard student image, and installed a beta version of FeederReader ([www.feederreader.com](http://www.feederreader.com)), on their Pocket PCs, to manage their subscriptions to the class podcasts and others of personal interest to which they subscribed.

The process outlined here was for the most part, foolproof. Only once during the semester did students accidentally overwrite the XML feed file that should have contained an index of all of the podcasts, with a file containing only their own.

#### 4. MOMENTS OF DISCOVERY

Earlier podcasts that they created showed students sitting in their dorm rooms, facing a web cam, describing a particular topic or summarizing steps for a procedure that they learned in class on their given day. As the semester progressed, students engaged in moments of discovery as they viewed the podcasts that their classmates created. Often their classmates work served as examples to refine and improve their own processes for creating video podcasts.

For example, when students recognized that a web cam pointed at a laptop screen provided inferior video clarity of the screen image, they began to search for other solutions. These included pointing the webcam at a 32 inch plasma screen in a study room in the campus library to which their laptops were connected, and pointing the webcam at a laptop after reducing its screen resolution from 1280 x 1024 to 640 x 480, in hopes of achieving better video quality when it was played on a 320 x 240 Pocket PC or iPod screen.

Still not satisfied with the results, students began exploring screen-recording software that they could load on their laptops to capture their screen's activity, their voices, and themselves. Some students used the trial version of Camtasia Studio, and others downloaded CamStudio, an open source application for screen capturing and recording. With no training, they were able to use the basic features of both programs to record their screen images with voice-overs in order to create short videos based on the day's course content. Students found screen

capturing software to be an effective way to create videos that described or demonstrated what they learned in class that day with various software applications such as Microsoft Excel. They posted their videos for their classmates to download and view.

A "friendly competition" arose as students who created podcasts later in the semester tried to be more creative with their final products than those who came before them, by adding picture-in-picture, leading or trailing images, zooming in on a region of the screen, and other advanced recording features. In several cases, students showed their classmates how to use the advanced features that they discovered while creating their podcast videos.

Students also discovered issues about the underlying technologies and their business implications in the process. When creating their videos for the class podcast, students needed to save their files in an MP4 format suitable for playing back on an iPod or Pocket PC media player. They noticed that saving the file in different formats changed the size of the resulting file, and that prompted the question of "why is the same video, stored in one format, smaller than when stored in another?" A lesson on data compression techniques followed.

As they converted music and video from one format to another, they questioned why Windows Media player wouldn't play them all, and that moment of discovery was the catalyst for another discussion about the role of standards in information technology, copyright on media formats, and other related issues.

Creating, subscribing, and viewing class podcasts arms students with yet another tool for learning. Students are engaged not only in their own learning, but in participating in that of the entire class. The use of podcasting in this way further reinforces the ideal that podcasting is about creating and sustaining a community. Like any broadcast series, one aspect of its appeal is that it is regularly updated with new content. Here the podcast subscribers are also the content producers, the learners are also the teachers, and participating in the IT 101 class podcast promotes a community both inside and outside the classroom.



It also creates a space where students are empowered to express themselves creatively. Their senses of humor, individuality, and imagination all make the students' podcast episodes attractive for their classmates to watch or listen to. In one of the first podcast videos recorded in a dormitory room (Figure 3), two students described the seemingly involved procedure for making a podcast. They reassured their classmates, "Now this whole process can be kind of confusing, so I'm going to go over [the steps] for you. ... It's really not that bad. While we don't know the whole process as well as [our teacher] does, we might be able to explain it better on a more student level."



**Figure 3. Two students create a video podcast describing how to create a podcast. The podcast is playing in The Core Pocket Media Player on a Pocket PC.**

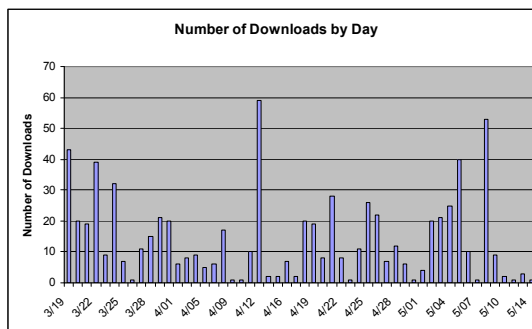
**5. STUDENT BEHAVIOR**

During the Spring, 2006 semester, two sections of IT 101 with a total of 54 students participated in the podcasting study described here.

An analysis of the web server logs shows that students in both sections were downloading podcasts regularly since the student-created podcast exercise began dur-

ing the week of March 19. The podcast feed URLs were known only to the instructor and students in the class. It is unlikely that students shared these URLs with others outside the class, and they were not publicized on any external podcast directories. Had either of these happened, this would have increased the potential audience and number of downloads. The number of downloads is consistent with the number of students in the class having access to each feed's URL. It is important to reiterate that the number of downloads only suggests that students actually viewed the class podcasts they downloaded.

