

Hello, and welcome to course 5.95 “Teaching College Level Science”. Today I’ll be talking about podcasts and audio-downloads, and their potential uses in teaching college level science courses. I’m going to start today’s lecture by explaining a little problem I had and how audio downloads helped me solve it. Then I’ll talk about why podcast lectures might be useful in teaching college courses and we’ll listen to a piece of a professional podcast lecture as an example. Then we’ll talk a bit about what podcasts are and how they work.

But before I start, I need to give you a warning. First, I’m not an expert on podcasts or computers. This whole exercise has actually been a learning experience for me, and this lecture is basically what’ve I’ve learned during this process.

Second, I’m also going to approach podcasts at the most basic level. I’m going to assume that you have a minimal level of computer expertise. Sorta podcasts 101. So if your more advanced than that, if you’re used to downloading and making podcasts, then this lecture might not be for you.

A few years ago, I wanted to start investing in the stock market. My economics classes had taught me a lot of what I needed to evaluate general market conditions and specific industries, but I didn’t know how to evaluate individual stocks. My problem was that I needed to learn how to read corporate balance sheets and income statements.

So I went over to the Sloan School of Business where they have a class dedicated to teaching students how to read corporate balance sheets and income statements. And for a couple semesters I tried taking this class, but time conflicts and my dissertation research would always come up to ruin it. And by mid-semester I’d usually just have to drop out.

I thought, ya know, it’d be really convenient if someone could just tape record the Sloan professor’s lectures. That way I could listen to them whenever I wanted and I wouldn’t have to miss any classes. If only there was someone who’d done this.

Well, it turned out that there is. I found this company in Virginia called The Teaching Company. Their website is [www.teach12.com](http://www.teach12.com). And the Teaching Company packages and sells college lecture series on CD or video, and last year they started offering audio downloads. And I found that they have a set of lectures all about how to read corporate financial statements. And it wasn’t taught by some wanna-be hack either. It was written & taught by a Professor from (Jules Schwartz at) Boston University’s Business School, who’d won awards for being a great teacher. I thought great! Exactly what I need! So I bought the courses and started listening.

I soon discovered, that not only was I getting a great college lecture and *not* missing any classes, but I was using my time more efficiently. I could listen at the gym, or on the subway, or during my walk back and forth to school. So I could make productive use of time that I was pretty much wasting before. And of course with an audio recording, I could just stop and rewind if a lecture contained a difficult concept or something very important. And over the next month, I spent my commuting time learning corporate finance on my Walkman.

I thought, this is great. I mean, I had lots of long drives, plane trips, gym time, and commuting time...so you know, why waste it. So I started looking through the Teaching Company’s catalog of about 100 courses which again you can find at [www.teach12.com](http://www.teach12.com). And over the next few I wound up listening to various courses in history, business, religion, philosophy...and if you’ve seen me walking into class with my ipod on this semester, I’ve been listening to a lectures on the history of science. If it

sounds like I'm plugging The Teaching Company, I am. I really love their products, and I highly encourage people to visit their website...especially if you have any long or regular commutes to kill.

And of course, my great experience with the Teaching Company has made me wonder about whether podcasts might be a good tool for use in teaching college classes.

### Podcast Basics

Well, let's stop and cover some basics...and I mean basics. To start off with, what's a Podcast?

Well...you're listening to one right now. A podcast is basically a computer file of some audio content, that you can download from a website and then play on your computer or your iPod.

If you're totally new to the subject, then perhaps the best way to demystify podcasts is to go back fifteen years or so. Because back then, if you as an amateur wanted to record your own audio and not pay a small fortune, well you made a tape recording. You stored this recording on a cassette tape. And then you played your cassette tapes on your Walkman. A podcast is just the modern version of this. Instead of storing audio on a cassette tape, you now record or copy audio onto a computer file, which you then play on your iPod. And if you put these audio files online for other people to download and listen too, then it's called a podcast.

