

SECTION A:

Getting Started

IN THIS SECTION:

What Is Video Conferencing?

What Do I Need to Get Started?

Choosing a Video Conference System

Application Sharing

Multipoint Conferences

Communications Links

Running Costs

Changing Systems

The Right Environment



What Is Video Conferencing?

At its simplest, video conferencing is a tool which allows users to see and hear the person they are communicating with. Video conference calls are usually one-to-one or point-to-point calls using a direct link between participants. Calls can be made locally, nationally or across the world.

Multi-way or multipoint conferences are also possible where more than two users take part in the call; these will be discussed later.

To make a video conference call each user needs some form of video conferencing system and access to a suitable communications link.

Video conferencing systems come in a variety of formats - some are computer based, some are dedicated units - but all have a number of common features:

- **Camera**
- **Microphone**
- **Speakers**
- **TV or Monitor**
- **Methods of establishing a connection to remote users via on-screen options**

The choice of system should depend on its intended use. Some systems are only suitable for person-to-person or small group use; others have the facilities to support use by whole classes.

A communications link is required, over which a video conference is established. A video conference signal requires more capacity than a normal, voice-only phone line can provide. An alternative - ISDN - is generally used. Users with access to fast computer networks can, in some cases, use that network for video conferencing - this is generally referred to as IP video conferencing.

A video conference allows you to take part in live audio/video presentations in your classroom, and to collaborate through them.

It is possible to video conference between two classrooms in the same town, or between two classrooms in different parts of the globe. The distance between each location is only restricted by the ability of each site to make the required connection.

Live video conferences differ from other multimedia resources, such as video recordings or television presentations, **because they are interactive**. You are meeting and talking face to face with someone else in 'real time', but in a different location.

Successful video conferencing in the classroom requires the technology to take a backseat and allow you to concentrate on the content and delivery of your video conference event or lesson.

Video conferencing is **not** 'big and scary' or too complicated, technical and beyond your capabilities. It does **not** need to take up excessive amounts of time, once you have mastered the basic techniques associated with any new, unfamiliar resource.

Video conferencing **is** exciting, stimulating, and easy to use with practice and confidence, and has the potential to totally involve pupils. It is perfectly within the possibilities and capabilities of what you can achieve in your classroom. The list of resources available to the teacher in the classroom is changing and becoming more sophisticated day by day. New technology and equipment are being developed all the time, extending our ability to communicate and collaborate with greater ease.

However, it is ultimately the skill and ability of the teacher in harnessing the technology that will determine the success of video conferencing in the classroom.

Mike Griffith, Global Leap

What Do I Need to Get Started?

Video Conferencing Systems

A video conferencing system must be able to fulfil the following tasks:

- **Establish a link to another user**
Much as a telephone call is made by dialling another user, a video conference call is made either by dialling the other user's ISDN number or selecting the network address of the other user if the unit is on a network. Most systems will have an on-screen address book or directory in which numbers can be stored.
- **Enable the user to hear and see the user at the far-end**
(in video conference terminology 'far-end' refers to the video conferencing system you are contacting and 'near-end' refers to your end).
All video conferencing systems need speakers and a suitable screen (computer monitor or television/video monitor depending on the system).

- **Provide a means of controlling the sound**

This is a major issue. The quality of sound will have a significant impact on the usability of the system for teaching and learning.

All units need a microphone and speaker. These may be built into the computer if using a computer-based system or built into the video conferencing system and monitor if using a dedicated system.

If the microphone and speakers are in close proximity there is potential for sound to loop between the speakers and the microphone resulting in howling or acoustic feedback.

Some units have methods of controlling sound such as echo cancellation and noise suppression systems. Others do not have sophisticated sound control and require the use of a headset for acceptable results.

- **Provide a means of controlling the video**

A camera is a standard feature on all video conferencing systems. Some are simple, cheap web cams, others are more complex with automatic focus and gain control. Some dedicated units include cameras that can be controlled (moved up and down, from side to side and zoomed in and out) using a remote control. Some can be voice activated where the camera will move to focus on the person talking. Some can be controlled from the far-end, enabling users at the far-end to choose what they want to see.

