



Tools for Supporting Educational Technologies

Introduction to Digital Desktop Video

UNSW

EDUCATIONAL DEVELOPMENT & TECHNOLOGY CENTRE



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INTRODUCTION TO DIGITAL DESKTOP VIDEO

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1. OVERVIEW

Developing the media content for your website or course requires the balancing of functionality, accessibility and available resources for both production and delivery. Enhancing your course with video or audio material does not need to be a Ben Hur production however, with desktop video technology for basic production now widely available.

This tutorial module examines production and delivery issues for online media and has been designed to meet the needs of both PC and Apple Macintosh users.

Useful links are threaded throughout this module under the relevant sections. They can also be found collectively for quick reference at 'Links & tools'.

This site offers some basic information and links to resources for UNSW teaching staff wishing to utilise video in their teaching material.

- Planning: Tools and techniques for planning your production
- Production: Tools and techniques for acquiring footage
- Post-production: Editing using Apple's iMovie 2 on the Macintosh platform and Adobe's Premiere 6 on the PC platform.
- Delivery: Modes of delivery including printing to tape, burning to CD/DVD and streaming via the Internet

EDTeC at UNSW offers the following support to teaching staff:

- Access to production equipment including cameras, microphones and post production facilities
- Training in the use of the above
- A full complement of production services
- Advice and troubleshooting (available at all times)

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2. PLANNING AND ACQUISITION

The present is a fantastic time to be working with moving pictures and sound. With the advent of light weight, high quality digital cameras and the power of late model computers the potential to produce professional video projects has been placed within everyone's reach.

Firewire (also known as i.LINK or IEEE-1394) connects camera to computer and enables footage to be digitized into the computer with ease. This same firewire cable enables the edited program to be mastered to digital tape by using the camera as a recorder. The degree of user empowerment offered by these technological breakthroughs is tremendous.

In addition, new modes of delivery such as DVD and the Internet are offering exciting possibilities for disseminating video and audio content.

All of these developments point to the fact that video is fast becoming a new standard document format for this century. Like all documents it has its own grammar and stylistic parameters.

The aim of this short course is to open up these exciting developments to potential users.

WHY USE?

- Descriptive capability
- Sensory richness - nuances
- Immediacy
- Satisfying for the end user
- Has become much cheaper to utilise
- Fun to work with (time permitting)

APPROPRIATE USE

- SHOW **NOT** TELL

As a visual medium, video is best at revealing information as opposed to being used in a didactic fashion. If you have a physical element to your course video is excellent at reinforcing this material. Production/construction processes, chemical reactions, laboratory procedures or field trips. Anytime something interesting is happening is a good time to record video footage. Particularly if your students can't be there when events are unfolding.

- Personalising distance education materials

If you are delivering material to students flexibly via the internet or other means video is a very potent way of personalising your material. Let your students see and hear who is behind all this great information that is being delivered to them!

- Creates a re-useable resource which can be re-purposed at a later date or as developments demand material be updated

Pause for reflection

How can you use these technologies in your specific area of knowledge?

EDTeC is looking at developing a workshop to specifically address the needs of academics who are looking at producing well designed and fully articulated video based projects in 2002.

Explore video in education:

- A consortium of English Universities is working together to develop the framework for creating video rich learning environments: <http://www.clickandgovideo.ac.uk/>. This site has a wealth of information and good examples to inspire you.
- The Apple Learning Interchange (<http://ali.apple.com>) offers a smorgasbord of video-rich learning material. Be sure to have a look at the "Quicktime TV for learning" link on the top right hand side of the page.

Tools of the craft

Mini DV cameras:

- High quality
- Easy to use
- Extremely light sensitive
- Connect directly into computer via firewire for editing and printing your edited master to tape

Computer and firewire:

- Late model computer (Apple Macintosh – G3 or later, PC – P2 bare minimum but P3 preferred) with 256 mb ram. computer with bundled iMovie non-linear editing software
- Non linear editing software. Apple machines have this bundled with their operating system. PC users will need to purchase additional editing software (we recommend Adobe Premiere 6).
- Firewire enabled. Apple Macintosh computers have this as standard. PCs will require a 3rd party firewire video card.
- Portable external hard drive with fast data throughput (recommended optional extra)

The advantage with the Apple system is that they provide an elegant, user friendly video production system straight out of the box. No additional hardware or software is required.

