

# Student Reaction to Podcast Learning Materials: Preliminary Results

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## Abstract

Portable sound playing devices for playing web-distributable .mp3 sound files have become accessible to 10% to 30% or more of the student population. It has been suggested that audio files of learning materials, playable on these devices in the form of "podcasts," may be capable of enhancing student learning experiences. This paper documents a test of this suggestion and describes how original reading materials for an introductory course in information technology were created specifically to be provided in podcast form as well as traditional published form, and the receptivity of a population of 92 community college students to their use. The study reveals that a small but measurable subpopulation of late teen and adult students may be benefited by the technique of listening to text being read while reading the same text themselves, a finding parallel to that of prior research in reading fluency conducted among grammar school children. Additional findings allude to the desirability of expanding the study to a wider range of four-year college students.<sup>1</sup>

## Background

Podcasting involves the provision of sound files via the web in a compressed format such as a .mp3 for listening on a computer or portable sound player. The technology to record sound digitally is several years old and is not in itself the major new feature of podcasting. The phenomenon is instead centered on the distribution mechanism, which provides the means for interested parties to subscribe on the web to downloading services that can make newly created sound files readily available on personal computers connected to the Internet. Small portable battery-operated audio listening devices such as the Apple iPod and other .mp3 players that allow sound playback "on the go" became popular by 2005<sup>2</sup>, and sound files are readily copied to a portable player from a computer. Originally designed for music listening, these portable sound devices play back any audio content. "Podcast" is a play on the words "broadcast" and "iPod," Apple's premier portable audio playback device. Appealing design and pervasive marketing has helped Apple garner a large share of the portable sound player market.<sup>3</sup> But many other manufacturers produce under \$30 flash memory .mp3 players that double as USB storage devices and perform nearly identically to the iPod as far as sound reproduction is concerned.<sup>4</sup> Cost is approaching negligibility as a factor in access to portable sound reproduction devices.

Apple popularized the sale and downloading of music to personal computers and portable sound playing devices via its iTunes web site. Sharing of music in the form of .mp3 files via the web has become widespread. While the audio recording of lectures, presentations, and speeches on audio cassettes has been done for decades, making these types of recordings available in the convenient .mp3 format via the same web distribution mechanism is a new and fairly recent development, enabling convenient "on the go" listening.

## Study purpose

In the December, 2005 issue of *Educause Review*, Gardner Campbell paints a scenario in which Jenny, a student at Anywhere State University,

"...rolls out of bed at about nine a.m., as usual, and thinks about breakfast and her first class. As she's dressing and getting ready to go out, she fires up iTunes on her laptop and checks her podcast subscriptions. There's a new show from Adam Curry at Daily Source Code, another from Cody at Vinyl Podcast ("fair use of forgotten music"), and three audio feeds from her classes. She doesn't notice that the classroom material and the leisure-time entertainment are coming through the same medium and desktop utility; for her, it's natural that school stuff would mingle with other aspects of her daily life."<sup>5</sup>

Gardner proceeds to develop this scenario in describing how the provision of audio capture and .mp3 file downloads positively affects many other aspects of Jenny's participation in classes and her interactions with other students. Would this scenario actually play out? Would course-related portable audio content be accepted by students in the same manner as is entertainment? A further speculation by Gardner riveted our attention:

"Imagine a busy commuting student preparing both emotionally and intellectually for class by listening to a podcast on the drive to school, then reinforcing the day's learning by listening to another podcast, or perhaps the same podcast, on the drive back home."<sup>6</sup>

Of DePaul's roughly 15,000 undergraduate student population, more than 70% commute. Among the community college "feeder" schools supplying transfer students to DePaul, all students are commuters. If learning materials were provided in a form that could be listened to on a portable sound player while commuting, would learning benefit? This study was formed to explore if, in

fact, Gardner's speculation had merit, and if so, to what extent the provision of audio materials closely tied to course content would be utilized by students, and how.

