



**Report for Schools
of the DfES
Video Conferencing in the Classroom Project**

MAY 2004

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ACKNOWLEDGEMENTS

The members of the evaluation team would like to express their gratitude for the help and support of everyone involved in the project. Particular thanks go to the staff and pupils from all of the participating schools for the generous giving of their time and co-operation throughout the study. We would also like to thank colleagues at the School of Education, University of Leicester, for their support and guidance, and members of the DfES Project Board for their comments and advice during the evaluation.

Thanks are also given for the support, advice and guidance provided by colleagues working on the DfES Video Conferencing in the Classroom Project [<http://www.global-leap.com>], in particular, Mike Griffith, Project Manager, Tim Arnold, Project Consultant and Adviser for Devon Curriculum Services, and Mary Wormington, International Officer, Gloucester LEA.

1. INTRODUCTION

There has been increased interest in the use of video conferencing in mainstream schooling over the past few years, but the amount of research into it has been relatively sparse, with most attention focused on its use in commerce and higher education. Video conferencing is currently a relatively underused technology in schools, often pursued by a few enthusiasts and with its educational potential across a wider curriculum still to be fully explored. In order to explore this potential further, the DfES set up the Video Conferencing in the Classroom Project [<http://www.global-leap.com>].

This report presents findings from an evaluation of the project over the period of approximately a school year. The study, commissioned by the DfES, explores the relationship between the use of video-conferencing technologies and their impact (both actual and potential) on pupils' attainment and attitudes to school, and on teachers' practices.

2. BACKGROUND TO THE PROJECT

Since October 2001, the DfES Video Conferencing in the Classroom Project (hereafter called the 'project') has enabled interested schools to use video conferencing as a resource to enhance the curriculum. The project covers each key stage across all areas of the curriculum as well as working with special schools, hospital schools, pupil referral units and with pupils who are otherwise isolated from mainstream education.

The project team also offers advice and support to schools seeking to develop video conferencing in the curriculum, loans equipment, finds video-conferencing partners, arranges interactive video conferences and sustains a nationwide network of skilled practitioners. Once schools have set up their equipment, dedicated sessions on getting started with video conferencing (*My First Video Conference*) are available via the project. A comprehensive guide to good practice produced by the team and published by the DfES (Arnold et al 2004) is available from the Global Leap website [<http://www.global-leap.com>].

An important part of the project is to lend DfES equipment to museums and galleries and to work with education staff to present live, interactive video-conference lessons matched to National Curriculum specifications in a range of subject areas including science, art, history and geography. In excess of 50 such sessions per month are available directly to classrooms from UK museums, galleries and other locations. Enabling these programmes to be available to schools has involved a range of new developments for many of these institutions, including the provision of internal training programmes, arranging session timetables and putting in place systems for effective communication with schools. This has, in turn, involved the regular support of the project team in developing, improving and sustaining these programmes.

The sessions are arranged via the Global Leap website which represents the central video-conferencing resource for teachers in the UK. The resource enables schools to be involved in a range of curriculum activities using video conferencing.

3. BACKGROUND TO THE EVALUATION

3.1. Aims

The DfES has a longer-term aim of spreading good practice in the use of video conferencing in delivering the curriculum. To enable schools to develop such practice, the DfES introduced video-conferencing equipment and support into a range of schools during 2002-03. This evaluation project was commissioned to collect evidence on the potential impact of this equipment in schools. For the purposes of this report, the main aims of the evaluation were to:

- highlight the factors perceived to have had the most significant impacts on teaching, learning and academic attainment
- make explicit the lessons learned, offering recommendations to schools about practices to be promoted or avoided.

To understand the impact of video conferencing in schools, the evaluation investigated three main levels of activity, namely:

- *Institutional* (the role of school leaders; the place of video conferencing within school policy).
- *Subject* (the nature/quality of teaching and learning with video conferencing).
- *Individual* (perceptions of individual teachers/learners of the advantages and disadvantages of video conferencing in different contexts).