Most systems have the facility to attach video players and cameras. Generally, only PC-based systems have the facility to share computer applications easily.

Choosing a Video Conference System

It is possible to video conference with systems ranging in price from about £50 (in addition to the cost of a suitable computer) to those costing in excess of £15,000. The choice of system will depend on how it will be used and the budget available.

Most units fit into one of three broad categories:

- **Low cost, computer-based systems**
- **Desktop Systems**
- **Group Systems**

These descriptions of the types of system available give an initial guide as to the most suitable type of system for a particular application. Budget will certainly be a significant factor but the purchase of inappropriate equipment can prove to be a false economy.

The initial purchase of a simple web cam to use with an existing computer can give schools an initial experience of video conferencing and can highlight potential uses and limitations.

Which communications link, ISDN or IP, to use is another important issue. This will be determined by who a school plans to link with, i.e. will links be with users connected via ISDN, IP or both?

LOW COST COMPUTER-BASED SYSTEMS

Description

Most new computers, particularly multimedia systems, already have speakers and a microphone. By adding a low cost camera, such as a web-cam, it is possible to video conference across a network or the Internet.

Uses

- Suitable only for personal one-to-one conferences where the quality of sound and picture is not critical.
- The quality of sound and picture will partly depend upon the power of the computer and the network being used for the link. Can be used across the Internet and broadband networks (*See 'Communications Links' below*).
- Not suitable for use with groups or classes.

Pros

- Application sharing is possible across some links

Cons

- Low cost camera may reduce the quality of picture
- Use across the Internet can be problematic and unreliable
- The lack of echo cancellation means that the use of a headset is essential
- The PC has to cope with the processing of audio and video

Cost Range

In the region of £50 for a camera to add to an existing computer

DESKTOP SYSTEMS

Description

A small unit, which includes the camera, is connected to a computer. The unit may include echo cancellation to control the sound and will usually incorporate the microphone and camera and may include the speakers. These units are primarily used for network-based conferencing.

Uses

- Suitable for personal one-to-one conferences or small group use.
- The quality of sound and picture will partly depend upon the network being used for the link. Can be used across the Internet and broadband networks (*See 'Communications Links' below*.)

Pros

- Better quality sound and picture
- Does not require a headset
- The unit processes the audio and video leaving the computer fully available for application sharing
- Application sharing is possible across some links

Cons

- Not suitable for whole class/large group use

Cost Range

In the region of £400 - £900 to add to an existing computer

ISDN VIDEOPHONE**Description**

The ISDN Videophone also falls into the category of desktop systems. As its name implies it is a telephone unit with a small built-in screen and camera.

They can connect with other videophones or the more expensive dedicated units.

Control of the sound is good, enabling hands-free calls to be made. Additional cameras and monitors can be attached.

Uses

Suitable mainly for individual use or groups of two or three. Works well for providing support and advice to video conference users. Good for one-to-one meetings. Can be used in multipoint conferences.

Pros

- Small, compact, self-contained unit
- Easy to use
- Compatible with more expensive units
- Good sound control

Cons

- Control over camera limited
- Only suitable for use with small groups

Cost Range

£800 - £1200

GROUP SYSTEMS**Description**

There is a range of self-contained units available in this category. Most sit on the top of a normal television and use the television for picture and sound. The unit may contain the microphone or have a table microphone attached. The camera is usually built in as part of the main unit. All functions, including camera movement, are usually controlled by a remote control or remote keyboard.

Some units support the use of dual screens (one to show the near-end, a video being played or an image from a document camera and the other to show the far-end).

Uses

- Suitable for all uses from one-to-one up to whole class use.