### **Preparatory infrastructure**

IT-201, "Introduction to Information Systems," is a 10-week, four quarter credit hour course offered every term by the School of Computer Science. It is one of dozens of courses offered by DePaul that fulfill a Liberal Studies Program science learning domain requirement applicable to all undergraduate students. About half the enrollment in IT-201 is typically made up of computer science majors early in their program of study; the remainder are business or liberal arts majors. IT-201 is offered in two or three sections each term, with an enrollment of 30 to 70 students. As a part of an effort that was initially unrelated to our exploration of podcast utility, I initiated the replacement of the existing assigned text with a locally-developed workbook supported by a web site with web link readings. The intent was twofold: to provide material suited to the intent of the course, and to reduce textbook cost to students.<sup>7</sup> The effort to locate content in freely-available web sources was already well underway in the Winter, 2006 term and the workbook in development, when I and another faculty member, Laura McFall, began a collaboration to compose the original writings.

Since McFall and I were already developing writings to summarize assigned web link readings, we let our intention to provide learning materials in dual text and audio format dictate the format of the writing. We developed each unit of writing to produce about 500 to 1000 words; if a topic required more coverage, we divided it to maintain units of this size. The completed workbook contains ten chapters, matching DePaul's 10-week terms. Each chapter contains between 7 to 10 units of writing; we gave each unit both a text title and a "podcast number." The workbook contains a total of 79 units of writing, each of which is actually the script for an audio file. Although we borrow the term "podcast" for these units of writing, simply because it is contemporary and identifies web-based audio distribution, we intended to develop the 79 .mp3 files and make them all available by the start of the Autumn 2006 term. During that term, it was our intent to make students aware of this additional learning resource, and to observe their usage of it to see if Gardner's speculation would in fact prove accurate. We intended to use a combination of informal and formal surveys and focus group discussions to learn about student utilization of these audio materials.

### **Conducting the study**

McFall and I met the publisher's writing deadline for the *Information Technology Workbook* in July 2006. The published workbook became available for Autumn 2006 term classes, and the audio files were produced on a rolling basis, to make them available by the time that classes reached each chapter.<sup>8</sup> Rather than reading the material into a microphone, we used a text-to-speech program and high-quality digitized voice to produce the audio from the actual word-processed files.<sup>9</sup> Part of the intended research was to focus on student reaction to the quality of this type of software-generated sound. We performed informal surveys aimed at adjusting course pacing in the autumn term across the two sections of IT-201, involving about 50 students, and evolved a survey which we had intended to use in the Winter term when both in-class and distance learning sections would be active.

Shortly after we completed all audio files for use in the Autumn term, an unforeseen licensing issue with the supplier of the first digitized voice we had employed made it necessary for us to remove the files from access, prior to our winter term. The effort needed to recreate these 79 files

using an alternative method has delayed the conduct of our survey at DePaul. However, the workbook had been adopted at a community college in Florida and was also in use during their Autumn term, in an innovative program conducted jointly with a local high school. The 92 students enrolled in this program made extensive use of the web links at the course web site and the workbook, and had access to the audio files prior to their removal from web access. Luckily, these students had actually completed the pilot version of our survey at the request of their instructor. These students were between 15 and 17 years of age, and many will be continuing on to college within 18 months. This population of respondents to the pilot survey provides the basis for the tentative conclusions presented in this paper.

## **Methodology**

A total of 83 of the 92 students to whom the 79 podcasts of textual material were provided for use in a course at a community college responded to the pilot survey, which is listed in Appendix A.<sup>1</sup> The intent of the 22 questions on the pilot survey was explore these issues:

- the relationship of employment to the time allocated to out-of-class study
- the proportion of fixed desktop computer usage to portable laptop computer usage
- the proportion of study time expended in podcast listening as opposed to reading
- the purposes to which students put podcasts
- where students listened to podcasts
- student length and voice preferences for podcasts
- the extent to which podcasts were listened to on a portable sound player
- self-reported learning effects of podcast listening on factual understanding and performance.

In addition, a question was included to determine how much students thought it would be worth to provide all 79 audio files on a CD in .mp3 form, for immediate loading to a portable sound device, as an alternative to having to download podcasts from a web site or subscribe to them. Finally, a question was included to judge student opinion about the workbook itself, as well as a free-form “suggestions” question.

A survey program provided by the Instructional Technology Group of DePaul’s Information Service Division was used to make the pilot survey web-accessible. Respondent identities were not captured, and whether or not students in the course at the junior college responded was not known to their instructor or the researchers and had no bearing on their grade in the course.

## **Results**

The results of this pilot survey are presented in raw tabular form in Appendix B, which also provides a listing and categorization of freeform comments and suggestions best suited to qualitative analysis<sup>1</sup>. Caution, however, is required in considering the results, since the size of the sample represented here, with a few exceptions, did not produce statistically significant results.<sup>10</sup> Some cursory insights into study habits can be drawn from the pilot survey, at least for the community college audience enrolled in the course involved.