3.2. Methods

The evaluation involved 28 schools in England, drawn from a wide geographical area, across all age phases. The sample included special schools and learning centres. The schools were selected to reflect three broad levels of video-conferencing experience: beginner or *entrance level* users; those who had been using video conferencing for a year or so (*intermediate level*); and *established* users. Four subjects – geography, history, English and modern foreign languages – were identified as representing the curriculum areas most commonly associated with video-conferencing use in the schools taking part in the project, although video conferences in a variety of other subject areas were also observed.

The main research strategy comprised three interrelated strands.

- In *Strand 1*, an initial picture of video-conferencing use was gathered using a baseline questionnaire followed by a familiarisation visit to each of the 28 schools during which key personnel (including the headteacher) were interviewed. Where possible, a video conference was observed during these visits.
- *Strand 2* involved more intensive case-study work with 12 of the 28 schools, chosen to represent a range of video-conferencing experience and phase/type of school. Pre- and post-session interviews were held with the teachers to explore

the effectiveness of the session. Post-session group interviews were also held with participating pupils.

- *Strand 3* involved the collection of electronic data from the remaining 16 schools, including calendars of the video-conferencing events and email ‘diaries’ from teachers and pupils reflecting their experiences of, and attitudes towards, video conferencing. End-of-evaluation telephone exit interviews were also conducted with the ‘lead’ teacher (the person with main responsibility for video conferencing within the school).

3.3. The participating schools: Baseline data

Video-conferencing experience

As the sample of schools was deliberately chosen to reflect three broad levels of video-conferencing experience, it was not surprising to find a large gap between the most and least experienced users. The two schools with the longest involvement in video conferencing (*established* schools) were a secondary school with over five years’ experience and a special school, which had used it for four years. At the other extreme were several schools (*entry level*) which had only very recently acquired their equipment.

Equipment and connectivity

Because loan of equipment to schools was a feature of schools’ participation in the project, facilities were of a high specification throughout. Some schools, especially those with greater experience, had also invested in their own equipment. For these reasons, the evaluation was not concerned with ‘lower-end’ video-conferencing technologies such as webcams. In terms of connectivity for video conferencing, ISDN2 was used exclusively by the majority (18:28) of schools, the majority of which were primary. A further five schools used ISDN4 or ISDN6. Eight schools used TCP/IP (broadband internet connection) for video conferencing.

Forms of activity

A wide range of year groups were reported to be involved in video conferencing, ranging from Year 2 through to adult. Schools held video conferences with partners ranging from schools within the same LEA (such as feeder schools), with organisations within the UK (such as galleries and museums), and with schools and organisations worldwide. Video conferencing was used in a variety of modes ranging from complete classes communicating with one another to contact between individual pupils. Most conferences involved exchanges between two sites, although a number of schools were involved in multisite (multipoint) conferences, both national and international/multinational.

4. FINDINGS OF THE EVALUATION

The major focus of the evaluation was to identify the impact of video conferencing at school, classroom and individual level. In reporting our findings, we begin by describing four *models of video-conferencing use* which represent the major ways in which it was used in the schools. This is followed by an examination of various *contextual factors* (organisational, curricular and technical) which were found to enable or inhibit the success and effectiveness of a given video-conference session.

4.1. Models of use

Four broad categories of video-conferencing use in the evaluation schools were identified:

(i) *Familiarisation*: Representing the ‘first steps’ in video conferencing.

Teachers mainly used this approach when first trying out video conferencing in the classroom. A typical example involved relatively simple exchanges about pupils’ interests, school-related activities, the weather, local geography, features of the local community and so on. In the great majority of cases, this approach represented an intentional and considered process, a first step towards a more embedded approach.

(ii) *Substitution*: The replacement of traditional curriculum delivery by video conferencing.

In this approach, video conferencing enabled schools to engage in activities that would otherwise be organisationally difficult, prohibitively expensive, a solution to staffing problems or some combination of these factors. A number of schools used specialist providers or collaborated with other schools to solve these types of problems. An example of this approach was the delivery by video conferencing of a specialist subject or one for which there was only modest demand – the technological equivalent of a peripatetic teacher. Observed instances of this approach included the provision of a psychology A-level course for a small group of sixth-form students in a rural secondary school, the remote teaching of Spanish to a small group of Year 10 students at a special school, and collaboration between two small rural schools with small classes to develop and work on joint activities which were previously only possible by ‘bussing’ children from one school to the other.

