

Streaming Audio and Video for Course Design

Kerry Shephard

Introduction

The use of streaming audio and video (or streaming media) to support learning is new; using audio and video to support learning is not. It is important that the technical issues involved in streaming do not outweigh the pedagogical issues inherent in the use of these conventional but still exciting learning resources. Nevertheless, the new technology is beginning to enable audio and video to be used in entirely new ways; ways that benefit tremendously from the ability of the computer to allow learners to interact with learning resources. This guide attempts to identify some technical issues in using streaming media but primarily looks at the educational possibilities. There is great excitement about streaming technologies but little information about the effectiveness of streaming media in supporting student learning now. To make progress it is necessary for academic staff to experiment with 'streaming' and to evaluate and communicate their results.

How can streaming audio and video support learning and teaching? Streamed media are 'sent over the Internet' to users who request them, for example, by clicking on a hyperlink within a web page. The information is passed through cables, optical fibres and wireless networks as digital code that is reinterpreted as moving images and sound by the user's computer. Learners do not need to download the media and it starts to play soon after the request is made; the user's computer 'buffers' information in its memory in advance of it being needed and it is never actually downloaded onto the computer. Downloading large multimedia files can take a long time so eliminating this stage, by streaming the media, makes the process very fast. With broadband or networked access to the Internet, the image, audio quality and viewing experience is often 'as good as television'.

Video and audio have been used for many years

to support student learning in all branches of education. In its broadest sense the term 'video' includes all media that support both moving pictures and sound. But some would distinguish between broadcast media and more portable forms such as the videocassette; likewise for audio. Authors often stress the value of these media to facilitate 'narrative visualisation' and 'dynamic modelling' or 'simulation' of real life events. Teachers use video to tell a story, convey emotions and provide 'real life' examples with which learners can identify. In some circumstances audio can be used to create more powerful images in the minds of learners. Advice on the most successful ways to use these media has been given by many, including, for video, Race¹. For example, educational experts agree that video is best shown in short segments so as to maximise learners' concentration and learners should also be encouraged to learn actively from the video. Much of this sound advice from experienced educational practitioners will also apply to streamed media, but much remains to be discovered.

New models of learning and teaching are being used to describe and even quantify specific stages in the learning process and particular aspects of interaction between learner, teacher and medium. Laurillard² describes video as, primarily, a narrative medium that does not, easily and on its own, support active learning. Lack of user control is a limitation of video in its basic form but probably less so when it is delivered through a computer. "In this mode it inherits expectations of interactivity"². Developing interactivity between the user and the learning resource remains an important aim in the design of learner-support programmes and a particular focus with streaming media.

Some uses for streaming media and strategies for engaging learners

Replicating the television or radio

Viewing a streamed video on a computer screen should be little different from viewing a video from a videocassette, loaded into a VCR attached to a television. Press the button, sit back and watch. There will be a short delay. The quality of the streamed image may not be quite as good as that possible on the television. The image size will almost certainly be smaller. Viewers need access to the Internet with reasonable bandwidth and they need to be using a computer with a media player and related software compatible with the streamed video. Viewers also need to know to expect delays and some interruptions and to not, necessarily, interpret these as faults. Most media players allow fast-forward, reverse and pause; generally they are configured to replicate the basic controls of a VCR³.

Hyperlinks and segments

Beyond this basic 'television' mode, media streams can be made available to students in a wide variety of ways. It is not necessary for a student to 'go' to the Web site from which the media is streamed. A text-based or image-based hyperlink can easily be inserted into any online learning resource, such as a Web page or page in a VLE (Virtual Learning Environment) and simply clicked to open the necessary link to the streamed media and run the required software. It is not necessary for students to view, or even to have access to, complete videos. Streamed media can be digitised and distributed in segments or 'clips' and viewers can choose which clips to view using additional controls on the media player. This is equivalent to using the 'index points' on a videocassette but much faster. As with using the VCR index-point technology, however, using 'File Markers' or 'Navigate' and 'Go to' controls does require users to develop a range of specialised skills. It is probably fair to say that few users of the VCR develop such skills. It is unlikely that users of

computer-based Media Players will want to. There are alternatives that place the responsibility for using specialist skills with those who produce web resources, rather than with users. ASX (Active streaming X) redirector files allow users to click on hyperlinks that take them to specified segments of a streamed video, often defined by start-time and duration. Redirector files generally require the assistance of specialist support. The same may apply to Play-lists. Play-lists allow users to select and save 'access to' specific sequences of clips from one or more streamed video. At least in principle these tools allow users great flexibility to watch, work with, adapt, build, re-sequence, link to or otherwise make use of online media. It remains to be seen how learners will actually use this array of tools and, indeed, the extent to which those who support their learning will.