The vast majority of students in the course (78%) reported that they studied outside of the classroom less than two hours per week, and over 85% have access to a laptop computer, presumably a non-school computer, implying some degree of portability. This is consistent with

the nature of the program in which the workbook was used, which focused on use of a classroom equipped with a computer for each student, and heavy reliance on the [www.ambriana.com](http://www.ambriana.com) supporting web site during class study times.

About half the students responding reported that they had made some use of the podcasts, but only 10% of students indicated that they used podcasts for more than 25% of their study time. This is actually less information conveyance than it might appear, since words are spoken at about two words per second, but can be read at a much higher rate. This easily-overlooked factor seems to be an inherent limitation on the usefulness of audio files for learning, whether delivered via podcast distribution or provided in a more traditional manner such as cassette audio tape. The low utilization rate of podcasts seems to refute some of Gardner’s speculations as to student receptivity of them as a learning medium.

An interesting outcome became evident in responses to the question “in what ways did you use the podcasts?” The 48 respondents who provided information for this question could select as many usage manners as applied; 25 of the respondents selected two or more categories. Responses were tallied across all categories, with the result:

respondents n=48, usages n=78

<b>Q09: how respondent used podcasts</b>	<b>Respondents</b>	<b>Percentage</b>
To go over material before reading it	26	54.2
After the class lecture on a given topic	15	31.3
For review before a quiz or exam	15	31.3
<b>While reading the matching printed material in the workbook</b>	<b>12</b>	<b>25.0</b>
Before a class session to get ready for a topic	10	20.8

Some of the respondents indicated that they listened to the audio files while reading the matching text. Inspection of the raw survey data reveals that of the 12 respondents indicating some usage of this type, 7 respondents (14.6%) indicated that this was the only way in which they used the audio material. While several results from much of the survey were not statistically significant, the result for this specific use of podcasts does appear to be, albeit with the wide confidence interval of plus or minus 13%:

Q09 response: listening to podcast while reading the matching material

Test of p = 0.5 vs p not = 0.5

Sample	X	N	Sample p	95% CI	P-Value
1	12	48	0.250000	(0.136372, 0.395959)	0.001

The result for students whose only use of the podcasts was to listen to them while reading the matching textual material was even more significant, with confidence interval plus or minus 10.5%:

Q09 response: listening to podcast while reading the matching material, their only use of podcasts

Test of p = 0.5 vs p not = 0.5

Sample	X	N	Sample p	95% CI	P-Value
1	7	48	0.145833	(0.060704, 0.277638)	0.000

We had been unaware of this possible usage until three students in our own IT-201 courses mentioned it in a class discussion on podcasting, stating that hearing the spoken word while looking at it in print helped them to understand the material. We included the usage question in the pilot survey surrounding the “while reading” category with other possible usage categories to further explore this. This results indicate that although audio files do not seem to be generally accepted by students as a primary learning medium, they can fulfill an important role for students with specific reading styles or with reading impediments. This presents an unforeseen opportunity to improve the learning experience for a subpopulation of students and bears further investigation.<sup>11</sup>

Of those respondents who listened to the podcasts, more than half did so at school or home. Only 3 (6%) listened while using public transportation, perhaps a reflection of less public transit commuting occurring in the small town in Florida where the community college is located, and one student indicated listening while driving. Interestingly, only one listened while walking, and none while exercising or jogging, refuting one of our likely usage speculations, and in stark contrast to observed widespread portable music device usage for entertainment purposes. In this study, this is no doubt related to the fact that only 16 of the respondents (20%) indicated that they had access to a portable sound player, consistent the Pew survey discussed in note 1. Usage of this type might be higher in populations where greater access to portable sound players exists.<sup>12</sup>

A total of 53 students responded to questions 11 and 12, which were Likert scale questions exploring whether respondents felt that the use of podcasts aided their learning and performance. For analysis purposes here we took as a baseline the value of 42, the number of students who in response to question 8 had previously indicated an actual percentage of study time that they accessed podcasts. We then lumped the two response values indicating agreement with the statement together and arrived at 15 students who indicated they felt podcasts had helped them understand and remember facts and concepts. These results were not statistically significant:

Q11: 42 used podcasts, 15 felt at least to some improved ability to learn

Test of p = 0.5 vs p not = 0.5

Sample	X	N	Sample p	95% CI	P-Value
1	15	42	0.357143	(0.215508, 0.519739)	0.088

We used the same approach to handle question 12, which explored if students felt that the use of podcasts helped them perform better on quizzes. Here, a total of 10 students agreed with the statement. In this case the results did appear statistically significant:

Q12: 42 used podcasts, 10 felt the podcasts helped their performance to some degree

Test of p = 0.5 vs p not = 0.5

Sample	X	N	Sample p	95% CI	P-Value
1	10	42	0.238095	(0.120516, 0.394502)	0.001

Both of these did, however, have very broad ranges of confidence interval. We are simply interested in determining if these podcasts were worth producing, that is, do they help to any degree in accomplishing learning for at least some students. As one student pointed out, even if only a few students felt aided by the use of the podcasts, perhaps they are worth the effort to

create. The results here do seem to indicate that a non-trivial percentage of students feel that the audio materials benefitted their learning, so the creation of these audio files appears worthwhile.

In terms of access to CD-stored .mp3 files, over 60% of respondents indicated that they felt it would be reasonable to pay slightly more for the workbook were it to be provided with such a CD, and a sizable proportion (over 26%) felt that this would be worth as much as several dollars more. We may infer from this that, at least for this population, access to the podcast distribution of the audio files is not as convenient and widespread as imagined by its proponents, and the alternative of immediate access not requiring the web overcomes a threshold of difficulty. The publisher indicates that providing a CD would actually add only \$2 to \$3 to the cost of the workbook.

Slightly more than half of the students (52.8%) responding to question 21, asking if the workbook met with their expectations, indicated that they felt it met their expectations. Only three respondents not satisfied with the workbook, web site, and podcasts chose to express specific comments in the final free-form question.

The 28 responses to the free form final question were illuminating. Based on what students indicated, we developed nine response categories ex post facto and tabulated the results, leading to this table:

Category	Number of responses
Positive	2
Not pleased with the voice	7
Podcast content "boring"	15
Not pleased with the published workbook	1
Not pleased with the organization of the web links on www.ambriana.com	2
Put more information depth into the podcasts	1
Use video podcasts	1
Make podcasts more fun	1

The most significant comment provided by 15 respondents (35.7% of total of 42 respondents we took as the baseline of podcast users) was that the podcasts were “boring.” These same respondents may have felt similarly about the printed rendition of the same content. Question 13 may be related to the question of the interest of the content; this question dealt with the preferred length of a podcast. Of the 52 students responding to question 13, 36 felt that each podcast should be 5 minutes or less in duration, and this result was statistically significant, albeit with an inordinately large confidence interval that spans 54% to 81%:

Q13: 52 responded, 36 indicated they preferred podcast length less than 5 minutes

Test of  $p = 0.5$  vs  $p \text{ not} = 0.5$

Sample	X	N	Sample p	95% CI	P-Value
1	36	52	0.692308	(0.548976, 0.812827)	0.008

A total of 7 of the 42 (16.6%) respondents using podcasts were not pleased with the original digitized voice, which had a British inflection. In an earlier question regarding voice preferences by categories of human or machine, instructor or other person, almost half of respondents preferred the instructor’s voice. It would appear that our use of a software-generated voice may

be counterproductive, and that recording of audio files with a human voice in the traditional manner could assist in podcast acceptance.

## **Conclusions**

Gardner's speculations about course-related audio blending in student's minds with entertainment programming may conceivably materialize at some point in the future, but podcasting and portable sound player access is not yet ubiquitous. Perhaps 20% to 30% of the students we surveyed who used audio files related to course content (10 to 15% of our total responding population) feel that their understanding of material and performance on quizzes is improved by them. This applies to audio materials that are optional for student use, as was the case here. Audio materials capturing speeches, events, or content upon which assignments are based, where the content is not otherwise available, will no doubt exhibit a higher rate of access if only because their use is made mandatory.