Pros

- Very good sound and picture quality (depending upon type of link used)
- Many peripherals, e.g. video players, document cameras, PCs can be plugged in
- Straightforward to use
- Can be used for both ISDN and network (IP) based links
- Can support multiple ISDN lines for better quality sound and pictures (see 'Communications Links' below)

Cons

- Can be expensive
- Some models can be difficult to integrate with PC application sharing

Cost Range

From £2500 - £15,000 plus

Application Sharing

Desktop systems and some group systems may, in addition to video conferencing, support application sharing. This is a process whereby computer programs such as Microsoft Word or Excel can be opened and seen and used by both users. Changes made by one user will be seen by the other. This enables collaborative work on documents, drawings or data. PowerPoint presentations can also be shared with the far-end. Specific applications supporting collaborative work such as file sharing, chat and whiteboard programs are included with some software. *For more details see Section G.*

Multipoint Conferences

Multipoint Conferencing Units (MCUs) facilitate conferencing between more than two users. MCUs act as a central bridging device that can link a number of users into a single conference. An MCU is often referred to as a 'bridge'.

The style of the conference may dictate how many users it is sensible to link at any one time. For example, when a high degree of interaction between all the users is expected, it is usual to restrict the conference to three or four other users. Where one centre is simply presenting, then more could be linked.

In practice, each centre will dial into the MCU and will be connected into the conference. There are two common methods for controlling who is on screen at any one time:

- Continuous Presence - where each centre is on all the screens all the time, usually displayed in a portion of the screen, e.g. four centres - each in a quarter of the screen.
- Voice Activated or Audio Follow - where the centre which is speaking at that time is shown full screen.

MCUs can be expensive pieces of equipment and the centre that hosts an MCU must have adequate incoming lines. With the reduction in the cost of MCUs and the increased availability of group systems that include multipoint capability, some larger organisations such as local authorities are purchasing their own systems. MCUs cost in the region of £10,000 - £20,000. Some video conference systems include an MCU as part of the system, which can be as little as £2,500.

A number of companies offer multipoint conferencing as a service. This service is usually charged based on the number of systems connected and the duration of the call.

Global Leap has a bridge facility which is available for schools to use. Contact www.global-leap.com for details.

Communications Links

A video conferencing system will use either an ISDN link or a network (IP) based link. Some of the more expensive systems can use either. A key issue is the capacity of the link, i.e. how much data can be transmitted over a specific period of time (known as bandwidth). Greater capacity will give better quality picture and sound.

ISDN (Integrated Services Digital Network)

ISDN is a dial up service but as its name implies is a digital service. ISDN can be supplied in a number of configurations; the most common used for video conferencing is the ISDN 2e service. This is a pair of ISDN lines, or channels, which are used together to provide the capacity needed for video conferencing.

Being dial-up it is used in much the same way as a normal telephone line. It is simply a matter of dialling the number of the far-end; a direct link is then established for the duration of the call. Both users must have compatible ISDN lines installed and have ISDN compatible video conferencing equipment. Because a direct dedicated link is established between users for the duration of the call their systems can use the full capacity available. ISDN is implemented worldwide opening up the possibility of conferencing with users in different countries. ISDN is currently a reliable option for video conferencing.

In the UK ISDN services are available from British Telecom and in some regions are also available from other suppliers such as cable companies.

Because it is a dial-up service it is paid for according to the destination and the duration of the call. As described above, ISDN 2e is a pair of channels, incurring double line charges for each call. There is also a rental charge for the ISDN service. (*For more details of charges see 'Running Costs' below.*)

Some video conferencing systems support the use of multiple ISDN lines connected to the same unit to give better quality sound and picture. This will only work if both users have the same number of ISDN lines available. It also results in multiple call charges and line rental costs. In practice, a single ISDN 2e link produces acceptable results for most video conferencing applications.

More details of ISDN are given in Section H.

IP Based Video Conferencing

IP based video conferencing is conferencing across computer networks. IP video conferencing is only possible across networks with sufficient capacity or bandwidth available for the conference.

It is possible to video conference across the **Internet** but because there is no guarantee of capacity from one end of a link to the other the results can be unpredictable. Points of congestion will interrupt the continuous audio and video stream. This makes video conferencing across the Internet unsuitable for an educational situation where a teacher will rely on the conference as part of a lesson.