(iii) *Enhancement*: Where the use of video conferencing ‘adds value’ to an existing curricular activity.

This approach to video conferencing represented by far the most common use of the technology. The examples given below represent just a fraction of the tremendous range of activities and projects that were observed in this category:

- *Class-to-class exchanges* (such as a modern foreign language class linking with a same-age group in Germany or France).

- *Access to remote expertise* (for example, ‘guest speakers’ from a university or business organisation; links to the educational services of museums and galleries; curriculum activities devised and co-ordinated by subject specialists).
- *Inter-school enterprises* (for example, joint problem-solving exercises; exchanges of local environmental, geographical or historical data; learning about one another’s cultural practices).
- *Links between local schools* (for example, social and academic activities related to secondary school induction procedures; modern foreign language conversation sessions for Key Stage 2 children).

(iv) *Adaptation*: This approach is characterised by exploring of the potential of video conferencing for developing new and innovative practices or to develop learning activities that had hitherto been difficult or impossible to organise. This differs from the *substitution* approach in that the focus is on a novel model of learning, rather than a different way of delivering a traditional pedagogy. One very effective example observed used video conferencing with a group of Year 6 children to satisfy curriculum objectives about persuasive argument and presenting information. A remote person role-played the part of a parent considering sending her child to the school. After presenting prepared information to the ‘parent’ extolling the virtues of their school, the children then responded spontaneously to her further queries.

4.2. Effective video conferencing

When evaluating the contribution of video conferencing to a given learning activity, we distinguish between a *successful* conference (where everything ‘runs smoothly’) and an *effective* one (where learning objectives are clearly stated and where the use of video conferencing is appropriate to those objectives).

We encountered a number of conferences that were considered by teachers to have ‘worked’, despite (in the opinion of the researchers) relatively modest learning gains. These were often relatively straightforward exchanges which were enthusiastically received by all concerned, but which were difficult to ‘map’ onto specific learning objectives. Where these were deliberately intended as *familiarisation* sessions, then the learning objectives can be said to have been met. However, a failure to set clear, further curriculum objectives once both teacher and pupils were sufficiently proficient with the technology may result in a failure to exploit a powerful technology fully, or may mean that video conferencing was inappropriate to the task.

An illustration of the difference between a successful and effective conference was an observed modern foreign languages session involving students in the UK and Germany. The learning objective was to develop language skills through communication with native speakers. However, most of the exchanges were mediated by the teachers, while students later revealed that the session had included a repetition of well-practised routines. While organisationally and technically the conference ran smoothly (and could on those criteria be described as successful), in terms of meeting the curriculum objective it was less effective.

The task for the teacher, therefore, is to consider how best to ensure an appropriate match between learning objectives and the use of the technology. This suggests a need

to undertake some form of ‘fitness-for-purpose’ analysis, which takes account of both the relative appropriateness of the *types of use* described above (familiarisation, substitution, enhancement and adaptation) and a range of *contextual factors* that are discussed below.

Organisational factors

Preparation

Pre-conference preparation is an essential stage of the video-conferencing process if the session is to be both successful and effective. All teachers recognised the need for thorough preparation and many described detailed discussions between them and their video-conferencing partners in planning the sessions. Making these arrangements could be a lengthy and elaborate process, particularly when setting up a ‘one-off’ conference or the first in a series. Where conferences were not sufficiently well prepared, their effectiveness was significantly diminished.

Another important aspect of conference planning is the preparation of the participants themselves. Both teachers and pupils need to be comfortable and confident with the process, and so several schools rehearsed or practised in some way prior to the conference proper. This ranged from learning basic video-conferencing technique – the essential protocols of video-conferencing exchanges – to full-blown rehearsals of questions, presentations and so on, prior to linking up with the far-end site.