But freeform comments submitted in this survey and gathered from anecdotal sources in conversations with DePaul students point out several potential problems with the audio transfer of new facts and concepts:

1. A significant limitation exists in the audio transfer of information. Speech is usually done at about 2 words per second. This is only about 120 words per minute, or about 600 to 800 words in a 5 to 8 minute audio file. This is a much slower rate of information transfer than the rate at which some people can read.
2. Since the information transfer occurs at rate dictated by the speaker, the recipient cannot linger longer on elements that are puzzling or move along faster on readily understood material.
3. In many cases, understanding a concept requires understanding of supporting facts which are presented in a sequential, linear manner in text. But if a listener misses a supporting point in an audio presentation—for example, by being distracted, by sound being obscured by surrounding noise, or difficulty in understanding the voice—the presentation continues regardless, and material subsequent presented can become frustratingly less understandable. Not all sound players conveniently allow scanning backward to review material already passed in the discussion. Even with sound players that do support scanning backward, doing it may be awkward or inconvenient, depending on what else the listener is doing at the time, and the guesswork nature of the scanning back process.

These factors would seem to severely inhibit the perceived usefulness of audio materials “on the go” for the initial learning of new facts and concepts. Unless these factors can be overcome, the ability for podcasts of learning material, especially for technical subject matter, to be accepted by students using portable sounds devices may be inherently constrained.

## **Recommendations**

Based on the results of this pilot study, we are encouraged to proceed with research efforts in the use of audio materials to enhance the learning experience. We intend to refine the survey instrument and expand the scope of the populations covered by the study, and to investigate possible correlations between factors and student characteristics which were not ascertained for the pilot population. Expansion of the study should include a focus on identifying students who

find it helpful to listen to the audio materials while reading, and to convene focus groups to explore this phenomenon.<sup>13</sup>

The results of this pilot study have caused us to revisit our thinking in regard to the *Information Technology Workbook* and our ongoing efforts to make it as useful as possible to students. In particular, we are inspired to take these steps:

- In revising our workbook for the second edition, we will concentrate on even more concise written expression, and set a target of 500 words per topic (podcast script). This will create podcasts of 5 minutes or less duration.
- We will abandon the use of a software-generated voice from text, and revert to using humans to read text into audio files. One feasible approach may be to secure a small grant or budget allocation and employ students studying communications and broadcasting to make the readings, since they will already have learned many diction and announcing skills.
- We will proceed to lower the threshold of effort needed to place the audio material on portable audio devices by providing all .mp3 files on a CD included with the workbook, in addition to posting the podcasts at the [www.ambriana.com](http://www.ambriana.com) support web site and at the DePaul page at iTunes University.
- In order to increase the subject matter interest level, we will investigate the means to create audio-annotated slides more closely coupled to the original writings, and will shift the focus of the web links to illustrate what the readings discuss, rather than to try to use the readings to summarize the web links.
- We have already begun to expand the coverage of IT-201 podcasts beyond simply providing spoken versions of text material, to providing support for a business case in the form of mock systems analysis interviews. Since completion of the workbook we have begun issuing a simple business case at the beginning of the term, and requiring students to use the knowledge gained from the course to make a recommendation for automation of the business in a paper due at the end of the term. A series of ten or more podcasts scripted as interviews of the owners and key personnel in the hypothetical firm could give students the flavor of participating in a real systems analysis effort. These podcasts could be released in stages, giving the sense of an ongoing analysis effort throughout the course.
- Exploring the feasibility of video as well as audio capture and distribution via the web, we've recently begun to use the "movie making" capability of ordinary digital cameras to record two-minute introductions to topics and posting these as a preface to chapter material. These appear to hold great potential for opening a new channel of connection between instructors and distance learners in particular. Initial experiments indicate that tripod-mounted cameras costing as little as \$150 can record video and sound well enough in ordinary surroundings to be workable. A two-minute video captured in this way may result in a file of 60 Mb., which when processed through "free" software such as Windows Movie Maker or similar Mac software can be output as a file of 320 x 240 pixel video less than 4 Mb. in size, comparable to the size of a voice-only podcast of 5 minutes recorded monaurally at a sampling rate of 22.5 K bps. By outputting these short video productions as .mp4 files, they become playable on all computer platforms.