The advent of **broadband** networks connecting schools is beginning to make local and regional IP based conferencing more of a possibility; this is because the network is effectively a private network linking the schools. Although the capacity of a network may be known, the number of users sending data across the network at a particular time may not. This can affect the performance of a video conferencing system. There are also a number of technical and performance issues that have to be addressed when video conferencing across networks and particularly between different regions.

The Regional Broadband Consortia (RBCs), which manage the regional grids for learning, are trialling a variety of different approaches of providing video conferencing via broadband. For more information see the BECTa website www.becta.org.uk

More details of IP video conferencing are given in Section G.

ISDN v IP

The choice of communications link will mainly depend upon who you plan to conference with. Most organisations that schools currently conference with are ISDN based, although many larger organisations are considering the use of IP based systems. IP has the advantage of being free of call charges. Over time there is likely to be an increasing move to IP based conferencing as the technical issues are resolved.

Because the two systems are very different, a 'gateway' between the two is required to conference between ISDN and IP. This equipment would not normally be used in a school but would be part of a regional or national network.

Schools purchasing equipment should consider the purchase of systems that will support both ISDN and IP based conferencing. Where schools are moving from ISDN for their Internet access to broadband access it is worth considering retaining the ISDN line for video conferencing with other ISDN based users.

Running Costs

There are a number of ongoing charges associated with video conferencing. These include support contracts for the video conferencing systems, ISDN connection and rental charges and multipoint access charges.

Support Contracts

Many companies offer support contracts on small group and dedicated video conferencing systems. These contracts can give access to technical support and offer system replacement if a fault develops. Choice of contract will depend on how important it is to have your system replaced quickly if it fails. A support contract can typically cost about 10% of the initial purchase price, per annum.

ISDN Costs

ISDN costs include a rental charge and ongoing call charges. Rental charges for ISDN 2e range from £60 - £90 per quarter depending upon the supplier and payment plan. A number of payment plans charge a higher rental but include inclusive call allowances. Multiple ISDN lines will incur multiple rental charges.

Local or national video conference calls are charged at the standard telephone rate for each ISDN channel. A video conference using both channels of a standard ISDN 2e service will cost the equivalent of two standard calls. International video conference calls are sometimes charged on a different tariff to standard phone calls

The number of lines your system uses multiplies this cost. A system that supports three ISDN 2e connections (six channels) will incur the equivalent of six calls if all the channels are used during a video conference. This would also incur three times the rental costs.

The cost of regular use of a video conference system can be calculated and built into an annual budget. Budgets will be easier to set after monitoring use for a year. As an example, Global Leap uses video conferencing several times a day to make a mixture of local, national and international calls. The average costs of calls are £200 per month. There are companies that offer reduced call charges whilst making calls via standard BT lines, resulting in up to 30-40 per cent discount on the costs of calls.

Call costs vary from country to country and are not necessarily calculated according to distance. A call to Connecticut USA can be cheaper than a call to some European countries.

Most video conferencing activity will also involve receiving calls. Costs can be shared with some partners, particularly where regular calls take place. In some instances, calls from location A to location B may be cheaper than vice versa, if location A has a lower call charge tariff.

IP Costs

Broadband connectivity is usually charged at an annual cost based on the capacity of the link. Initially this cost may be hidden by the various government initiatives that are currently putting broadband links to schools. Once the link is in place, there are usually no additional usage charges incurred for access to the network, including video conferencing. Schools should be aware that the use of video conferencing may put pressure on existing capacity, resulting in additional costs associated with increasing bandwidth.

Changing Systems

Some schools will already have video conferencing systems and some will be considering purchase. A key factor is the connectivity options available on a particular system. Some systems are designed for use solely on ISDN or IP. Others support both. Some ISDN systems support connection to just one ISDN line (two channels); others support multiple lines.

The choice of system will clearly have an impact on upgrade options. Some existing systems may be upgradeable; others may not, incurring replacement costs. Some companies have a 'trade-in' programme in place to assist in this process.

The Right Environment

Although video conferencing equipment can be used in most environments, there are a number of factors that will enhance the experience for you and those at the far-end.

