

Podcasting and screencasting for supporting lectures



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Overview

The *Resource Pack* is designed to provide some practical guidelines on how to create podcasts and screencasts to develop resources that can be used to support lecture delivery and student learning. An overview of the use of podcasting and screencasting is provided, along with some principles from cognitive literature on designing e-resources. There are some practical suggestions on how to create casts and an overview of some common software. [Dec 2010]

Introduction

The increasing availability of a wide range of free or low cost software allows for the rapid generation of a wide variety of types of reusable learning objects (RLOs) such as podcasts or screencasts. Podcasts are generally considered to be an audio file (although the definition varies, and in the context of iTunes is very specific – see below), while screencasts are audio files coupled with a video stream – such as a PowerPoint presentation, video of a whiteboard, video of the speaker or a combination of these. The advantage of these casts are the incorporation of audio, which allows for a much fuller explanation or discussion of a concept than a PDF or PowerPoint slideshow might allow. Podcasting is undergoing something of a meteoric rise, with a large number of studies in the literature examining their implementation and effectiveness.

A recent review on podcasts (McGarr, 2009) categorised podcasts into one of three types: (i) those which replay the content of a lecture for review and revision (substitutional), (ii) those which provide additional material to aid students' understanding (supplemental) and (iii) those which are student created (creative). Much of the literature about podcasting focuses on the first category, with consequent discussions about whether podcasts will replace lectures (McKinney, Dyck, & Luber, 2009). However, I would argue that it is the second category where podcasts (and by extension screencasts) have most potential, and there are some good examples from the literature where these supplemental uses, integrated with lectures, have proved beneficial.

A key aspect when considering the development of any e-resource is whether the time required to develop the resource is outweighed by the pedagogic value in using it (Salmon, 2002). Therefore the expectations of what the

podcast/ screencast is to be used for in any given situation needs to be carefully considered. Typical examples would be explaining a difficult concept, providing a worked example to a solution, providing an audio summary of a topic, providing introduction to terminology prior to lectures, providing feedback on assessment, providing information on practical activity, and so on (Rotheram; Salmon & Edirisingha, 2008). Mobile phones with cameras are now ubiquitous, and I have seen an example of a lecturer videoing the process of going to the library and getting a text book and demonstrating a search of the index to show new students how to perform this task. The point is that this and all the examples given have a specific outcome – they are a learning object often with just one key topic being explained. Once generated, they can be recycled annually and/or by others in the same discipline, so they become a reusable learning object (RLO).

Finally, the early use of virtual learning environments was marked by academic staff, unsure what to do with this large online space where learning was supposed to happen, uploading a lot of content that students would access and read. This has been called “shovel-ware” as the material was uploaded in bulk. This failed on two counts – the first was that the students didn't generally access the material because there was too much there or they didn't have the skill to sift through it. With this model, students will generally access online materials most in the period just before examinations and therefore don't have the time to review material that was meant to support their learning during teaching in their final days of revision before an exam. Secondly, the process of placing a lot of largely non-interactive material online and telling students to “go there” and look at it meant that the real and virtual learning spaces were not interlinked, so the value of the virtual space was diminished in the eyes of students, and probably of staff who were unsure what to do with the space in the first place. Therefore in considering the development of podcasts (or indeed any e-resource), it is useful to consider exactly how it will be integrated into the in-class work, and consequently attributed the value arising out of this responsibility by both

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lecturer and student. Integration and attributed value should enhance the prospect of the resources being used.

Cognitive Considerations

Overview

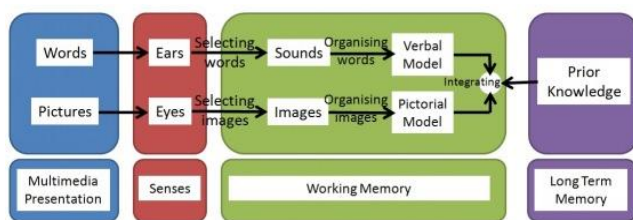
The design of e-resources may be considered in the context of cognitive load theory (CLT) to give a model for instructional design based on knowledge of how we acquire, process and retain new information. It proposes that a successful use of the model will result in more effectual learning, and the retaining of information in the long term memory, which can be recalled when required in a given context. The theory distinguishes three types of cognitive load (Ayres & Paas, 2009; Sweller, 2008):

1. **Intrinsic load** is caused by the complexity of the material and depends on the learner's understanding (prior knowledge) of the subject.