We are also encouraged to realize that speeches, recorded panel discussions, and audio materials we have located on the web are also available to provide audio variety relevant to many courses. As awareness of the podcasting phenomenon has developed, various organizations at DePaul, such as the DePaul Humanities Center, have undertaken to record and make podcasts available of noted authors and lecturers who visit and present talks. Podcasts of these events now make them available to a much wider audience and support their use as the basis for class assignments far beyond the original event date. External sources of audio materials are also becoming accessible. For another computer science course, CSC-208, “Computer Ethics and Social Responsibility,” we have identified a series of 45-minute panel discussions conducted by Melvyn Bragg of the BBC as superbly relevant and of great interest. Audio resources such as these are becoming available for a variety of subject matter, to enhance the learning experience in the same way we hoped to accomplish with our workbook-related podcasts.<sup>14</sup>

Finally, none of our research efforts have touched on student created podcasts, which may open a whole new venue of learner engagement. It is conceivable that audio captured from exercises involving active learning techniques could be made available in podcast form as a course progresses, and aid in maintaining a higher interest level. Study should be directed toward dampening factors, however, such as the intimidating effect of recording. This inhibiting response can affect people when they know they are being recorded, and therefore choose their words more carefully and are guarded in what they will even venture to say.

It appears highly likely that the population of students already equipped with portable sound playing devices will continue to increase. Our research gives us reason to suspect that it may be possible to leverage the capability of these devices to enhance the learning experience. To do this wisely, it is essential that efforts be made to experiment with and evaluate the effect of various approaches, and to disseminate factual information about the results. It has been our intention to contribute to this ongoing effort in a perhaps limited and focused but potentially insightful way.

## Notes

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<sup>1</sup> This paper as well as appendices A and B are available in .pdf form in one zipped file at the author's web site at [www.depaul.edu/~jjanossy/janossy\\_etl\\_paper\\_and\\_appendices\\_april2007.zip](http://www.depaul.edu/~jjanossy/janossy_etl_paper_and_appendices_april2007.zip) .

<sup>2</sup> According to a Pew Internet and American Life Project survey conducted in February, 2005, "Almost one in five (19%) of those under age 30 have iPods/MP3 players. Fully 14% of those ages 30-39 have them; and 14% of younger Baby Boomers (ages 40-48) have them... iPods/MP3 players are gadgets for the upscale. Fully a quarter (24%) of those who live in households earning more than \$75,000 have them; 10% of those living in households earning \$30,000 to \$75,000 have them and 6% of those living in households earning less than \$30,000 have them." Retrieved March 22, 2007 at <http://www.pewinternet.org/PPF/p/1047/pipcomments.asp> .

<sup>3</sup> According to an April 19, 2006 entry in MacWorld magazine, "'Apple has cumulatively shipped more than 50 million iPods now', said Apple CFO Peter Oppenheimer... The company also generated \$485 million in music revenue; this was driven by iTunes Music Store sales, iPod accessories, and the iPod Hi-Fi. The company noted that the iTunes Music Store now accounts for 87 percent of all legally purchased and downloaded music in the United States, offering more than 2.9 million songs and 70 television shows." Retrieved March 22, 2007 from <http://www.macworld.com/news/2006/04/19/financial/index.php> .

<sup>4</sup> For example, see <http://www.geeks.com/products.asp?cat=MP3> for a variety of USB devices providing 1 Gb of flash memory storage accessible for music or data storage and retrieval, and the ability to play .mp3 sound files, priced at under \$30 as of March 21, 2007.

<sup>5</sup> *There's Something in the Air: Podcasting in Education*. Educause Review, December, 2005, p. 33. This article is available online at <http://www.educause.edu/er/ERM05/ERM0561.asp?bhcp=1> . In a refreshing dose of the doctor following his own advice, Gardner put in the effort to record his article and also post that as a podcast, which is available at <http://www.gardnercampbell.net/blog1/?p=263> . The web page at which the podcast is available provides some insight into the reality that creating a podcast is not a veritable piece of cake, in spite of the fact that as Gardner explains, he has 13 years experience in broadcast radio! Similar concerns, and not merely convenience, shaped our initial intent to use software to generate sound files through text-to-sound, rather than trying to read our material for the *Information Technology Workbook* into audio form.

<sup>6</sup> Although, contrary to Gardner, we felt it was inadvisable to suggest that students listen to any materials we would provide while driving, with the possibility of distraction leading to an accident. Instead, given the litigious nature of American society, it seemed wise to admonish students not to listen to these learning materials while operating a motor vehicle. We had in mind that students might listen to learning materials while riding the Chicago commuter train, subway, and bus systems, or while walking, jogging, exercising, or otherwise performing some unrelated solitary activity.