Now when you enter the world of podcasts you instantly get hit with all sorts of jargon, like .mp3's, RSS, wma's, iPods, etc. So let's take a few minutes to sort all of that out. And perhaps the best way to explain how podcasts got started.

The history of podcast's is still being written, and I'm no authority, but for our purposes I think its safe to say that the origins of podcasts lie around summer of 1995 when .mp3 technology was first released to the general public. MP3 is an important part of the story because before .mp3 was developed, there was really no simple cheap way for the average person to store and play audio on their personal computer.

What's MP3? MP3 is just a type of computer storage format, it allows you to store audio as a computer file on your personal computer. So, just like you store text as .doc file or .txt file on your computer, or your digital camera let's you store pictures as .jpeg, .giff, .png files on your computer, MP3 is just the name of the computer file format used for storing all kinds of audio: like music, lectures, sound effects, whatever.

And after the release of the .mp3 format, and software that let you work with it, anyone could easily store audio. Music was, and still is, the first and most popular use for .mp3's. Because while your CD player might be able to hold 5 CD's at most, you could put hundreds of songs on your computer harddrive in the form of .mp3's. So, people began transferring their music CD collections into .mp3's to play at home and then to share with others online. If you remember Napster, Napster was part of this movement. Napster was a service that let people share their music .mp3's online for free.

Now, the biggest problem with mp3's back then was that, sure you could now store thousands of songs as .mp3's files, but if you wanted to listen to them, you had to play them on your computer. And who wants to lug a computer around everywhere they go. So, a company called SeHan Infomration Systems came up with a simple idea. Why not sell a pocket-sized flashdrive whose only function is to store and play .mp3's? Sorta like a Walkman for computer audio files. And the business really took off in October 2001, when Apple released the iPod, with the slogan "store 1000 songs in your pocket". Now,

business analysts thought this was a horrible idea and major mistake for Apple, but to their surprise the iPod immediately took off and has come to dominate the market for music players. In fact, the iPod is so popular, that the word “iPod” is slowly becoming a generic term, and some people use “iPod” to refer to any portable listening device that plays audio computer files. So the words iPod, mp3 player, portable audio device all get used interchangeably. Note that the same thing happened to the word “Walkman” and portable cassette players twenty years ago.

This is probably a good point to mention that .mp3 players are relatively inexpensive these days. And if you don't already have one, you can buy cheap ones for as low as \$40, while expensive ones can get to around \$400. And you can find them at any electronics store and most computer stores, and of course retail websites like Amazon.

So to recap, iPods are just harddrives that are essentially music players, and the audio they play are stored as .mp3 files.

### File Fomats

Now we have to get a tiny bit technical and talk about file formats. If you go back 20 years then you might remember the old VCR's and how Betamax and VHS had different formats that didn't work in each other's machines. Well, audio formats are similar to, but not as bad as the Betamax vs. VHS things.

Remember I said that mp3 is the most popular format for storing audio files. But it is not alone, there are dozens of others formats that have been developed. Thankfully, we don't have to worry too much about these, because like I said, the most popular kind of audio file is still mp3. But there *are* two large competitors out there called .wma, and .ogg that you should probably be aware of.

### WMA:

WMA stands for Windows Media Audio and is just Microsoft's format for audio. The story behind WMA is that Microsoft wanted to come up with its own proprietary format to include with its products. Also, as Napster demonstrated, MP3's are easy to pirate, and Microsoft wanted a format that would make this harder. They wanted a format that would allow the original owner of the audio to control who copies and listens to the audio file. So Microsoft developed .wma which is now perhaps the second most popular audio format.

### OGG:

The third most popular format is probably the one called .OGG, and one reason why its so popular is that it is not patented at all. So software makers can use OGG without paying license fees or worrying about infringement. MP3 and WMA are patented so if you're a software maker, you need to pay to incorporate these formats into your software, not OGG.

