



Video/videoconferencing in Support of Distance Education

KNOWLEDGE SERIES

Classroom teaching techniques are easily adapted for video, and video is an easy distance delivery format for new participants to adapt to

Videotape makes video programming nearly universally accessible... however, with the increasing availability of higher bandwidth modem connections and new image compression techniques, Internet-based streaming video is gaining popularity.



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DESKTOP VIDEOCONFERENCING CAN BE EASILY COMBINED WITH OTHER ONLINE LEARNING APPLICATIONS.

introduction

INTRODUCTION TO VIDEO TECHNOLOGIES FOR DISTANCE EDUCATION

Video is an increasingly important part of many distance education programmes, as it provides a visual and auditory context for learning. The necessary equipment need not be prohibitively expensive, and the range of options for videoconferencing connectivity and video distribution include traditional videotape, video broadcast (instructional television), interactive videoconferencing, desktop videoconferencing and streaming video.

ADVANTAGES OF VIDEO TECHNOLOGIES

Video and videoconferencing are currently the most convenient means to reproduce, at a distance, the social atmosphere of an ordinary classroom. Both verbal and visual interaction are strongly represented on video, so the format is highly accessible and inclusive – classroom teaching techniques are easily adapted for video, and video is an easy distance delivery format for new participants to adapt to.

Video's face-to-face context engages the students, and video can effectively capture cultural context to enhance the learning experience. Videoconferencing can significantly broaden learning opportunities, particularly for rural schools. Desktop systems for videoconferencing and streaming video are increasingly available and affordable, as are alternative distribution formats to traditional broadcasting (videotape, CD-ROM, DVD).

DISADVANTAGES OF VIDEO TECHNOLOGIES

Costs for video broadcast and traditional videoconferencing are still high. Video and videoconferencing both need high bandwidth modem connectivity; although some streaming video can be accessed with a low bandwidth modem, transmission may be choppy and participants must still have a reliable phone connection.

Videoconferencing takes place at a fixed hour in a dedicated facility, which may limit its usefulness to people who work on shifts or with erratic schedules. Learning through videoconferencing is by nature group-paced, not self-paced; this may not suit every individual's learning style.

Both video and videoconferencing lean heavily toward a traditional lecture format, which can encourage passivity in participants similar to watching television. For this reason, the medium does not necessarily transmit detailed factual content well; presenters must adapt their approach, providing supplementary materials in alternative formats if necessary.

traditional

TRADITIONAL VIDEOCONFERENCING

For the past six years, Heritage College (Hull, Quebec) distance education programmes have enabled aboriginal Cree adults to take preparatory college-level courses by videoconferencing, without leaving their home communities in the remote James Bay region of northern Quebec.

Multi-site conferences are transmitted from the college over a single ISDN connection (two, high bandwidth digital phone lines) by dialling in to a conference bridge. Participants at each site can see and hear the instructor, and be seen and heard when called upon. The students attend classes from their local adult education centres, communicating with their instructor by talking during the videoconference and by receiving or sending images from a document camera.

The choice of when and how to use videoconferencing is based on the needs of participants and the requirements of the content being delivered. In this instance, videoconferencing is well suited to the Cree students' preference to learn by seeing how something is done, and by hearing what it's used for.

EQUIPMENT AND COSTS FOR TRADITIONAL VIDEOCONFERENCING

Basic classroom/boardroom videoconference equipment packages include a video camera, microphone, and a *codec* - a digital encoder/decoder – that converts analogue images into digital signals. These signals are compressed and transmitted by high bandwidth phone lines to and from the receiving sites, and displayed on standard large-screen televisions. A remote control keypad controls camera movement and sound levels.

Presenters will often have the option of using peripheral devices, such as:

- A *document camera*, which displays physical objects, documents, or notes shown live by the presenter
- A *split-screen function*, for viewing several sites on-screen at once (typically up to four)
- A *PC (personal computer) input/output* to transmit displays from data files
- An *electronic whiteboard*, useful if the presenter is facilitating a group locally while simultaneously conferencing with remote sites
- A *second TV screen*, for a view of both the local and remote sites



- *Electronic polling devices*, which allow large groups of participants to vote or respond to questions electronically rather than verbally.

If traditional videoconferencing facilities need to be purchased rather than rented, they may be expensive to maintain. Careful planning, shared usage and time management are often necessary to justify high operating costs. Besides using videoconferencing for distance education, for example, a rural school board can use the system to hold administrative meetings or to conduct job interviews, saving travel time and costs.