Linking with other learning resources: design for learner activity

When these technical possibilities are integrated with pedagogically designed tools, the educational functions of streamed media potentially extend far beyond the narrative. Widely available technologies currently allow a stream of media of, for example, a lecture or a demonstration of a process to be played to learners at the same time (and in the same screen) as a range of other resources. These resources may include scrolling text that repeats the spoken word and hyperlinks to maps, charts, diagrams or pictures that illustrate the points being made in the video. 'Chat boxes' or threaded discussion boards allow distant learners to synchronously or asynchronously discuss the content and issues within the video. Streaming media may also be played as part of the questions set by teachers in online tests, exams and quizzes. Streaming video could reasonably be part of student online answers or assignments⁴. Perhaps not surprisingly, streaming media are starting to be used as a more convenient form of conventional audio and video to support lectures. Many lecturers have experience of combining the motivational power of

the lecture with the 'real life context' of video using a videocassette recorder and large-screen television. The technique particularly facilitates discussion and other learning activities, even with large groups. Lecture rooms with Internet connections and projectors are becoming more common. The reliability of such Internet

connections may not be perfect but is often as good as that of conventional audio-visual aids. Streamed media then becomes just a subset of the array of media available via the Internet to support learning within the lecture.

Other pedagogical innovations, probably more 'round the corner' than currently available, will depend on the success of current exploration of the way that metadata can be used to catalogue and give access to online video and audio. When learners can reliably acquire, refer to and use specific clips or elements of online media, as is currently done with online textbooks and journals, they will be able to use streaming media in a far wider context than possible today.

Advantages and disadvantages Streaming media do have major advantages over their conventional forms. Their ability to be combined with powerful VLEs does create powerful and flexible tools for learners; also for teachers. Learning resources then really do become 'independent of time or (networked) location' and do encourage students to become more independent and responsible for their own learning. Case studies show that much of this is possible and happening now, for some students and in some situations. Herein lies a major disadvantage. Using streaming media successfully requires skill, equipment and good infrastructure. It also requires both teachers and students to change their traditional roles and expectations. These attributes, facilities and processes will take time to implement and will probably never be uniformly distributed as technologies are changing constantly. We also need to accept that we do not yet know how these new tools and facilities

will best lead to improved student learning, nor what new demands will be placed on them. We need to experiment and evaluate; and communicate our successes and failures.

Streaming media also have other, less obvious, advantages and disadvantages. As streaming media are not copied by receiving computers, copyright holders have considerably more power over distribution than with conventional media. This should facilitate licensing and distribution and encourage production of dedicated learning resources. Related to this, much conventional 'footage' could be digitised and streamed but without regard for its original design features; it may, for example, have been produced on the assumption that a lecturer would be available to help to interpret it in a classroom setting.

Getting started Getting started with streaming media requires the acquisition of two sub-sets of skills. Working with video and audio to support learning is itself a significant development for many lecturers. Using 'technologies' to support learning is another.

Many Web sites offer demonstrations of media streams that encourage academic staff to engage with this resource and to experiment with ways to

use it to support student learning. Examples of such Web sites can be found from around the world. These include the University of Wisconsin-Madison⁵, USA, and the University of Portsmouth⁶ in the UK. There are also examples from the commercial world, such as Boxmind⁷, offering a service to academics. This information is useful to inform academic staff about what is possible. In general it is promotional in style. It is less good at providing a more balanced view of how streaming resources have actually been integrated within

learning programmes and what success they have had at supporting learning. Such information is not easy to obtain. Other services based on government-funded research projects, such as 'Lifesign'⁸ and 'Click and Go Video'⁹, offer support to academics to find suitable video and offer advice on its use and evaluation. These projects are producing case studies that should provide a more balanced perspective on the use of streaming media. Without evaluated case studies to illustrate what really happens when learners confront streaming media, the 'potential use' of streaming represents little more than wishful thinking on behalf of the technical developer. Those with appropriate technical skills are in danger of allowing their enthusiasm to develop tools and resources to far exceed the inclination or ability of teachers and students to use them. Case studies, whether in the peer-reviewed academic literature or more informally in project Web sites, are a valuable asset for potential users of streaming media.