The Production Process

The production process can be broken down into the following stages:

- Pre-production (planning)
- Production (lights, camera, action)
- Post-production (editing)
- Delivery

Planning is all. It will save you time, money and heartache. It will also allow you the confidence to improvise and remain adaptable during the production process.

As part of your planning always ensure your cast and crew are well fed.

To help you plan, a variety of tools and techniques are available.

The Script

EDTeC recommends the two column form of script layout. The left column contains the visual elements of the script and the right column contains the audio elements of the script in line with the relevant vision. As the reader reads down the page he/she can see how the vision and audio components of the script inter-relate.

The Storyboard

The storyboard is a shot by shot breakdown of the visual elements of the script with accompanying notes on the audio component of the script written under each shot. The storyboard is an excellent way to refine the visual approach to your material and plan for how much coverage you will need to illustrate your material effectively (more about that later).

The Shooting Schedule

The shooting schedule is really what happens when and who is involved. It is a word document which tells everyone involved in the production when they will be needed and for approximately how long. It spans the entire length of the production phase of your project.

Call Sheets

Call sheets are a refinement of the shooting schedule in that they span a day at a time. In the same way that a story board refines the scripting process, the call sheet articulates who is needed when on any particular day of the production. It has personnel, time and location details for each cast and crew member.

Additional handy hints

A list of props and extra components required for specific scenes in your production will further help you organise daily logistics for your project. Finally, an equipment checklist will ensure you have all the production equipment you need for your video shoot.

Remember, the whole point of the pre-production process is to adequately prepare for the chaos of the production phase of your project.

3. PRODUCTION

Cameras - mini DV - 3 chip cameras give a better quality picture with truer colour reproduction. They cost approx. \$1,000 more than single chip cameras but give a much better result. If you can afford it, they are definitely worth the extra money.

This section covers acquiring footage in the field (both video and audio). Our aim is to guide you through techniques and offer tips which ensure you gather source material which can be successfully edited to create quality educational resources.

Remember, the amount of planning you have put into your project is directly related to how smoothly the production phase of your project runs.

To find out more please continue to:

- Camera & techniques
- Lighting
- Shooting style
- Sound
- Coverage

Explore digital video production:

Two digital video resource centres which are worth a visit are:

- <http://www.dvcreators.net>
(be sure to click on the knowledge base in the bottom left hand corner)
- <http://www.2-pop.com>.

Both of these sites require that you register. This gives you access to their regular newsletters.

Camera and techniques

Although mini DV cameras work adequately set to fully automatic mode you will always get a superior result operating the camera in manual mode.

Use the camera's **automatic exposure** mechanism as an internal light meter. Then set the camera to manual exposure to lock in the exposure setting. By doing this you will avoid the camera varying exposure whilst in record mode.

Take another auto exposure reading when the light conditions of the scene change (ie sun goes behind cloud) or you move the camera for a new set up.

Likewise - zoom in to your subject and use **autofocus** to find focus then set the camera to manual mode to lock in the focus point. This will stop the camera from focus hunting whilst in record mode. Reset the focus with each new camera set-up.

Keep zooms to a minimum - or work to edit them out in post production. As a general rule, frame your shot **before** hitting the record button on your camera. Try to avoid using the zoom to position your frame size whilst you are recording.

These simple steps will greatly aid the look of your footage.

WHITE BALANCE

The white balance setting in the camera aligns it to the available light conditions and enables the camera to give an accurate colour rendition of the scene. The daylight (exterior) and interior presets are adequate for most situations. However, manually setting the white balance will provide the most accurate colour rendition of your scene.

To manually set the white balance - zoom in on a white object (paper, t/shirt) until it fills the screen. Press the White Balance button to set the reading. Reset the white balance each time the light conditions change (eg. when moving from indoors to outdoors).

LIGHTING

With the later model mini DV cameras lighting is almost unnecessary **BUT** video has a lower contrast ratio when compared to film.