Why do these different formats matter? Well, like I said before, for us as educators, we actually don't have to worry a whole lot. But we do need to be aware of some of the issues that exist. For example, one issue is interoperability: different files formats work on some devices but not others. Again this problem is not new. For example, .mp3 is the oldest, most popular, and most widely supported audio format. So most devices will play .mp3s. But some .mp3 players won't play other formats. For example, if you buy an iPod made by Apple, I'm pretty sure that they only play .mp3's and not files in Microsoft's .wma format or ogg format. But even this is changing, and there many .mp3 players out there are able to play all the major audio formats.

Another issue with file formats we might want to keep in mind is pirating. Like I said, depending on who you are, one potential problem or benefit with .mp3's is that they're easy to copy and distribute. This is where Microsoft's WMA format comes in, because it allows the copyright holder to control who can copy and use a given WMA file. So, for example, many companies that sell downloads of audiobooks will record them as WMA files, so that they can't be pirated by the people who download them. But of course, Apple and others recognize that piracy is a problem, so they are constantly coming up new competing file formats that prevent piracy

For us, since we're in education, and we want to be as accessible as possible, so we probably don't care too much about piracy. We want our materials to be copied and distributed freely amongst our students. And we want to maximize the number of students who can listen to our podcasts, so we probably would want to use the .mp3 format. But its important to know that there are these other competing formats out there, and that the formats may change as time goes by.

### RSS

Maybe the final bit of jargon you'll hear when talking about podcasts is RSS. RSS stands for Really Simple Syndication. RSS is another type of file format, but not for audio. RSS is specifically used for updating people when new material has been put up online, in a blog for example. Basically, when you post things online, you can decide to support RSS, which means that everytime you post something new to your blog for example, your computer also puts out a machine readable version of your new post. That version is stored as an RSS file which only computers can read. And what happens is, your fans all have what are called RSS aggregators on their computers. These RSS aggregators automatically probe their favorite blogs for new RSS files, which means that whenever new material has been published, they get updated immediately. So if you make regular podcasts, you can choose to support RSS, which will alert your students or fans who have aggregators that a new podcast is up for them to hear, and even automatically download it for them.

So that's the basics of listening to podcasts. Podcasts are audio files that are stored on the web for people to download and listen to on their iPods. And if you have an RSS aggregator, you can use it to get updates whenever your favorite podcasters have new material for you to hear.

### Making Podcasts

As we'll see during class next Tuesday, making podcasts is almost as easy as making a tape recording on a cassettee player.

What sort of equipment do you need? First, you need a microphone, but not a special one. This podcast your listening too was recorded using a \$15 mic from Radio Shack. You can connect your mic directly to your computer like I have, or you can always record onto a tape player, digital recorder and then transfer that recording to your computer. Either way, you'll need software for audio recording & editing, which you can get for free online. On Tuesday, we'll try to use a free one called Audacity, which is what I used to create this podcast. You'll also need software that turns your recorded file into an .mp3, this is called an MP3 encoder. Again, this software is free, and we'll use one called LAME. Finally, you'll need a file transfer program for uploading your .mp3 file up to the web. [pause] Personally, this is where I get off the techie bus, so I've relied on Lauri's web person to handle this part. [pause]

Now there's a great online tutorial that leads you through all of this, which I highly recommend it. If you want to check it out before class, its at [www.how-to-podcast-tutorial.com/](http://www.how-to-podcast-tutorial.com/)

## Podcasts and Education

So how would podcasts be useful in education? Well, since podcasts are so new, the jury is still out on their usefulness in teaching college courses. But my experience with the Teaching Company lectures I've listened to can provide examples of some benefits.

As a student, I found that since I could listen to the lectures at my convenience, I absorbed more of the material than I usually would. I listened to it when I was ready and interested, not when it was scheduled. Also, if I became distracted or needed to take a mental break for a minute, I could hit pause and not miss anything. And if something in the lecture was not clear or a major bombshell, I could rewind and listen again.