The requirements of the environment are linked to the type of system you are using. For example, a PC-based system used with a headset can be used in all but the noisiest environments, but a dedicated system with a sensitive microphone will pick up every sound within a room.

The following guidelines relate primarily to the use of dedicated systems with a class or group and they suggest the ideal environment. Many schools will not be able to take on board some of these points without dedicating a room to video conferencing, but other factors simply relate to how a room and participants are arranged.

SOUND

It is considered that 85 per cent of the information disseminated in a video conference is delivered aurally, so getting the audio right is essential.

- Choose a room that is acoustically 'dead'. Ideally, it should be carpeted and have 'soft' wall covering such as hessian boards or curtains. A good test is to stand in the room and speak loudly. If you hear a reverberation or echo, the video conference system will too. The worst case scenario is to have glass walls as the sound reflects off them. Bear in mind, though, that people act as baffles; the more people in a room the better, and often a very reflective room will be perfectly useable with five to ten people in it.
- Switch off any heaters or air-conditioning systems that produce a 'hum'. These will be picked up by sensitive microphones, making it difficult to hear quiet voices. The air flow itself can also have a severe effect on audio input. A simple test is to place a tissue on the table by the microphone to see if it is disturbed by airflow. If it is, the audio may be affected.
- The room should be as undisturbed as possible by external noise. A camera that is set to track voices and focus on the person talking can be 'fooled' by other noises. Multipoint conferences often rely on the voice of a contributor to switch to the person talking - again other noises in the room can 'fool' the system. Use of camera 'pre-set' buttons often helps in a 'formal' environment.
- The space should be laid out so that those taking part are equidistant from the microphone - ideally between three and five metres.
- Know how to MUTE your system. Muting switches off your microphone, which is particularly important when listening to contributions from the far-end. Use of the mute is especially important during multipoint conferences to avoid the audio control switching to your camera at the wrong time.

LIGHTING

- It is not normally necessary to bring in specialist lighting. Most modern systems have the ability to adjust to local conditions with specific software controls. However, it is important to have some control over natural and artificial lighting. In practice, if a room is to be used regularly, it is better to cut out natural lighting and use artificial lighting, over which you have control.
- Lighting should fall on the faces of those taking part in the conference to give a good picture to the far-end. The key to good lighting is to have no shadows. Shadows effectively double the amount of movement the video conference system has to process and thus the video quality can be significantly reduced. A simple test is to place your hand about one foot from the top of the table surface where most participants will be. If you can see a significant shadow the lighting is too direct. To reduce this effect use as many diverse lights as possible. Diffusers can be placed over fluorescent lights. A light-coloured table top, avoiding white, helps reflect light into the faces of the participants, increasing image quality.

- Don't sit in front of a window - this will produce good silhouettes but will mask the detail of faces. Avoid strong backlighting from windows or low lights behind those taking part.
- Turn off any computer screens that are in view.

BACKGROUND

- Avoid cluttered backgrounds. A single-colour background, perhaps with a sign or logo to identify the school, is better than lots of pictures, work or posters. A plain pastel colour is best - a pale blue is a good colour to start with.

ARRANGEMENT OF THE ROOM

This will depend upon the type of conference and the number of people involved but the following guidelines will help:

- Ensure that all those taking part are in the camera shot.
- Ensure that those speaking can be clearly identified.
- If numbers involved are small, aim for a 'head and shoulders' shot of the participants.
- If numbers are large, it may be necessary to move those contributing nearer to the camera and microphone for parts of the conference - however, aim to keep movement to a minimum.
- Ensure that all those taking part can see the screen. A large television is usually sufficient. The signal from the unit can be projected using a data projector, but this can sometimes result in a poor resolution picture, so experiment before use.
- The camera should be positioned close above or below the screen and presenters should look directly at the camera so it appears to those watching at the far-end that they are looking directly at them.

DRESS

- Because video conferencing cannot reproduce fast movements or quickly changing areas it is better to wear plain clothing - avoiding stripes or chequered patterns. Some bold colours, particularly reds, do not work well.