Values are exceptionally high on March 19 and 22, the first class sessions in each section when students learned how to subscribe to and download the class podcast. Other high downloads occurred on April 12 when students were asked to watch a particular student podcast prior to the midterm exam, and May 5 and 8, when students in each section, downloaded a "class review" podcast that the instructor posted to help them prepare for the final exam. See Figure 4.

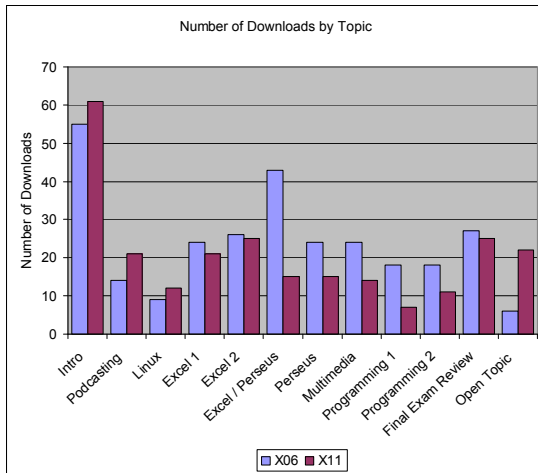


**Figure 4: Number of Student Podcast Downloads by Date**

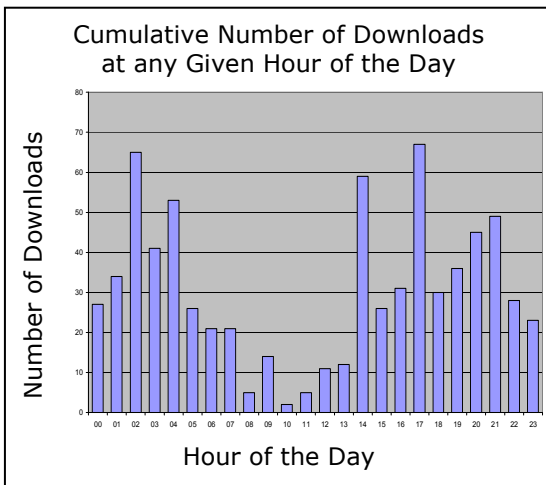
Figure 5 shows the number of times students in both sections (designated X06 and X11) downloaded each podcast episode, as they were posted chronologically throughout the semester, at any time during the semester. In the first class on podcasting, students learned to subscribe to the feeds from both sections, hence the "intro" podcast has the highest number of downloads, as it was downloaded by almost every student in both sections. Note that the Excel/Perseus podcast (in which students learn to use Microsoft Excel™ to analyze data imported from a Perseus™ survey) from Section X06 and the "Final Exam Review" podcasts have



higher download rates across both sections because students were specifically told to listen to them prior to a midterm and final exam, respectively. Several students admitted to watching some of the podcasts on their friends' laptops, Pocket PCs, or iPods during study times. The graph shows that over half of the students were downloading and presumably watching their classmates' podcasts.



**Figure 5. Number of Student Podcast Downloads in Sections (designated X06 and X11) on Each Course Topic**



**Figure 6. Cumulative Number of Student Podcast Downloads at any Given Hour of the Day (00 = midnight; 23 = 11 pm)**

Figure 6 shows that over the course of the semester, most students downloaded their podcasts either immediately after class (be-

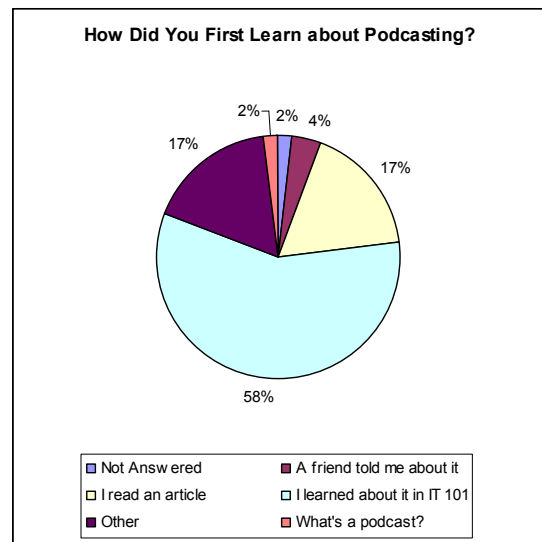
tween 2 and 3 pm, or between 5 and 6 pm) or during the early hours of the morning.

**6. SURVEY**

In addition to viewing the web server logs to analyze student download trends, a survey administered to 48 of the 54 students in attendance in both sections at the end of the semester asked them to evaluate the role of podcasting as a tool for their own learning.

The majority of the students had not heard about podcasting prior to taking IT 101. Among those who had heard of podcasting in ways other than those listed in Figure 7, two students knew about it because they owned iPods, and three others had read about it on various web sites or magazines. Nine of the students who responded to the survey said they had subscribed or listened to podcasts before, but no students said they created them on their own prior to the class.