Curricular factors

As might be expected, considerable variation was observed in the degree to which a given video-conference session was embedded in the taught curriculum. Some video conferences, particularly those categorised as *familiarisation* sessions, were set (usually intentionally) within a relatively weak curricular framework. At the other extreme, the *substitution* approach (such as use of the technology for the remote delivery of discrete courses) represented an example of a completely integrated approach. In this model, not only is the curriculum entirely accessed via video conferencing, but in many cases would have been inaccessible without it.

The degree of curriculum embedding was also related to the place of the conference in the lesson or series of lessons. Many conferences were more or less self-contained events, that is, a discrete lesson rather than being one of a series. While many of these satisfied fitness-for-purpose criteria (in that they represented an appropriate use of the technology in terms of the learning objectives of the session), ‘one-off’ sessions could be extremely time-consuming to organise so that there was something of a trade-off between effort and curriculum gain.

Where conferences were a part of a sequence (such as a weekly meeting between two classes), or an open arrangement (such as ‘drop-in’ language sessions between students in a secondary school and their counterparts in a French school), there was a greater sense of continuity. Participants at each site became accustomed to communicating in this way and developed more secure relationships with one another, which contributed to conferencing becoming a normal part of the teaching and learning routine.

Technical factors

The impact of technical factors on the effectiveness of a conference included those which were likely to affect its ‘smooth running’ (and thus – in our terms – its *success*) and those which had a direct impact on the learning itself (its *effectiveness*). In fact, many teachers reported that the ‘learning curve’ for video conferencing was much less steep than for some other forms of ICT. Video-conferencing technology was thus considered by most teachers to be relatively accessible and simple to operate, allowing them to focus more of their time and energy on learning and teaching issues. While various problems were observed, these were almost always associated with inexperience, which in most cases appeared to be relatively short-lived.

Systems

The nature and quality of any technology will affect what can be achieved with it, and this is as true of video-conferencing systems as it is of other technology. Generally speaking, the more sophisticated the equipment, the more satisfactory the experience. Having said this, we need to return again to the notion of fitness for purpose. A small webcam, for example, can be used to very good effect in certain situations – such as one-to-one conversations in which high sound and/or visual quality are not essential – but is less well suited for more complex interactions.

Connectivity and data speed

As video conferencing is reliant on visual and audio cues, sound and picture quality have a great impact, a situation which is exacerbated for some pupils, for example, those with hearing impairments or learning difficulties. The speed at which data is transferred between conference participants clearly has an impact on the technical quality of the conference and, generally speaking, the faster the connection, the better the conference experience, and poor sound and audio quality were seen to have undermined the experience of some video-conferencing sessions.

With the advent of Regional Broadband Consortia (RBCs), classroom video conferencing is increasingly likely to be based on broadband connectivity, enabling faster connection. In the evaluation, however, around two thirds of the schools used ISDN of varying capability, with about half of the primary schools relying on ISDN2. In fact, while in some cases this introduced some limitations in terms of the quality of visual and sound quality, for discussion-based activities (to which video conferencing was mainly put), this was generally regarded as adequate by most teachers.

A problem did exist for some schools with ISDN, however, where they wished to communicate with sites using broadband, necessitating access to an external ‘bridge’ which enabled the two systems to ‘talk’ to each other. A number of schools indicated that this had caused difficulties, or had actually prevented them from extending their video-conferencing activities.

Technical support

Where technical problems, arose teachers needed access to appropriate support and expertise. In a number of (mainly secondary) schools, technical support was available to assist with the setting up of equipment and troubleshooting. In one or two observed conferences, a technician was on hand throughout the session, although this was not viable for most schools.

Primary schools were in the main much less likely to have access to regular support of this kind, many of which either bought in (or shared with another school) a technician on an occasional/needs basis, or relied on a willing and technically-minded volunteer such as a parent or governor. Schools could also turn to the project team which provided technical support and system testing. The team also offered *My First Video Conference* sessions, an introductory session designed to take teachers and pupils through the basics of video conferencing.

4.3. The impact of video conferencing on learning and teaching

Having discussed the various factors which influenced the general success and effectiveness of a conference, we now turn to the impact of its use on the way that pupils learned and on teaching practice. As described earlier, the evaluation schools were selected partly on the basis of their major activity in one of four curriculum areas – humanities, English, citizenship and modern languages. This raises the question of whether video conferencing might be more appropriate for certain subjects than others.