As teachers, recording our lectures and placing them online as podcasts for download gives us a number of options. At the most basic level, we can simply use them as compliments to our existing material. We can just put online the *same* lectures that we give in class. This way, students who miss something during class, or who want to hear the lecture again, can just download it. Students also don't have to worry about frantically taking notes during class, instead they can just listen, absorb, and ask questions during the lecture in class. Later, they take notes from the podcast. Personally, I like this because I notice that many students insist on using laptops to take notes during class. But they don't take notes for long, pretty soon they're surfing the internet or doing internet chat, and totally ignoring the lecture. So as a professor, I kinda want to ban laptops, and I think I'll have an easier time doing that if students don't need to take notes in class.

But podcasts give us more flexibility than just putting our in-class lectures on line. If we want to get a little more sophisticated with our podcasts, then we can put all our lectures online and use class time for something more productive. For example, saying your teaching physics. You could podcast lectures on basic theory and concepts of electromagnetism, and then use classtime to demonstrate applications and problem solving, or for doing desk work, or having general discussion, laboratory experiments, or active learning exercises.

And if we wanted to get our students in on the act, we could even have them record and post their own podcasts as part of their homework or term projects.

Again, the technology is all new. So as the cliché goes, the only limits are our imagination. The question is how useful will it all be.

### "So what would a podcast lecture sound like?"

Well, let's hear a piece of a professional podcast lecture. I'm a political-economist, so I like the history and politics stuff. But you're all scientists & engineers, so I thought we'd meet half-way and listen to some history of science. You're about to hear Professor Lawrence M. Principe of Johns Hopkins University. He's won multiple teaching awards, including awards from the Carnegie Foundation, the Templeton Foundation, and several from Johns Hopkins itself.

The piece of lecture you're going to hear is an eleven minute excerpt about the "Galileo Affair" taken from his class "History of Science: Antiquity to 1700" which is an absolutely great class sold by, you guessed it, the Teaching Company.

Now, we all know the classic story about Galileo. In 1633 Galileo was convicted of heresy, and sentenced to house arrest, for teaching that the Earth moved around the Sun. This story has become *the*

classic example of how hidebound religious conservatives hate and fear science, and fight its progress. But as Professor Principe will reveal, the truth is that Catholics didn't strongly object to the theory of heliocentrism until Galileo made his appearance. In fact, Copernicus' earlier book on heliocentrism was dedicated to the Pope, and was published at the insistence of several Catholic cardinals. Hence we'll find out that persecution of Galileo had a lot more to do with politics and with Galileo's cantankerous personality, then with religious Catholics being anti-science. Indeed, as we'll hear, Galileo wasn't being very scientific, or very honest, at all when he made his famous claims. Let's listen to Professor Principe...

### **[Insert 11 minutes of “Galileo Principle” here]**

So that's what a podcast of a lecture might sound like...at least for a history class. If you want to hear other examples of podcasts, try going to [web.mit.edu/mitir/](http://web.mit.edu/mitir/) This is MIT's new journal called the International Review, and they have a couple podcasts available of recent talks on international stuff. . Just click on the word podcasts in the upper right blue box.

Now of course a science or math lecture might work differently than these, or even from the lecture we just heard on Galileo. Indeed, you might want to combine a science or math podcast with downloads of say a powerpoint presentation, so that you could present equations or formula along with the lecture.

If you wanted to get really sophisticated, you could forget about audio podcasts and go video. With video podcasts, you use a digital camera to record a video of yourself, and present that file online for people to download. If you want to see some examples of video podcasts, go to [web.mit.edu/zigzag/](http://web.mit.edu/zigzag/) which is MIT's video magazine.