3 or 4:1 for video as opposed to 20:1 for film

Note: the human eye can handle a ratio of 100:1

If you are compressing for delivery (cdrom or internet), a well lit image will give you a crisper end result.

- 3 source approach - key, fill and backlight
- KEY - main light source
- FILL - secondary source, less intense, provides modelling and helps reduce the contrast ratio
- BACKLIGHT - separates subject from the background and helps provide definition

The fill and backlight provide scope for creative lighting so have some fun with it.

At the very least:

- Keep your subject brighter than your background
- Place your camera between your subject and the sun
- If outdoors - place the camera between your subject and the sun
- Indoors - turn on all the lights
- Open curtains (increase ambient light)
- Don't shoot directly into windows and doors

SHOOTING STYLE

- Tape delivery - anything goes (wobblycam and all)
- If compressing for delivery - use a tripod and frame shots with your delivery window in mind
- Smaller frame size needs tighter shots

Shooting for the Web

- Consider the available technology and keep it simple
- ALWAYS use a tripod

- Minimise camera movement
- Minimise background movement
- Keep shots tight

Streaming media

The reality is that streaming video via a 56k connection will deliver the end user an audio stream and accompanying slide show at best. If this is your chosen mode of delivery, adapt your material accordingly. Full motion video is not really achievable as a stream down a 56k modem. Tailor your material for delivery as an audio stream with small still frames.

SOUND

Sound is generally the weakest link in the tool-kit of production equipment because the out-of-the-box solution is poor. Consequently, additional attention must be given to the audio component of your production to produce professional results.

- Set camera to 16-bit sound quality mode (don't bother with 12-bit).
- Use an external microphone for improved sound quality
- Shotgun mike for documentary style shooting in the field
- Lapel mike for interviews or piece-to-camera style shooting
- Consider using a converter box to connect and convert professional microphones (balanced audio) to DV cameras (unbalanced audio)
- Set sound levels in camera (manual or auto) or use an external mixer for multiple sound sources
- Monitor sound quality with lightweight headphones

PLANNING ADEQUATE COVERAGE FOR YOUR PRODUCTION

The golden rule of production is

Thou shalt not bore

Generating adequate coverage is the single most important thing you can do to make your projects more compelling.

Consider this:

- 1 hour television doco - shooting ratio of between 20 and 100:1 (ie between 20 and 100 hours of material is shot to produce an hour of completed material)
Often unrepeated events - cull material to construct program
- 1 hour television drama - shooting ratio of between 10 and 30:1
Mostly repeated takes of scripted material
- Educational shooting ratio?

2:1 if you are lucky!

It shouldn't be this way

If you have gone to the effort of developing and organising a production you should allow enough time to gather adequate footage.

Adequate coverage:

30min doco - 45 edits

30min drama - 60 edits

30min educational - **at least 30**

Our viewers are sophisticated and are accustomed to watching professionally produced programs

Editing rhythms feed directly into viewer satisfaction

You cannot generate any editing rhythms if you do not gather adequate coverage whilst originating your footage

Use the scripting and storyboarding stage of your production process to work out how much coverage you need to effectively communicate your material and maintain your audience's interest.

Rules of thumb:

- If you mention it attempt to SHOW it
- Use shot variety to advantage - alternate between wide, medium and close shots
- Be prepared to repeat actions and video them from different angles and with differing shot sizes to generate adequate coverage.
- Remember, if a job's worth doing it's worth doing well.

Generating adequate coverage in the production stage of your project will allow you to make creative choices in the next stage of your project

4. POST-PRODUCTION

Postproduction is the next stage of your production and it here that you select the material that is going to be included in your completed program. Material can come from a variety of sources:

- Camera - provides sound and vision
- Digital files - still pictures, text, voice over, music, sound effects and animation

Postproduction allows you to combine and control all these elements over time.

The main reasons why video production was so slow to be swept up into the all encompassing world of computing was that the computers were not fast enough to deal with the massive data rates demanded by reasonable quality video and the hard drives were not big enough to hold the huge raw media files that desktop video production generated. Only desktop computers manufactured in the last 12 to 15 months are fast enough to accommodate video being fed into them via a firewire connection.