In fact, observations of video conferences in these and other subject areas revealed clearly that even where the specific focus of a video conference was on one subject area, there were numerous opportunities to develop children's skills, knowledge and understanding in other areas of the curriculum, as well as the fostering of key or cross-curricular skills. For example, one area of the curriculum for which video conferencing appeared to be especially suited was modern foreign languages. Synchronous, face-to-face interaction with native speakers of French or German was reported to be a real benefit for language students who were said to develop confidence and competence above what would be expected in a more traditional lesson.

However, other benefits accrued which might be regarded as more generic (for example, the development of speaking and listening skills), or related to other subject areas (for example, citizenship through the raising of cultural awareness, geography through the exchange of local environmental data and so on).

Here, we present examples from across a range of subjects to explore some of the distinctive features of video conferencing as a learning medium and examine its potential to enhance the classroom experience.

4.4. Authentic learning experiences

One of the most significant benefits that video conferencing offers is its ability to give students 'live' access to a world outside their classrooms, an aspect of the technology that teachers and students alike reported as being especially motivating:

A lot of our children won't get out of Birmingham, let alone out of England, let alone [get to] anywhere else... [video conferencing is] making them more aware of what's around them, and if that only lasts for five minutes, it lasts for five minutes, but the seed's there that will develop later on. That's the biggest thing.
[Teacher, EAZ]

The experience of communicating directly with normally inaccessible people and places provided a sense of authenticity that was difficult to achieve with other media.

For example, several schools used video conferencing to link to schools in other European countries for modern foreign language exchanges. Teachers were clear in their view that listening and speaking to native speakers – especially when they were of the same age – was a great motivator for the development of students’ language skills.

This emphasis on authenticity was echoed in other curriculum areas. In the humanities, for example, teachers described how their students experienced ‘history as reality’. Following a video conference with the Cabinet War Rooms (CWR) in London about the Second World War, a student at one of the special schools commented that the CWR tutor had:

...showed us things we haven’t got in school and we could talk about them... you can communicate with people you would probably never meet. [Student, special school]

Another example comes from a very first video conference, where a group of Year 4 pupils expressed the difference for them of communicating directly with children from another culture compared to learning about them in more traditional ways. This inspired them to find out more about their country, lives and language:

I like listening to children from different countries because you find more about their hobbies and interests.

You could learn more about them like if they have brothers and sisters, what their problems are... [Year 4 pupils, primary school]

4.5. Raising cultural awareness

Children were intrigued by other people’s lives and cultures, curious to explore similarities with, and differences from, their own lived experience. The following example of refugee students finding a worldwide audience for their stories is a powerful illustration of such an exchange:

It was just like someone had opened the floodgates. These were kids who had been speaking English, some of them less than a year, and they were saying, we came from a country where there was war, we’re in England now and we can go to school, and we’re happy... but these ones in South Africa started to say: “Excuse me, before we go any further, I’d just like to ask the girl there, the one with the scarf on, a girl from Afghanistan, we hear that in Afghanistan you weren’t allowed to watch TV.” ...and she said: “No, we weren’t allowed to watch TV, we weren’t allowed to listen to the radio...” Then one of the other kids from South Africa said: “You are strangers in the country that you now live in...” – I thought this was a wonderful question – “How do you feel, how are you made to feel living in England when you are not English?” ...and the kids were saying things like: “Well, in my country I had to sleep on the floor because there were bombs dropping. Now I’ve got my own bed.” and “In my country, I couldn’t go to school, I’d never been to school before I came to Britain.” Even though they were talking to, it must have been hundreds of people, it was really quite a feeling of intimacy that we’d managed to create across the world... [Lead teacher, secondary school]

While some of the most dramatic examples of this kind were interactions with people on the other side of the world, the opportunities offered by more local exchanges were also valuable. Interactions between rural school pupils and their counterparts in a

large, inner-city, multicultural institution, for example, often proved to be equally revelatory events. An instance of this was a conference between a small rural school in Cumbria and an inner-city comprehensive. While the exchange provided a window into the rural world of the Cumbrian school for the city-based students (encapsulated in the following quote)

I suppose for people in Tower Hamlets, that's a big thing. Yes, for them I'll put the camera out and there's the cows out now. [Headteacher, primary school]

it also meant that the rural children also saw and learned about aspects of life in a large city, a genuine learning experience for both groups of pupils which would not have been possible outside of an actual field trip.