2. **Extraneous load** depends on the quality or nature of the instructional materials. Poor materials or those that require a large amount of working memory to process will increase the load and leave little capacity for learning.

3. **Germane load** is the mental effort required for learning. Because of the limited capacity of the working memory, germane load (the extent of learning) is dependent on the extent of the extraneous load, and also on the material and expertise of the learner – the intrinsic load. An expert on a topic is able to draw from prior knowledge, and release working memory capacity for germane load processing.

The mechanism of information processing was summarised succinctly by Mayer for the purposes of multimedia learning. This is similar in many respects to the information processing model familiar to many science educators through the work of Alex Johnstone (Johnstone, 1997; Johnstone, Sleet, & Vianna, 1994). Mayer's model is shown in the figure below (Clarke & Mayer, 2008; Mayer, 2005).



Cognitive Theory and Multimedia Learning (from Clarke and Mayer, 2008 and Mayer, 2005)

Information is presented to users in the form of words and pictures (there are other channels too, but these are the most pertinent to e-learning). The user senses these (what Johnstone refers to as a perception filter) and some of this is processed in the working memory, which can hold and process just some information at any time. If this material can be related to existing prior knowledge, it is integrated with it, and effective learning occurs – the new experiences and information are stored in the long-term memory.

Considerations for Presentation of Information

1. **Split Attention:** Learning materials that provide two sources of mutually dependent information (e.g. audio and visual) will require the learner to process both channels and integrate them, requiring working memory. Design of the materials should therefore ensure that as, for example, a reference to the diagram is being verbalised, the associated diagram reference is clear for the viewer to see. The alternative is that learners require working memory to process the diagram to find the reference being verbalised. Clark and Mayer call this the contiguity principle, and provide two strategies for considering it in practice, namely to place printed words near the corresponding graphics (including, for example, feedback on the same screen as the question and integration of text legends) and to synchronize spoken words with the corresponding graphics.

2. **Modality:** Because the working memory has “channels”, the most significant being the visual/pictorial and auditory/verbal information channels, consideration of the nature or mode of information can be beneficial. In the split-attention effect, above, it was argued that they different modes must be integrated effectively to ensure that working memory was not overloaded. This can be teased out a little further. If learning material contains a diagram and explanation, (mutually dependent), the explanation can be in text or audio form. Presenting the explanation in text form means that learners' visual/pictorial channel will be overloaded more quickly, as they must process the diagram and read the text. If the text is presented as audio, both channels are being used effectively. Clark and Mayer also discuss the modality principle, advising that words should be presented as audio and not on screen. However, they limit it to situations where there are mutually dependent visual/auditory information being presented (see below). Additionally, they argue that there are occasions where text is necessary – for example a mathematical formula or directions for an exercise, that learners may need to reread and process.

3. **Redundancy:** The split-attention and modality effects considered mutually dependent information. If there is multiple representations of the same material, each self-sufficient, or if there is material of no direct use to learning, it can be considered redundant. The time required to attend to unnecessary information or process multiple versions of the same information means that the working memory capacity is reduced. Clark and Mayer also discuss the redundancy effect, especially recommending that on-screen text is not used in conjunction with narration, except in situations where there are no diagrams, or the learner has enough time to process pictures and text, or the learner may have difficulty processing the speech.

Consideration for Design of Interactions

1. **Worked Examples:** Worked examples have been shown to reduce cognitive load. The reason is that students who were exposed to worked examples and who then were required to solve problems did not need to spend extraneous load on the process of solving the examples, and could concentrate on the problem itself instead. Clark and Mayer

agree, and discuss five strategies for incorporating worked examples into e-learning instruction, including fading, described below. The role of worked examples in chemistry have recently been discussed (Crippen & Brooks, 2009).

2. **Expertise-Reversal:** While the case for worked examples is strong, the situation becomes problematic when learners who are already expert engage with the material. In this scenario, their learning may be at best the same as solving problems without worked examples and at worst hampered by the presence of worked examples. The nature of delivery of material (considered for example in the split-attention and modality sections) can also differ for experts, as some material may become redundant. A potential solution offered by Sweller is to present learners with a partially completed problem and ask to indicate the next step required. The response was then used to direct the further instruction pathways (progress with or without a worked example).