Fixed costs for a single, site-to-site videoconference include:

- Equipment purchases (currently US\$3,000 – \$7,000 per site); where available, private videoconferencing rooms can be rented
- Long distance charges on a minimum of two digital phone lines (charged to the outgoing call)
- Salaries of any technical personnel (including the presenter) engaged for the conference.

Variable costs include the above, plus:

- Equivalent costs for each additional participating site
- Multi-site bridge administration charges, including registration or scheduling fees
- Additional long distance charges for connecting with sites outside the bridge's local calling area.

VIDEOCONFERENCING TIPS

As the dynamics of on-screen interaction – especially where multiple sites are involved – can become somewhat chaotic, video conferences often need more planning and management than face-to-face meetings.

ROOM AND CAMERA SET-UP

- *Seating arrangements*: a U-shaped group seating arrangement transmits well visually.
- *Camera angles*: avoid extreme close-ups. Placing the camera just above the TV monitor can help a sense of eye contact, as people will look at the monitor image of the person they are talking to. Camera settings can be saved as numbered pre-sets on the control keypad.
- *Consistent lighting*: lighting and framing subjects in the camera viewfinder should follow the guidelines for basic photography, with ample controlled lighting to ensure both subject and background are evenly lit.
- *Microphone placement*: videoconference system microphones should be aimed away from the television speakers and the hum of electronic equipment.
- *Support equipment*: a fax machine for transmitting hard copies of notes and a separate speaker phone, in case any technical troubleshooting needs to be done with someone attempting to connect to the conference.

PRESENTER STRATEGIES

- *Prepare*: class materials should be ready at hand and organised.
- *Body language*: avoid rapid movements, pacing around or erratic hand gestures. Make distinct movements, e.g. take slow steps forward or backward, and use specific hand gestures where needed for emphasis.

- *Voice*: speak clearly but in a natural voice, at a comfortable volume. Energy and enthusiasm are critical in motivating participation, so voice quality (pitch, tone, volume and pacing) is important.
- *Clothing*: wear solid colours and simple jewellery. Flashy jewellery or bright colours (including white and striped clothing) do not transmit well in compressed video.
- *Movement*: avoid moving off camera, or too close or far away from the light source; your image will be “cut off” or appear too light or dark on screen. The videoconferencing inset window can be used to monitor how the image looks at the remote site.
- *Visual aids*: both the presenter and remote-site participants can use a document camera or electronic whiteboard.
- *Pacing*: there can be a delay between the time a person talks at one site, and the time he or she is actually heard at the remote site. Presenters should pause for a longer than normal period of time when expecting a response.
- *Monitor questions*: use a timesaving question format, e.g. “Is there anyone who did **not** understand?” instead of “Does everybody understand?”.

ENCOURAGING INTERACTIVITY

- *Prepare participants*: distribute pre-readings or questions. Notify participants early in the session about specific discussion topics.
- *Establish rapport*: use social icebreakers, such as having participants introduce one another. The presenter should draw on common interests between group members at different sites. Participants should identify themselves when they speak and learn others' names.
- *Monitor participation*: pay as much attention to the remote sites as to the host site. Address questions to specific groups or sites but not to specific individuals, unless they are clearly comfortable with this. Avoid an over-emphasis on the presenter reading his or her material.

desktop DESKTOP VIDEOCONFERENCING OVER THE INTERNET

Cathy Gunter has used videoconferencing as a teaching tool at the Provincial School for the Deaf in British Columbia since the mid-1990s. Deaf students are very visual and frequently have lower literacy skills than their hearing peers. An early project connected students at the school with another school for the deaf in St. John's, Newfoundland. As a teacher, Ms. Gunter finds videoconferencing a “fairly inexpensive method of connecting with the outside world and to get information first hand . . . We have visited the San Diego Zoo, the Museum of Modern Art in New York.” Conferences are interpreted using American Sign Language (ASL).

EQUIPMENT AND COSTS

Using the Internet greatly reduces the cost of videoconferencing, but the quality of the transmission is also reduced. Internet-based videoconferencing from a desktop PC requires:

- A webcam: a digital camera (US\$80 – \$200) that attaches to a PC
- A sound card



- Speakers
- A microphone, or a headset that combines speakers and a microphone
- Conferencing software, such as NetMeeting or CuSeeMe Pro
- Internet access at 56 Kbps.