A teacher from a secondary school in the rural Midlands described another example of this kind of exchange. The school had established links with a school in North London, a rural/urban link similar to that in the example given above. In this case, however, both schools had large traveller communities, a second focus of the conference, representing an exploration of cultural identity on at least two levels.

4.6. Access to experts

The use of email or the internet for (mainly asynchronous) exchanges with remote artists, authors, historians and so on has in some schools been a feature of curriculum activity for a number of years. Video conferencing takes this process a stage further, so that these communications are not only happening in real time, but also face to face. Remote access to curriculum specialists – that is, teachers or lecturers with expertise in a particular subject area – was a feature of many of the conferences in which the evaluation schools were involved.

A particularly powerful example of this was students at a secondary school who were involved in a series of video conferences as part of their study of the mutiny on the *Bounty* and which involved linking up with experts both in the UK and Australia:

We've done three conferences, one to the National Maritime Museum, where they talked about life on board ship and what it would have been like for Captain Bligh and his men; the second one to the Public Records Office and there they showed us the captain's log and they told us again what the circumstances were for the mutiny; and then in the third one we went to the Great Barrier Reef and spoke to the archaeologists and divers who dived down to the Pandora which is the wrecked ship that was sent out to find the *Bounty*. The pupils were just captivated, they absolutely loved it, they're world experts now on Captain Bligh!
[Teacher, secondary school]

This shows the impact of access to expertise, in this case from multiple sources around the world.

What was especially valuable about the gallery and museum specialists involved in the project, such as the Maritime Museum and the Public Records Office, was the careful matching of activities to National Curriculum specifications, as well as the provision of support materials. This provided teachers with a ready-made lesson which slotted directly into their classroom work, combined with expert tuition and remote access to rare artefacts:

We've done a wonderful one with the National Archives. They do one called 'What is History?' and they send a pack, it's upstairs in the classroom actually. I've done it with two classes and I'm about to do it with my Year 7 class next week and they're very, very good. They send you all the stuff first of all, and it fits in exactly with the start of the Year 7 National Curriculum in history, and they just know what they're on about... same with the National Portrait Gallery, they're brilliant too. [Teacher, secondary school]

Expertise from other sources (often organised by the schools themselves) was also a very powerful motivator for many students. A good example here was a sixth-form link with a physicist at the University of Cambridge, who not only provided a fairly traditional short lecture on an area of the physics A-level syllabus, but allowed for students to ask high-level questions of an acknowledged expert in the field.

4.7. Enhancing social and communication skills

A powerful effect of using video conferencing is its tendency to increase in users a sense of audience. Teachers reported this be notably greater than in within-class activities such as student presentations. A teacher in an EAZ, for example, claimed that awareness of a 'real' audience encouraged students to try to be more aware of how they presented themselves, a view confirmed by many students:

When we video conference, we know there's other kids here and they're our age, and we know we've got to perform our best. If they're going to take the mickey out of our accent, or if they're not going to understand what we're saying, it's going to be embarrassing, and we recognise that we represent our school, and we recognise that we represent Birmingham. [Year 9 student, secondary school]

The very act of communicating with remote others was reported to improve the core literacy skills of speaking and listening. A headteacher at one primary school, for example, told us that the pupils had learned that they needed to project their voices more, to speak more clearly and to use more expression.

4.8. Student autonomy

Another feature of video conferencing in a number of schools was a genuine shift towards student autonomy, something which is often claimed (but much less frequently demonstrated) for ICT. An example of this occurred between pupils of a middle school where pairs of Year 7 students used the system during their lunchtime to converse informally with Year 5 students in a school in Brest, France. Although an adult was always present at one of the two schools during these sessions, the intention was that they be informal with as little intervention by teachers as possible:

I can supervise both ends because I'm only there for communication purposes. If the communication breaks down because they can't understand each other, I have to chip in and help out but I don't actually say: "Now you speak... now you speak", they do it on their own. [Lead teacher, middle school]

This degree of informality and autonomy proved to be a powerful incentive, as students voluntarily gave up their break time to talk to their 'video pals'. A similar arrangement – here mainly for social exchanges – applied where pupils in two 'partner' schools (two linked rural primaries) had informal social exchanges during break times.