File size:

- Video consumes 3.6 mb/sec on your hard drive
- Or 13 gb per hour of footage
- EDTeC recommends using an external hard drive to store your projects and raw media.
- This allows you to move your projects between computers as the project is independent of the workstation. For example a project originator could use EDTeC's computers to produce their project but retain their project on their own portable hard drive. This is a very flexible way to work and relieves you of the burden of having to pay for the production asset!

Explore digital editing:

Adobe's Premiere Expert Centre

(<http://studio.adobe.com/expertcenter/premiere/main.html>)

is an extremely well designed and useful editing resource. Bookmark this one as you will keep on coming back. There are particularly useful PDFs on Digital Video and Streaming Media.

Editing with iMovie 2

In session 2 we covered:

- Digitizing
- Organizing your project
- Titles
- Transitions
- Effects

As the session was predominantly hands on the best way to refresh or consolidate your knowledge is to use iMovie again as soon as possible. To this end, EDTeC offers access to Apple Macintosh computers running iMovie.

Don't forget the iMovie Help Section on the far right of the top menu bar can get you out of any tight corner you may have worked yourself into.

The main things you should bear in mind regarding iMovie are:

- Always keep the project file and the media file together in the same folder to ensure the 2 are linked at all times.
- As there is no "save as" function in iMovie, to create alternate versions of a project choose "duplicate" from the "file" menu. This action must be done before opening iMovie. Again, take care to keep the duplicated project file in the same folder as the media file.
- To allow access to the "restore clip media" command under the "advanced" menu make sure you do not empty the dedicated iMovie trash unless it is absolutely necessary. By this I mean only if you are running out of hard drive space.
- There is no automatic save function in iMovie so users must manually save at regular intervals.
- In terms of project management it is best to implement a piecemeal approach to editing your project. Break down your edit sessions into the following steps, saving, duplicating and renaming at each stage:
 1. rough cut (assemble edit)
 2. fine cut 1 (further refining the rough cut and adding narration)
 3. fine cut 2 (adding transitions, titles and music)
 4. fine cut 3 (making final refinements to the vision track and balancing (mixing) audio tracks - try to allow input from colleagues)

This approach will ensure you can go back to earlier incarnations of your project should you wish to do so.

P.S. Don't empty the trash!

Editing with Adobe Premiere 6

In session 2 we covered:

- Setting up your project
- Batch digitizing
- Editing basics
- Creating titles
- Creating transitions
- Effects and filters overview

As the session was predominantly hands on the best way to refresh or consolidate your knowledge is to use Premiere again as soon as possible. To this end, EDTeC offers access to PCs running Premiere 6.

In terms of project management it is best to implement a piecemeal approach to editing your project. Break down your edit sessions into the following steps, saving and renaming at each stage:

1. rough cut (assemble edit)
2. fine cut 1 (further refining the rough cut and adding narration)
3. fine cut 2 (adding transitions, titles and music)
4. fine cut 3 (making final refinements to the vision track and balancing audio tracks - try to allow input from colleagues)

This approach will ensure you can go back to earlier versions of your project should you wish to do so.

Explore digital editing:

- Apple iMovie - A direct link to Apple's iMovie entry level editing software:
<http://Apple.com/imovie>
- Apple Final Cut Pro 3 - A direct link to Final Cut Pro 3, Apple's high end editing and compositing software: <http://Apple.com/finalcutpro>
- Adobe's Premiere Expert Centre (<http://studio.adobe.com/expertcenter/premiere/main.html>) is an extremely well designed and useful editing resource. Bookmark this one as you will keep on coming back.

5. MODES OF DELIVERY

This final session aims to scope the various choices facing the program maker as they decide how to deliver their project to their audience.

From the desktop -

Print your project to tape using camcorder and firewire to create a master tape. This master tape can be used to make multiple copies for your audience.

Create digital files using compression

Deliver digital files by CD-ROM, DVD or the internet

CD-ROM - approx. 45mins of media at up to **1/2 screen** size

DVD - an hour of randomly accessible **full screen** media. This will be a compelling choice in the near future.