INTERNET CONFERENCING SOFTWARE

Two inexpensive desktop conferencing software packages are NetMeeting, available free from Microsoft (newer versions of Microsoft Windows include a copy of NetMeeting) and CUSeeMe, which can be purchased along with an inexpensive camera for under US\$100. Typically, videoconferencing software offers interactive voice, video, text chat, file exchange, a whiteboard for sharing ideas and the ability to jointly surf the Web. Some programmes also allow data collaboration, through which participants can jointly work on a document or a computer programme. NetMeeting has strong document sharing capability; however, currently only two participants can use video simultaneously although NetMeeting allows multiple audio users. CUSeeMe can accommodate up to twelve different video participants, but its document sharing features are more limited than NetMeeting.

An Internet-based videoconferencing programme enables an instructor to interact with students, present slides (such as a PowerPoint presentation) and web-based lecture notes, or visit relevant websites. An instructor can also initiate group work; for example, students could be asked to supply responses to a word-processed questionnaire.

Internet videoconferencing software requires connection to a conference server. In a multi-point conference, the server is responsible for receiving incoming video from each conference node and forwarding the signals to each endpoint. Most Internet-based videoconferencing software products provide access to publicly available conferencing servers. It is also possible to purchase a videoconferencing server for private (local or wide area network) use, or to license access to such a service. For example, CUSeeMe Conference Server (previously called MeetingPoint) is used with CUSeeMe software, but can also be accessed by NetMeeting and some other desktop conferencing software products. Microsoft Exchange 2000 includes a conferencing server.

Accessing a videoconferencing server outside a local area network (LAN) can be prevented by a firewall, software that monitors and blocks unauthorised access to a PC or a network of computers. Sometimes this can be resolved by changing firewall settings. Be sure to investigate firewall compatibility issues before purchasing any conferencing server software.

VIDEO BROADCAST

Carleton University (Ottawa, Ontario) has offered courses over the local cable television network since 1978 (www.carleton.ca/itv). Despite many new developments in the videoconferencing and Internet arenas, Carleton's "old technology" approach to distance delivery remains viable – it is streamlined, cost-effective and pedagogically sound.

By broadcasting over the metropolitan cable television network, Carleton offers its most popular courses to a greater number of students while avoiding class-scheduling conflicts. Today, roughly 70%

of the approximately 4,500 students annually taking Carleton's television courses also attend other courses on campus. The remaining 30% are distance education students. Through its "Tapes-to-You" videocassette courier service, Carleton is additionally able to reach students across North America. The university is currently researching the possibility of distributing video courses using CD-ROM (see "Video CD" section at the end of this paper).

Courses are deliberately filmed in a classroom environment, which includes actual on-campus participants. The existing classroom setting reduces costs and is a naturally dynamic environment for both instructor and students. The classroom is equipped with a multi media teaching console, a multi media computer, 35mm slide-to-video player, VHS video player and an overhead document video camera. Pre-recorded tapes, 35mm slides and computer applications (such as PowerPoint) can be presented to the on-site class and recorded as part of the taped lecture.

streaming VIDEO STREAMING

An emerging, less expensive option to full broadcast video is "streaming" sound and video over the Internet. The video is streamed through the computer and displayed on the screen without needing to be saved onto its hard drive, as most hard drives are not large enough to store a whole video programme. Streaming video can also be broadcast simultaneously around the world (called live streaming or webcasting), or archived and accessed as required.

A good way to learn about streaming video and its uses is to sample it. Learning Week Live is a weekly webcast (a real time, Internet video broadcast) featuring video streaming, slides and online chat, broadcast from an online streaming platform called HorizonLive. The appeal of HorizonLive is its variety of visual content. Simple visuals (usually, "talking heads") can be enriched by adding electronic slides (e.g. PowerPoint), web pages, text chat and polling features. HorizonLive also incorporates a whiteboard and the ability to automatically capture and display screen shots through a programme on the viewer's PC.

Streaming video captures images using a digital video camera or camcorder, and compresses the video file using video-encoding software. A video capture card translates the digital video file into data signals that a computer can read, and transfers that information from the camera to the PC; analogue formats, such as an existing programme on videocassette, can also be transferred this way. FireWire is the current standard for capturing digital video through a digital video port on your computer. Watch for FireWire or iLink compatibility when purchasing video hardware and software.

Most streamed video comes in one of three flavours: Microsoft Windows Media (ASF or Advanced Streaming Format), RealNetwork's RealVideo, or Apple QuickTime (Windows and Macintosh platforms).