4.9. Impact on attainment and attitudes

Attainment

The collection of reliable data on the relationship between video conferencing and attainment proved impossible. The use of video conferencing in any one school and/or with any one group was neither systematic nor sustained enough for any statistical data to be convincing. A calendar of video-conferencing events collected from schools showed that the use of video conferencing tended to be opportunistic and exploratory rather than being systematically used to deliver examination specifications or attainment targets within the National Curriculum. In other cases, the difficulty of isolating the effects of video conferencing from other initiatives, or the presence of other factors such as a new headteacher, or an inspirational teacher, were cited as reasons why it was difficult to be sure about the quantitative impact on pupil attainment. Most of the teachers were therefore reluctant to commit themselves to a definite view that video conferencing had increased attainment.

Nevertheless, most of the teachers and principals, when invited to offer their professional judgements, did maintain that positive responses to video conferencing would inevitably 'feed through' into performance gains, even if this was difficult to demonstrate quantitatively. One headteacher linked such gains to current concerns about boys' underachievement in English:

If you do nothing more than change attitudes, [for example] talking about poetry, if you change boys' attitudes towards poetry, the impact on GCSE English marks should be dramatic. [Headteacher, secondary school]

Others were prepared to go further, arguing that video conferencing impacted more directly upon pupils' attainment, as did this teacher:

...we checked with the parents, we got their comments, we looked at their SATs results and these were kids with special educational needs... they've made fantastic progress in their confidence and it's spilling over into lessons, it's spilling over into their enthusiasm for education. [Teacher, EAZ]

In addition to this perception of the general benefits of video conferencing, there was a definite view that the technology helped to develop students' understanding. By engaging pupils in interesting and novel activities, teachers felt that the acquisition of knowledge and skills was more assured. One primary school headteacher was so convinced of the effectiveness of video conferencing in promoting learning that he had made it the central plank of developments in his school. His LEA was so impressed with the progress that had been made that it had recruited him to lead another local 'failing' school – but on the understanding that he would institute video conferencing as the main thrust of his reforms.

This confidence that learning was helped by the experience of video conferencing was supported by the pupils themselves. In email diaries and group interviews, positive views of the learning experience of video conferencing were expressed. Pupils who felt they were not learning effectively identified technical problems as the main reason for this.

Motivation

The attitudes of teachers and pupils involved in video conferencing were partly dependent on the type of activity that they engaged in. Where video conferencing was used to deliver a fairly conventional lesson, for example, students were generally less enthusiastic than they were about activities that exploited the technology more fully. Exchanges with other pupils in different parts of the country or the world, question and answer sessions with experts, remote ‘visits’ to museums and galleries, and the viewing of rare artefacts were all reported by teachers and learners alike to be highly motivating experiences.

While the overwhelming majority of students took immediately to video conferencing, some pupils initially expressed reservations about the technology, in particular disliking the feeling of being exposed or ‘on view’. However, greater familiarity with the experience lessened this effect considerably, and in most cases fairly rapidly. Indeed, for many pupils who were identified by teachers as being less secure in a public forum, the experience of communicating with remote others, once initial anxieties were overcome, actually appeared to increase their self-confidence and improve their social and communication skills. The motivational effect of video conferencing also reached beyond the participants to their parents, who were highly positive about its use, and to the rest of the school, who wanted to be part of what was regarded as an exciting new approach.

Behaviour

As well as providing a motivating influence on the pupils, many of the teachers noted a positive effect on pupil behaviour during video-conferencing sessions, which also extended into regular classroom activities. Increases in concentration were remarked upon by a number of teachers and were confirmed in all of the observations made by the research team. Even when conferences were longer than planned or were with younger pupils, the vast majority of the pupils maintained a disciplined demeanour in front of the camera.