3. **Fading:** Fading is related to worked examples, and involves a progressive reduction in the information presented in worked examples, so that learners are initially provided with many details on how to process a worked example, with the amount of guidance (scaffolding) reduced as more examples are provided. Clark and Mayer discuss this in some detail, and highlight it as a potential remedy for the expertise-reversal effect. For a three step problem, they propose that in the first worked example, all three steps are shown, and in each subsequent example, one step is left to the learner until they are required to complete an entire problem. They do acknowledge though that there is not yet sufficient evidence to decide how fast fading should proceed. Clarke and Mayer state that some students may not engage with the worked out components of a faded example, and propose that a worked out step of a faded example could be coupled with a request requiring learners to state a reason/principle why a particular step was used. This is aimed to ensure learners are interacting with material that may otherwise be passive.

Getting ready to record

As described above, it is probably best to develop a podcast or screencast for one concept or outcome, or a series of closely related outcomes. I consider a resource of about 5 minutes plus interaction time (e.g. quizzes or other interactions) suitable for most purposes, with an absolute limit of ten minutes in special cases. The overwhelming consensus seems to be that students do not fully interact with longer resources. It can be useful to jot down the main outcome you want from your cast and then the main points that you will discuss, and structure the podcast purposefully around these. In recording the podcast, it is useful to give verbal triggers to alert the listener where they are – saying, for example that you are going to talk about three key factors and indicating when you are on the first, the second and final of the three. With screencasting, it is possible to include section menu to one side, so viewers can see what section they are in, and also jump to a particular section. If a screencast is uploaded to YouTube, entering the time in the format (m:ss) in the video description will be coded as a

hyperlink to that section of the video. Where possible avoid mentioning dates or even class groups – keeping it generic will enhance its reusability. The key aspect of the design is that it is a self-contained logically structured object which students will be able to use in any context (just after lecture, just before exams, etc).

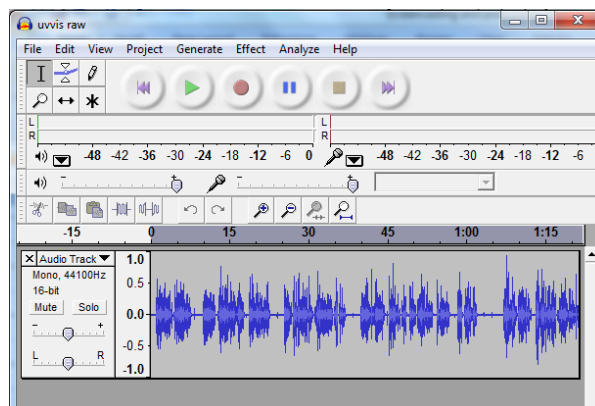
Obviously for a screencast, the associated screen-component (usually PowerPoint slides) will need to be prepared in advance of recording the audio. It is also worthwhile preparing a script – in my experience the time spent doing this is offset by reducing the number of takes required. It also means that subtitles are available if you choose to incorporate them into screencasting software.

The recording environment should be quiet, but even then, audio noise can be a problem – for example noise from the computer can be enhanced if it is placed on a table. If this can be dampened (by placing on a soft surface), it will mean better audio quality. I have experimented with several microphones, and find little difference between traditional jack input and USB, although the latter is meant to give a better quality. My microphone of choice is a Logitech dual headset with microphone attached to the side. The microphone input should be positioned above or below the mouth, rather than in front of the mouth – this will minimise air bumping noises and heavy breath noises. Gentlemen with beards may need to consider a separate microphone to the headset. While audio can be enhanced and manipulated in several of the software programmes, I have found this to be a false hope, and can take a lot of production time. It is better to spend a bit of time considering how to get the very best raw audio signal rather than trying to do post-recording improvements, which rarely work as well as you would hope them to.

Tools of the Trade

Audacity

Audacity is a free and very versatile audio recording and editing tool that can be downloaded from the sourceforge site: <http://audacity.sourceforge.net/>.