Progressive download files for the web - user must wait for file to fully download before it will play. This can translate to a sizeable wait if material is delivered via a 56k modem.

Streaming media files - delivered off a dedicated streaming server, files play as soon as the first trickle of media has reached the user's computer. This is a good viable alternative for delivering material over fast networks but far from satisfactory via slow connections (56k or less). As the file does not actually arrive on the desktop, this mode of delivery has inbuilt copyright protection.

COMPRESSION

- Digital media projects must be compressed to enable desktop playback
- Different files play on different operating systems and software
- It's a jungle out there! What we want to cover in this session are the choices available to the content developer so they can make an informed decision on which way to deliver their project.

COMPRESSION DEMYSTIFIED

- The amount of compression applied depends on the mode of delivery
- DVD - light compression- MPEG files - maintains integrity of original
- CD-ROM - medium compression
- AVI files for Windows, Quicktime or MPEG files for Macintosh and Windows
- Internet - heavy compression. The amount depends on the user's connection speed. The slower the connection speed the smaller (more compressed) the file needs to be.

CODECS

Short for compressor/decompressor

A codec is a software module which turns your large video file into a much more user friendly file in terms of size and deliverability.

There are a wide variety of codecs and, as time goes by, the list will become longer.

Video and audio compression are new fields of expertise and are really a bottomless pit in terms of understanding how altering compression settings can vary the results of the encoding session.

Explore video compression:

- All you need to know about compressing video for delivery on CDROM or the web: <http://www.terran.com/codeccentral/index.html>
- Adobe's Premiere Expert Centre (<http://studio.adobe.com/expertcenter/premiere/main.html>) has a succinct section on video compression.

COMPRESSING WITHIN IMOVIE 2

The most comfortable entry point into the world of compression is from within the user's editing software. To compress files within iMovie 2 follow these simple steps.

Once you are happy with your final edit, under **File** on the top toolbar within iMovie 2 choose **Export Movie** (Apple E) and then select **To Quicktime**. A choice of preset settings covering web and CDROM delivery will be offered. Make your choice, click on **Export**, choose a destination for your compressed file and then click on **Save**.

Familiarise yourself with the presets by working your way through them. If your project is large do test compressions on a 30 second portion your project. Do this by exiting iMovie and renaming and duplicating the project file. Open the duplicated file and edit this project down to a length of 30 seconds. Use this for your compression tests.

Once you are comfortable with the iMovie presets venture into the expert setting by clicking on **Expert** under the **Format** choices.

This is where you get to manipulate the variables to achieve (and hopefully optimize) your compression results.

As a general rule of thumb for the Apple Macintosh platform use the **Sorenson** video codec for picture compression, the **QDesign Music 2** codec for compressing music or the **Qualcomm PureVoice** codec for compressing voice.

As you are working your way through the Expert settings take note of the way the variables interact to produce a wide range of results.

COMPRESSING WITHIN PREMIERE 6

The most comfortable entry point into the world of compression is from within the user's editing software. To compress from within Premiere 6 follow these simple steps.

Once you are happy with your final edit, under File on the top toolbar within Premiere choose Export Timeline and then select Save for Web.

Premiere comes bundled with Cleaner 5 EZ, a dedicated software compressor. It has been designed to interface seamlessly with Premiere at the export stage. A choice of preset settings covering web and CDROM delivery will be offered. Make your choice, click on start, choose a destination for your compressed file and then click on Save. It is a good idea to set up a dedicated compression folder to store all of your compressed files. This makes the task of comparing outcomes much easier.

Familiarise yourself with the presets by working your way through them. If your project is large do test compressions on a 30 second portion of your project. Instead of compressing the entire

project choose a portion of your project on which to run test compressions. Once you are comfortable with the results you can compress the entire project with the preferred setting.