These results reinforce the appropriateness of introducing podcasting as a new topic to an introductory information technology course.



**Figure 7. How did you first learn about podcasting?**

One of the biggest concerns about faculty making course lectures available as podcasts is the impact on class attendance (Chan and Lee, 2005; Maag, 2005). In this study, only three of the 48 students responding said

they ever skipped class because they knew that they could download a podcast based on the course lectures. In addition, 38 of the 48 students responding said that if they took a course where additional materials (not covered in lectures or tutorials) were made available for download as a podcast, they would listen to them. These results suggest that short podcasts can supplement course lectures but do not take the place of them. There is added value in participating actively in the classroom process, an element that is missing when a student simply watches or listens to a recording of it.

Table 2 shows how students made use of the class podcasts in their own learning. Most used them to clarify a point. Others used them to supplement their learning alone or with their study groups.

**Table 2. How students use podcasts as part of their learning.**

<i>Characteristic</i>	<i>Responses</i>	<i>Percent</i>
I listened to parts of a podcast to clarify a point.	29	55%
I listened to all of a podcast to see if I missed anything.	14	26%
I listened and took notes (or updated my notes).	14	26%
I listened to some podcasts many times.	8	15%
I only listened if I missed class.	6	11.5%
I listened to podcasts with my study group.	7	13%
Other	5	9%

**7. STUDENT FEEDBACK**

Students recognized that podcasting was a new technology with many applications beyond the classroom. Over half of the students (25 of 48) surveyed said that in addition to the class podcasts, they subscribed and listened to podcasts on topics of personal interest. Several students

wrote in their web logs for the course about their pride in learning how to create and share podcasts, and the potential implications that podcasting has on their lives:

“Podcasting is becoming a very big marketing tool. I’m glad that through this class I was able to get an idea of how effective technology is in the world of business. ... I will be able to give the CEO of whatever company I work for a lesson on podcasting, maybe even by podcasting it.”

“The whole idea of applying podcasting [is one] I could have never foreseen myself using. It is one thing to record yourself for self records and such, but it is another to publicly broadcast your voice .... I could understand certain professions using this.”

“It seems that podcasting is coming big, and I had no idea this existed until I took this course. The stuff we did with podcasting is so useful and it's something that I have been doing ever since I learned how in class. I've made a couple video podcasts about college life and all of my friends around the country were able to get them with one click. They were blown away that I actually knew how to do that stuff.”

“I'm glad that I decided to continue taking this class and challenging myself. I have figured out HTML with the help of friends, figured out how to design a website, upload things using ftp, make a podcast, upload a podcast (which is a task in itself), and so much more. I never thought that I would be able to do this. And now, I realize that I can.”

“I'll definitely continue to download and listen to [podcasts], but most likely not make any myself. If it wasn't for the class though, I probably wouldn't be into podcasts as I am now. It's awesome that you can just sync your iPod or Pocket PC to the computer the night before and it'll automatically download all of your feeds onto your device of choice.”

“It is good the world can see and appreciate the impact of what we are learning.”

## 8. IMPLICATIONS FOR FURTHER RESEARCH

Having students creating podcasts showing their learning for their classmates to view or listen links the inside-the-classroom experience with outside-the-classroom learning and provides new opportunities for learning from one another. However, there is not a forum for students to react to the multimedia created by their classmates.

One next step will be to integrate student podcasts with blogs so that students can comment on each other's podcasts and provide each other with feedback on the videos that they watched. This provides a new forum for students to communicate with their classmates online outside the classroom and engages them in using these technologies. It will be of interest to explore the impact of blogging about podcasts on the sense of community developed as well as on student learning.

## 9. CONCLUSION

Podcasting is a useful tool for disseminating course information to students but becomes even more powerful when students are responsible for creating that content for their classmates. In this study, rather than introduce podcasting as a discrete unit in an introductory technology course, on which the course would spend one or two sessions and then move on to the next topic, podcasting became a thread that ran throughout the course. Students learned to find and subscribe to podcasts of personal and course-related interest, as well as create and publish their own podcasts.

An analysis of web server logs showed that students were downloading their classmates' podcasts on a regular basis, and a student survey indicated that using podcasting in this manner contributed to overall student learning. Podcasting added value to, but did not replace the in-class experience.

Several critical thinking and technology skills were involved in the tasks required for students to create their own podcasts: first and foremost, they had to understand the course content sufficiently well in order to be able to determine which aspects of it they could effectively present within a six to ten minute timeframe; next, they had to become facile with multimedia technologies

to create, record, and convert their presentations, and finally, they had to understand podcasting and Internet technologies in order to post their videos to the class podcast for their classmates to download. The exercise required students to synthesize many IT 101 course topics, and learn some new ones, making podcasting an appropriate addition to the information technology classroom.

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