<sup>7</sup> The assigned text, *Information Systems Technology* by Ross A. Malaga, provided more coverage than needed for the course, was three years old (obsolescent in the rapidly changing computer environment) and, in addition, was priced at \$125. The effort to replace it had already moved in the direction of using web links at a web site, arranged in chapter and section format, and a locally-developed workbook providing learning goals, original summary readings, copies of lecture slides, assignments, and a sample final exam for study purposes. The workbook was published in August, 2006. It is 334 pages in length and costs students \$35, and is the only required text for the IT-201 course; access to the web link web site, [www.ambriana.com](http://www.ambriana.com), is entirely free to everyone, independent of the workbook.

<sup>8</sup> The *Information Technology Workbook*, ISBN 1-58874-618-6, was published by Stipes Publishing, LLC, of Champaign, Illinois ([www.stipes.com](http://www.stipes.com)). The podcasts and web links are freely available at [www.ambriana.com](http://www.ambriana.com) . The contents of chapters 1 and 2 in .pdf form, and slides for these chapters, are also freely available at this web site. The complete set of slides for all 10 chapters of the workbook for lecture use are posted for instructors at this web site in a self-decrypting file. If you are an instructor and would like to obtain the password for the complete file of slides, send an e-mail to the author at [jjanossy@depaul.edu](mailto:jjanossy@depaul.edu) with a brief description of your teaching activities.

<sup>9</sup> Specifics of the process of using the TextAloud text-to-speech software, Cepstral digitized voice, and shareware Audacity sound editing software were discussed and demonstrated in a pre-conference workshop entitled "Creating and Sustaining a Podcasting Infrastructure using Direct Digital Recording and Text-to-Speech Software" at the Instructional Technology Conference conducted at Middle Tennessee State University on April 1, 2007. See

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[www.mtsu.edu/~itconf](http://www.mtsu.edu/~itconf) for material related to that workshop, and visit [www.ambriana.com](http://www.ambriana.com) at the IT Workbook button to hear the podcasts (Caution! Some pages of this site serve midi files and play music when accessed!).

<sup>10</sup> The confidence intervals of all correlation cross tabulations are plus or minus 10% or more, and the p-values are far in excess of levels at which confidence can be placed in the results. At best, the results hint at possible relationships that may warrant further investigation. The cross tabulations are not presented in this paper, but tabulations that are close to or meeting statistical significance levels are discussed.

<sup>11</sup> Why not, for example, provide a special learning area where reading material might be scanned and “read out” by text-to-speech software? A student with a reading impairment could be aided by hearing the words spoken as he or she read them. As more study materials become available in electronic form, the relatively inexpensive text-to-speech software and digitized voices could make this capability available to individuals.

<sup>12</sup> Informal discussions with students in the DePaul IT-201 classes indicate that more than half of these student have access to portable sound players. This seems to be roughly double the level of iPod and .mp3 players reported in by the Pew Internet & American Life Project in their February-April 2006 survey, in which 20% of American adults and 26% of Internet users reported owning a portable sound player. However, as the Pew survey notes, rates of sound player usage by computer and Internet-skilled individuals are higher than for the population in general. See [http://www.pewinternet.org/pdfs/PIP\\_podcasting.pdf](http://www.pewinternet.org/pdfs/PIP_podcasting.pdf) , retrieved on March 21, 2007.

<sup>13</sup> Interestingly, a study by Hollingsworth (1970) discovered that children reading at below-grade level were aided by "assisted reading" in which they listened to passages being read while they attempted to silently read the same material. As paraphrased by Kuhn and Stahl in terms of increase in reading fluency, "In real terms, students using the assisted reading technique made one year's growth over the course of a semester, whereas the other students made only .04 year's growth during the same period." See *Fluency: A Review of Developmental and Remedial Practices* (Kuhn and Stahl, Center for Improvement of Early Reading Achievement Report #2-008, March 31,2000), p.14. We may be observing a similar phenomenon in late teen and early adult students whose current focus is the acquisition of information rather than the improvement of reading skills, but reading skills may improve as a byproduct of this use of podcasts. Such a byproduct would be truly serendipitous.

<sup>14</sup> For example, see [http://www.bbc.co.uk/radio4/history/inourtime/inourtime\\_archive\\_home.shtml](http://www.bbc.co.uk/radio4/history/inourtime/inourtime_archive_home.shtml) to access the BBC's web site and archive of the “In Our Time” panel discussions and other audio programs available for streaming listening and .mp3 download.