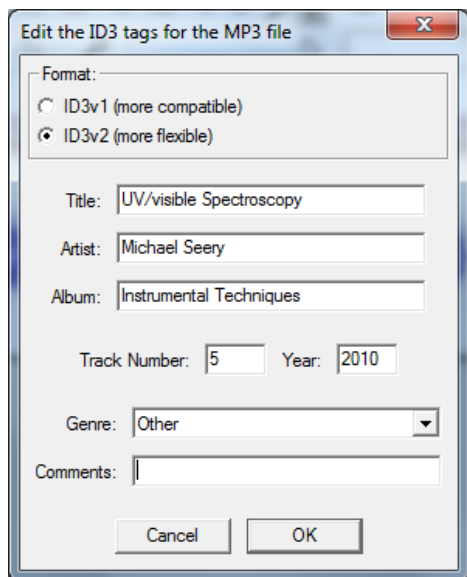


Screen shot of Audacity showing audio track

Once installed it is very easy to use. A microphone will ensure good sound quality and the audio input can be edited to remove unwanted sections or to add in extra sections. For

reasons unknown, I have found it necessary to record using mono rather than stereo – this gives a better sound output.

There are lots of tutorials on using Audacity on the web, and one I have made is available on the “Becoming an E-Teacher” site (Harmer, DuVivier, Seery, & Melrose). To export the Audacity file in mp3 format, a separate encoder needs to be installed – this can be downloaded from the sourceforge website, and needs only to be identified the first time an mp3 file is created. It is important when creating an mp3 file to include title and other information, so that if a student uses the file on an mp3 player that it will be easily identifiable. This information will allow users to locate these audio files easily either by title, lecturer’s name or “Album” title.

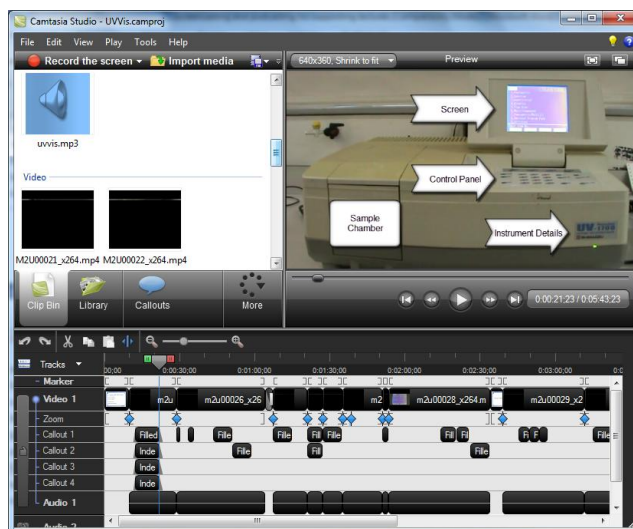


Entering mp3 tagging information when saving in Audacity

Camtasia Studio

Camtasia Studio is screencasting software, and while there are free alternatives, the educational pricing package for Camtasia provides a fantastic programme for a very reasonable price. A fully operational free 30-day trial is available prior to purchasing and can be downloaded from <http://www.techsmith.com/>. It is possible to do a wide range of productions with Camtasia, from the simplest – recording while narrating a PowerPoint presentation (the software when installing requests to install a PowerPoint add-in which is very convenient) – to the most complex – multiple tracks of video, audio, PowerPoint or images. The software is very intuitive to use, and there are user discussion boards which provide a lot of help if you are stuck (the discussion boards are available at the link <http://forums.techsmith.com/>). Camtasia allows importing of a wide range of media types which can be chopped, linked and mixed into a variety of combinations very easily. The screencasts can also include screen annotations/highlights which can aid the audio. The output of the screencast can include a menu so that users may navigate through the presentation easily. If a screencast was produced from a PowerPoint presentation, each slide title is marked as menu items by default.