A second spin on video is what's called a screencast. A screencast is a video recording of a computer screen's output, often with some audio narration attached. So with a screencast, you can literally talk your way through a presentation on your computer screen, and upload the whole recording as a single file. When it gets played on the computer, the viewer would hear your voice, while watching say powerpoint slides flip by on their own, and even watch the cursor move around on its own as you use it to point things out on the slides. And you can use screencasting software to record anything you can put on your screen. If you want to see some examples of a screencast, then check out that website [www.how-to-podcast-tutorial.com/](http://www.how-to-podcast-tutorial.com/) I mentioned. They have screencasts about how to use Audacity, the audio editor. I'm not going to focus much more on video or screen casts today, because they're honestly both a little advanced for me and a little expensive for those of us on tight budgets.

### Copyrights

One final thing we might want to cover here is copyrights. That lecture snippet you just heard about Galileo is actually property of the Teaching Company. And in order to legally use it in this podcast, I had to get explicit permission from them, which I did. In fact, any recording made after 1923 is likely covered by copyright protection. This makes adding sound effects or music to your podcasts a bit tricky. Since even if the music itself is in the public domain, like Mozart or Bethoven, almost any recording of that music is going to be copyrighted.

Copyright laws are fairly complex, but there are exemptions for something called “fair use”, and there are even special allowances for educators. The basic idea is the less copyrighted material you use, and the less popular it is, and the less income you deprive the owner of the copyrighted material, then the

less chance you have of getting successfully sued. We'll talk a little bit more about this in class on Tuesday.

Well, if I timed this lecture properly, then its been around 35 minutes, which is plenty of time to spend listening to a podcast about podcasts. But if you haven't had enough, then I recommend you go online and hunt down Stanford University's podcasts on Apple's iTunes website at [itunes.stanford.edu](http://itunes.stanford.edu). These Stanford podcasts are additional examples of academic content on podcast, they're free to download and cover everything from science to history to recent events at Stanford. Check them out.

And when we get to class on Tuesday, to show you how easy it is, we'll see if we can download all the software and make our own podcast in just thirty minutes...

Oh, and your homework? That's easy. Just analyze this podcast. What was good about it? What was bad about it? How would you make it better? And do you think it works as a tool for teaching courses? This is Zak Taylor for course 5.95, on Sunday April 30 signing off.

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OK, yeah, a strange & slightly boring problem. Well every scientist I know turns their field into a hobby. My computer scientist friends write video games in their spare time, my chemistry friends are all amateur chefs at home, my biology friends all make beer. Me, I'm a political-economist, so that means that I like to dabble in the stock market. Not a lot money mind you, but just enough to make it fun little hobby. And it is fun because I get test what I think I knew about international politics and economics in the stock market. And a few years ago, I realized that I was actually getting pretty good when it came to picking which industries or countries would do well, but I would often pick the wrong company to invest in. That is, I could never tell exactly which firms were good or bad, so I'd often buy a bad or average stock in a great industry. And wind up not doing as well as I thought I should. So my problem was, that if I didn't want to lose my tin life savings, I realized that I needed to know how to read and interpret corporate financial statements.

Now, corporate financial statements are no magic wand. They don't tell you which stocks are going to skyrocket and which are going to plummet. Looking at a company's financial statement is little like when a doctor gives her patient a physical and looks at his vital signs. They do give you a general sense of how healthy and efficient a company is, whether its growing or shrinking, and why. Which is exactly where I was messing up in my investing strategies.

And I stumbled on this course called Lost Christianities taught by the chairman of the Religious Studies department at UNC Chapel Hill. And it was about how the bible got written, why some books made it in, and why some books didn't, and what these lost books had to say. It was about how different sects of early Christianity battled it out over who Christ was and what he meant, and how mainstream Christianity as we know it came to be. In other words, it was all about the politics of religion, and as a political scientist I'd never even considered the politics of religious ideas. So I got that course and it blew me away.

Lessons:

- a boring lecture makes a boring podcast
- voice speed, inflection, and pronunciation matter and take a bit of practice
- verbal "chapter headings" help a lot
- perhaps try dialog or interview format