Players for streamed videos are free, but as each format is distinct students may need to have a copy of each player on their computer if more than one format is being used. Most sites with streaming video include a link to the appropriate player, and have information about the specific computer configuration required to access the video.

Typically, the minimum Windows-platform requirements for viewing video over the Internet are:

video

- A Pentium 166 MHz processor
- 32MB of RAM
- A 28.8 Kbps or better modem (a faster connection will improve video quality)
- A 16-bit sound card
- Speakers
- A 256-colour video display card
- Windows 95 or higher (Windows MediaPlayer 7.1 requires Windows 98, but earlier versions are available for Windows 95 and Windows NT)

Because streaming video involves compressing data for transmission over a computer network, even the very highest quality streaming media signal does not quite equal the image quality of analogue formats (videotape, or traditional broadcast television).

PRODUCING STREAMING VIDEO

This requires a good quality video camera, ideally a digital camcorder. Although it is possible to use an analogue video camcorder, the quality of a digitally captured image will be noticeably better. Prices vary considerably, but acceptable quality digital video camcorders cost about US\$1,200; a 60-minute digital videocassette costs approximately US\$10. It is also possible to record video and audio streaming content using other types of media devices, such as audiotape, videotape, CD-ROM, or satellite feeds.

Streaming also requires software for encoding and compressing video. Windows Media, RealNetworks and QuickTime each have proprietary products. Basic encoding software, such as RealNetworks' RealProducer Basic, is inexpensive and sometimes free.

For detailed product information or availability, and for streaming video "how-to's," see:

- Windows Media (www.microsoft.com/windows/windowsmedia/default.asp)
- RealNetworks (www.realnetworks.com/getstarted)
- QuickTime (www.apple.com/quicktime/products/qt)

Digital video editing software lets users cut and paste, add text and other effects to a video. RealProducer Plus and iMovie (www.apple.com/imovie) are affordable beginner video editing products. Adobe Premiere (www.adobe.com/products/premiere) and FinalCut Pro (www.apple.com/finalcutpro) are more sophisticated products that require training and skill to use effectively. Simple "talking heads" productions may not require sophisticated editing.

Equipment and tools for capturing and editing digital video on a PC are designed to streamline the process, but producing good quality video can still be tricky. You need good equipment, significant bandwidth, a large computer hard drive and considerable time to produce streaming video successfully. It can also be costly, especially if you

intend to run your own streaming video server (required for a large, simultaneous audience) to monitor the video downloading process. Instead of a "do-it-yourself" mentality, institutions should consider using the technical support services of application service providers (ASP's) such as Horizonlive (www.horizonlive.com), WebEx (www.webex.com) and CentraNow (www.centranow.com). These online services offer video streaming and videoconferencing features in an integrated learning platform.

TIPS FOR EFFECTIVE VIDEO STREAMING

Ideally, institutions interested in producing streaming video should involve someone skilled with using a video camera and who has some technical video knowledge. Here are some other suggestions:

- Events should be under 90 minutes, and structured around a few basic themes. Thirty to 60 minute events are considered most effective
- Use good quality equipment and check wiring connections; a faulty connection can cause loud background noise
- Use a clip-on microphone or a podium microphone directly attached to your recording device, to reduce background noise
- A simple backdrop for the subject is best
- Close shots with minimal movement work better than far away or "action" shots of the subject
- Avoid a lot of camera movement or zooming, which are difficult to effectively compress; use motion only where it clearly compliments the learning experience, as when demonstrating an action relevant to the topic presented
- Visuals that accompany a video presentation should be simple but effective, including a mix of photos, simple graphics and well-designed text.

VIDEO CD

Because Internet connectivity is still sporadic or slow in many parts of the world, producing and distributing video on CD-ROM is an attractive option – the downside is that you need to distribute the physical disc. MPEG1, Real and Quicktime are common file formats that can store slightly more than an hour of audio and video on a CD-ROM, which is normally adequate for distributing a class lecture. To produce a video CD you will need a camcorder, a video capture card, a high-end Pentium computer with a very large hard drive, software to capture, edit and encode the video, and a CD-writer to write the information onto a disc. InterVideo's MyDVD for CD is an example of a video-authoring package; WinProducer and Apple iMovie also let you export videos to a CD-ROM. To learn more about producing video CDs, see:

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VIDEO/VIDEOCONFERENCING IN SUPPORT OF DISTANCE EDUCATION

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