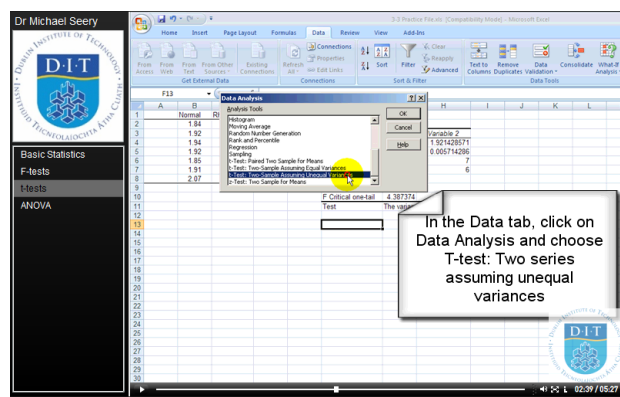
Some limited interactivity is possible with Camtasia, whereby a quiz can be added at any point in the screencast. This can help make the screencast a little more user active, and provide some feedback to students as they interact with the resource. It is possible to incorporate SCORM capability into the quiz (see below) which allows quiz results to be fed into the virtual learning environment gradebook, if the resource is hosted there. The quiz is a Flash object, and hence will not appear on any mobile Apple product (iPhone, iPad).



Screenshot of Camtasia showing the arrangements of camcorder video, audio, screenshots, images, etc.

One final technical consideration to discuss about screencasting is production. Once the array of media files (at the most simplest the PowerPoint recording with audio) is imported, the fun of editing begins. This time requirement can be minimised with a storyboard and a script, and some learning technologists sensibly argue that any production should be minimal so that resources can be quickly developed and published, without relying on editing to make up for poor preparation. While there is some merit in this argument, I believe that some editing – annotation, appropriate zooms, quizzes, removing redundant information and so on – will generate a resource that is much more likely to be useful and reusable. For good visual quality, a rule of thumb is that recording the screen and the production settings should be at the same resolution, or a multiple of that. For example, if a screen resolution is at 640 x 480, the production settings should be selected to match this, or be, for example, 320 x 240. This means the output file won’t be distorted visually. Camtasia allows the screencast to be produced in a wide variety of formats; .mp4, .flv, .swf, .avi, .mov and so on. It will suggest the type based on where you plan to host the movie, so for web hosting, .mp4 is the selected format. There is an option to produce and simultaneously upload to your YouTube account (content menu and quizzes will be stripped out) or to screencast.com which allows a small but usable amount of free space, and keeps menus and other Flash objects in tact. You can also select a simultaneous production of an mp3 audio file which

can be convenient. The formats .flv and .swf are Flash formats, and these will not play on iPhones or iPads. The .swf format is not suitable for uploading to Youtube.



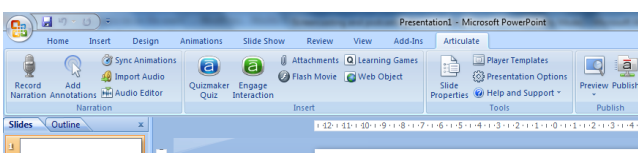
Example of a screencast with a menu incorporated

Alternatives to Camtasia

There are several free alternatives to Camtasia Studio for screen capture, although naturally these do not have the same extensive editing functionality. Jing, also provided by Techsmith (<http://www.techsmith.com/jing/>), allows short screen captures to be made, with some annotation options. Jing has a paid option, but the free version is very useful for rapid image or screen capture to produce small files that, for example, could be useful in replying to a student's question by email or in a chat room. The generated video file can be hosted using webspace available freely on Techsmith's <http://www.screencast.com>. Camstudio used to have more prominence as a competitor to Camtasia, although I think with the arrival of Jing, this has abated somewhat. Camstudio (<http://camstudio.org/>) also allows for screen capture, with a few options in the type of file type that can be created. Screenr (<http://screenr.com/>), part of the Articulate family is a very simple, technically impressive web-based screen-capture (no software download) which is then hosted on the Screenr website, in a manner similar to YouTube.