The case studies available from the projects described above have much in common. They all demonstrate enthusiasm from academic staff towards experimenting with new learning resources. They all report enthusiasm from some, but not all, students. They all report some technical difficulties but generally describe how these were overcome for most students. None of them report on the use of streaming video as a 'mainstream' learning resource. Each has involved additional work by academic staff and additional support by project staff; viable in an innovative and experimental setting, but not necessarily in mainstream higher education yet.

Pointers for development and implementation

First tackle your own motivation to use streaming media. What is wrong with existing learning

When choosing streaming media be sure that the resource will be available for the duration of your teaching programme. Whilst developing your learning resources be sure to try them out yourself, using the same computers as those that your students will use. Ensure that you benefit from the cumulative experience of teachers who have used video to support learning for many years¹¹. Watching video on a computer screen can be as unhelpful to learning as watching television. Benefit from streaming to a computer by making the most of the computer to encourage interaction between learner and learning resource. Evaluate as you go and disseminate the results of your evaluation to the wider community.

resources? To use streaming media, you and your students will need to acquire additional skills and this does need to be balanced against the added benefits of using the resources. Academic staff in well-resourced departments will find that modest IT skills will be enough. They will simply click on the links and the videos will play. They will add hyperlinks to Word documents in their own VLE and students will gain easy access to the media. But it is not always like this! Computers need to have particular media player software installed and Internet links need to be reliable. If the streaming resources are to be an essential feature of the programme's provision then all students need to have access. Considerable integration between learner support, infrastructure, skills training and IT support is absolutely necessary.

Seek support from your institution's staff development unit, from the LTSN or from national projects that set out to support innovative developments using streaming media (e.g. Lifesign⁸). Use this support to help you to find streaming resources that will support your students' learning or to help you to stream existing recordings that you already use. Copyright and licensing are significant problems that can be resolved given financial and technical support and time. Make use of the online gateways that provide access to streamed media such as the British Universities Film and Video Council Moving Image Gateway¹⁰ and that provided by the
M e d i a
R e s o u r c e s
C e n t e r o f
t h e
U n i v e r s i t y o f
C a l i f o r n i a ,
B e r k e l e y ^{1 1} .

**most of video. SEDA paper 90,
73-90.**

²Laurillard, D. (2002) *Rethinking University Teaching*. Routledge Falmer, London (p105).

³ Microsoft (2002) Windows Media Player
<http://www.microsoft.com/windows/windowsmedia/>

⁴ Shephard, K.L. (2001) Submission of student assignments on compact discs: exploring the use of audio, images, and video in assessment and student learning. *British Journal of Educational Technology* 32 (2) 161-170.

⁵University of Wisconsin-Madison
<http://www.doit.wisc.edu/services/streaming/>

⁶ University of Portsmouth

<http://video.mdc.port.ac.uk/video.htm>

⁷ Boxmind <http://www.boxmind.co.uk/>

⁸ LIFESIGN (2002) <http://www.lifesign.ac.uk/>

⁹ Click and Go Video (2002)

<http://www.clickandgovideo.ac.uk/>

¹⁰ Moving Images Gateway

<http://www.bufvc.ac.uk/gateway/index.html>

¹ ¹ T h e M e d i a
R e s o u r c e s
C e n t e r o f
t h e
U n i v e r s i t y o f
C a l i f o r n i a ,
B e r k e l e y
<http://www.lib.berkeley.edu/MRC/>

AcknowledgementsThe author
**acknowledges the help of members of the
Lifesign Project, Southampton's Centre
for Learning and Teaching and the Faculty
of Medicine, Health and Biological
Sciences.**

Dr Kerry Shephard is Learning Technologies Co-ordinator at the University of Southampton's Centre for Learning and Teaching. He has a background of teaching and research in biology.