Explore:

Once again, the Premiere Expert Centre is a good place to visit for some extra detail - <http://studio.adobe.com/expertcenter/premiere/main.html>

IMPORTANT VARIABLES

Data rate – the speed material is delivered to the viewer - closely tied to the connection speed of the end user. If you create material that run at a higher data rate than your mode of delivery you will grind to a standstill. **Nothing will be delivered.**

Here are some upper limits for data rate settings for various delivery modes. Remember this includes video and audio.

- 56K modem - 4K/second
- ISDN - 12K/second
- T1 or cable modem - 20K/second
- CD-ROM - 100K/second
- Hard drive - 250K/second

A good way to calculate the approximate data rate you should be aiming to produce for a given mode of delivery is to use this simple calculation:

DATA RATE = width x height x frames per second = KB/second

48000

Frame rate of media

At least half the rate of original media, ie 12.5 as opposed to 25 frames per second.

Less for streaming to a 56K modem connection - 1/3 original rate

(DVD is the only format that will deliver full frame rate and full screen video).

Frame size of media

- Original media - 768 x 576
- DVD - maintains original
- CD-ROM - 320 x 240
- Internet - 240 x 180 or 160 x 120

Keyframe frequency

Rule of thumb is one per second. You can set this to natural and the chosen codec will set its own key frames.

Audio rate and size

Again there are trade-offs regarding the rate and resulting file size when using audio compressors.

11Khz, 8 bits – low quality – 662 K per minute

11Khz, 16 bits – much better – 1.3 mb per minute

22Khz, 16 bits- very acceptable – 2.6mb per minute

44.1Khz, 16 bits – CD quality – but 5.3mb per minute mono and 10.6mb per minute in stereo

All of these variables work together to determine the file size and deliverability of your completed project. Compression is as much an art as it is a science and your own experiments will carry you further down the path to understanding compression.

STREAMING OVER THE INTERNET

Streaming is the act of placing a heavily compressed digital file on a streaming server thus making it available for public viewing. The file can be embedded into a web page or accessed via a URL with a stand alone media player.

- Can be video, audio or both
- At present, audio streams best because the smaller file size fits our relatively slow connection speed (56K)
- Still images can be linked to an audio stream and delivered to domestic desktops
- As bandwidth increases streaming capability increases
- Rich media can be successfully streamed across the campus wide network

THE MAIN PLAYERS

- Apple Quicktime - file type - .mov
- Windows Media Player - .wmv
- Realnetworks - .rm

EDTeC hosts streaming files in Quicktime and Windows Media Player format.

To access the streaming example used in this session open Quicktime player on your desktop (if you don't have Quicktime it can be downloaded from www.apple.com/quicktime/download).

Under file choose **Open URL in new player**. Type in the address:

rtsp ://edtec-s2/desktopstreamer.mov and click on **OK**.

Note: this file has been optimised to play on the UNSW network and is too large to be accessed from a 56k modem.

Other examples of streaming media can be found on the [EDTeC website](http://www.edtec.unsw.edu.au/frames.cfm) (<http://www.edtec.unsw.edu.au/frames.cfm>). Click on **Services** and select Video Production and Streaming. Quicktime files are indicated by the small quicktime logo.

Links to a range of supporting websites can also be found on the [EDTeC site](http://www.edtec.unsw.edu.au/frames.cfm) in the Resources section under Video Production and Streaming. Here you will a variety of information to support your interest and growing knowledge in the field of Video Production and Streaming.

Explore video streaming:

- All you need to know about producing video and audio streams for the internet, with tutorials on using the "big 3" streaming browser plugins - Quicktime, Real and Windows Media Player: <http://streamingmediaworld.com>
- A great source of tips and best practice all focussed on Apple's Quicktime software: <http://www.judyandrobert.com/quicktime/>
- The Microsoft approach to streaming and the place to download Windows Media Player: <http://microsoft.com/windows/windowsmedia/en/default.asp>

- Download the free Realplayer plugin: <http://realplayer.com>
- A presentation created at the University of Melbourne on using Realmedia for delivering video over the web:
<http://www.economics.unimelb.edu.au/RealServer/ASCILITE/video.html>. (This site requires the Realplayer plug-in to be installed)
- A good overview of the emerging streaming media and its potential impact:
<http://www.media100.com/streaming/interactivestreaming.html>