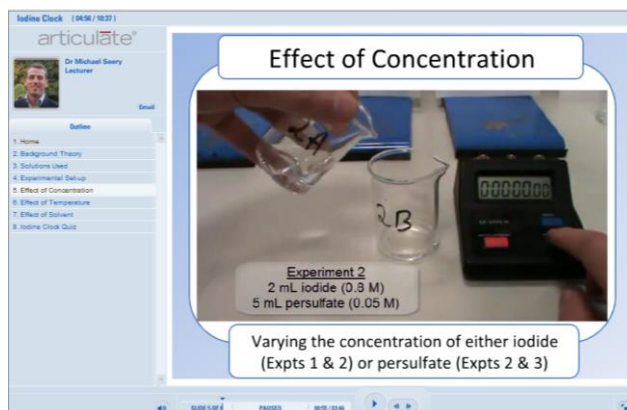
Articulate Studio

Articulate Studio (<http://www.articulate.com/>) is a high-specification product which can be used to create Flash learning resources without the need for programming. The programme has three main components – Articulate Presenter, which acts as an Add-In to PowerPoint; Articulate Engage, which allows for the generation of a wide range of interactions, either as stand alone or for incorporating into the Presenter; and Articulate Quizmaker which generates a wide range of quiz types, which again can be embedded into Presenter or used on their own. The quizzes are SCORM compatible (see more about SCORM below).



The Articulate interface in PowerPoint

As it works through PowerPoint, the software is very intuitive to use and quickly generate Flash resources that can be played in a web-browser, hosting for example, in the VLE. As the software is quite widely used in the corporate training world, there is extensive support freely available, through a wide range of channels, with dedicated support staff (<http://www.articulate.com/community/>). Several examples of the type of resources that can be generated in an academic context are available at the University of Leeds website (<http://www.leeds.ac.uk/articulate/>). Some of the resources I have generated include those to support maths in chemistry (<http://www.mathsforchemistry.info>), introductory chemistry terms (<http://www.michaelseery.com/chem1306/>) and pre-laboratory work, incorporating videos and a quiz (<http://michaelseery.com/home/?p=722>).



A produced Articulate resource showing a typical interface

Articulate, with its ability to generate a Flash resource with any and every bell and whistle that you may or may not need, comes at a price to match. However, there is an educational licensing option which has a generous discount, and at the time of writing, Irish HEI's associated with the NDLR (<http://www.ndlr.ie/>) are able to avail of a bulk discount negotiated by the Higher Education Authority – your local NDLR representative will be able to give the necessary details. A fully functional 30-day trial is available from the Articulate website.

SCORM

The sharable content object reference model (SCORM) is a set of guidelines that e-learning software products comply with so as they interact with other products. In practice, this means that if a resource with a quiz is generated from software (e.g. Camtasia or Articulate) and embedded into the VLE, the quiz results obtained by students after interacting with the resource can be fed into the VLE gradebook. Therefore students can complete a quiz and obtain feedback during the interaction with the resource, as determined when making the e-resource, with the quiz results can be made available at a time the lecturer chooses. Both Camtasia and Articulate have SCORM production options which can be selected during the production process – Articulate even produces the .zip file that can be imported directly to the VLE

when adding a new SCORM resource. To add some confusion, there are two standards currently in use – SCORM 1.2 and SCORM 2004. The standard you select will be dictated by the VLE you plan to use it with.

Podcasting and iTunes

As well as hosting podcasts or screencasts on the VLE, another option for dissemination is to publish to iTunes. While the casual definition of a podcast is any audio or even audiovisual file, from the point of view of iTunes, a podcast is one of a **series** of audio or audiovisual files that are released periodically. For example, a radio programme might release podcasts weekly, so its podcast index (the .xml file as we will see below) is updated weekly as a new audio/audio-visual file is added. The great benefit of iTunes is that once the set-up is organised correctly, iTunes will automatically scan to check whether a new podcast has been added to the series (automatically using RSS methodology) and if it has, will download the latest additions to the user's computer once they have subscribed. It is important to note that iTunes does not host the audio files themselves, just the link to the .xml index file that itself links to wherever your podcasts are stored.

To create a podcast series on iTunes, you need an iTunes account, somewhere to host your podcast files, a file that lists all of the individual audio/audiovisual files within a particular podcast (the .xml index file) and an optional image file. The iTunes account is easy to set up, once you have downloaded iTunes. A webspace to host your files costs about €20 per year (I use Blacknight), or you may be able to arrange with your institution to host the files. If you host your own, you will need an FTP programme to move the files from your desktop onto the webserver, and Filezilla is a very good free one (<http://filezilla-project.org/>). You then need to create your podcasts – for example using Audacity. The final element then is to create the index file, listing all of your details about the podcast and each individual audio or audiovisual file (called an “item”) within that podcast – this holds all of the information that will appear on iTunes. This is called an .xml file and is easily created. To do this, you could open Notepad, copy and paste the text below (or see similar examples from iTunes) where the underlined text is what you would change for your own set-up. This podcast has two items listed, each one enclosed in the <item>...</item> section. You can remove one or add as many more as you like. Once all the data is added, save the file as filename.xml, with no spaces in the filename. Each time you make a new audio file, you would add a new <item> </item> component with all the details of that file and then reupload the filename.xml file to your webspace along with the new audio file (with no spaces in the filename).

This code is available to copy and paste from various sites online (Apple; Seery, 2010) and more detailed information on each of the tags is available on the iTunes website. The links to the mp3 files etc are the weblinks to wherever your mp3 file is saved on the webserver – it will be of the form “http://www.example.com/myfiles/audio/podcast1_1.mp3” for an mp3 file.

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here</title>
<link>A link to a webpage can go in here (optional)</link>
<language>en-us</language>
<copyright>your name here</copyright>
<itunes:subtitle>Suitable subtitle here</itunes:subtitle>
<itunes:author>your name here</itunes:author>
<itunes:summary>Short summary of what the series of podcasts
is about</itunes:summary>
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When you have completed and uploaded your .xml file, it is worth using a Feed Validator to test the code (<http://www.feedvalidator.org/>), before submitting to

iTunes. Once this is OK, and at least one audio file have been uploaded, you need to submit your podcast to iTunes for approval. iTunes don't "test" anything, so your submission should be for the first real podcast. The submission process can take a while, as much as two weeks. Once your podcast is approved, you can update your stream by adding a new <item>...</item> to your .xml file, upload it and the stream will update within a short time.

Acknowledgements

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References

- Apple. An Example Feed, from
<http://www.apple.com/itunes/podcasts/specs.html#example>
- Ayres, P., & Paas, F. (2009). Interdisciplinary Perspectives Inspiring a New Generation of Cognitive Load Research. *Educational Psychology Review*, 21(1), 1-9. doi: 10.1007/s10648-008-9090-7
- Clarke, R. C., & Mayer, R. E. (2008). *E-Learning and the science of instruction* (2nd ed.). San Francisco: Pfeiffer (Wiley).
- Crippen, K. J., & Brooks, D. W. (2009). Applying cognitive theory to chemistry instruction: the case for worked examples. *Chemistry Education Research and Practice*, 10, 35-41.
- Harmer, E., DuVivier, E., Seery, M. K., & Melrose, P. Becoming an E-Teacher Module 5, from
<http://sites.google.com/site/becominganeteacher/home/module-5-making-podcasts-and-incorporating-into-website>
- Johnstone, A. H. (1997). "...And some fell on good ground". *University Chemistry Education*, 1, 8-13.
- Johnstone, A. H., Sleet, R. J., & Vianna, J. F. (1994). An information processing model of learning: Its application to an undergraduate laboratory course in chemistry. *Studies in Higher Education*, 19(1), 77-87.
- Mayer, R. E. (2005). Cognitive theory of multimedia learning. In R. E. Mayer (Ed.), *Cambridge handbook of multimedia learning*. Cambridge: Cambridge University Press.
- McGarr, O. (2009). A review of podcasting in higher education: Its influence on the traditional lecture *Australasian Journal of Educational Technology*, 25(3), 309-321.
- McKinney, D., Dyck, J. L., & Luber, E. S. (2009). iTunes University and the classroom: Can podcasts replace Professors? *Computers & Education*, 52(3), 617-623. doi: DOI: 10.1016/j.compedu.2008.11.004
- Rotheram, B. Sounds Good, from
<http://sites.google.com/site/soundsgooduk/>
- Salmon, G. (2002). *E-tivities: the key to active online learning*. London: RoutledgeFalmer.
- Salmon, G., & Edirisingha, P. (2008). *Podcasting for Learning in Universities*: SRHE/OU Press.
- Seery, M. K. (2010). How to add a podcast to iTunes from
<http://michaelseery.com/home/?p=761>
- Sweller, J. (2008). Human Cognitive Architecture. In J. M. Spector, M. D. Merrill, J. van Merriënboer & M. P. Driscoll (Eds.), *Handbook of research on educational communications and technology* (3rd ed.). New York: Routledge.