In general, video conferencing led to an increase in children’s attention to task. Moreover, many of the pupils indicated that they took great pride in representing their school, locality or country to a wider community. Teachers commented on students who took greater pains with their appearance than usual, while many pupils themselves demonstrated a clear understanding of appropriate communication protocols, such as speaking clearly for people who did not share their language or dialect. Students also displayed an awareness of the fact that they were somehow representatives of their school or class. A good example of this was the Year 6 group that had developed a variety of strategies to overcome any nerves they might feel when talking to a remote ‘visitor’ (“I pretended she was my friend”, “I tried to forget she was there as if I was talking in a mirror”) because they saw themselves as ambassadors for the school.

Although off-task behaviour was not absent during video conferences, this was generally caused by a lack of direct involvement in the conference, which occurred for a variety of reasons, from the size of the group to the organisation of the conference. An example of this was a four-way conference involving a class in a UK school and groups of same-age students in three other European schools. The students in each country had prepared presentations, and the taking of turns was well co-

ordinated. However, the four-way exchange meant that students spent far more time listening than presenting. As a result many of the students were observed to be disengaged after being passive listeners for fairly lengthy periods. This was another example of a conference which was in organisational terms highly successful but where some educational potential was lost as a result of this relative lack of interaction.

4.10. Impact on teaching style

Despite the many and varied projects in which the evaluation schools were involved, our observations suggest that the use of video conferencing had not, for the majority of participating teachers, so far resulted in a marked shift in teaching practice. This was confirmed in interviews where the majority of teachers indicated that they were still at an early stage of exploration with the technology, but were beginning to identify pedagogical issues they faced in developing ways of working with remote others. For the most part, therefore, teachers were adapting its use to fit existing approaches (characteristic of the *enhancement* model of use), rather than more innovative uses associated with the *adaptation* approach. There was nevertheless a recognition on the part of most teachers that the full potential of the technology had not been reached and that, as new ways of working with remote others emerged, they would have to re-think some of their assumptions about their teaching styles.

Despite initial resistance from some teachers to engaging with video conferencing, the relative simplicity of its operation – “If you can use a phone, you can use video conferencing”, as one headteacher put it – enabled teachers to focus on curriculum integration from a fairly early stage.

4.11. Broadening the use of video conferencing

Integrating video conferencing into mainstream practice

The introduction of video conferencing capability into schools raises a number of strategic issues for management teams. The ease of using the technology makes it likely that demand for access to video conferencing will spread. In the majority of the evaluation schools, the number of teachers using video conferencing still represents a small proportion of the staff. Even in those which fell into the *established* user category, the use of video conferencing tended mainly to be confined to certain curriculum areas and/or one or two ‘enthusiasts’, although in the most advanced schools, interest (and use) was beginning to spread out from these centres of enthusiasm. Such developments were generally associated with the support of senior management and/or specialist status (for example, technology colleges).

Teachers at an early stage in their use of video conferencing tended to take any opportunity or ideas presented to them and explore these within the existing curricular structure, rather than starting from the curriculum and identifying opportunities for video conferencing. This approach to video conferencing was generally acknowledged by the teachers to be exciting, but ultimately unsatisfactory in terms of achieving learning outcomes for their pupils. Many of the teachers, having tried out video conferencing, intended to plan more systematic use. This was recognised as involving considerable forward planning, especially where remote experts were used, as it was necessary to fix a time where the expert was available at a time appropriate for the stage in the curriculum. To be effective, school-to-school links also need high

levels of forward planning to mesh timetables and curricula, particularly when involving international contacts.

Falling somewhere between the two extremes is the kind of service provided by galleries and museums, in providing pre-prepared educational packages rather than ‘bespoke’ services tailored to a particular class or school project. The fact that they were well-designed, expertly hosted and universally-praised events, and closely mapped onto the National Curriculum objectives, meant that schools could have confidence in the quality of provision, without the risk (or indeed organisational difficulties) associated with ‘chance’ events.

Strategies to integrate video conferencing more fully across the curriculum were various. Some schools relied on the enthusiasm of champions, who having seen what it can do are keen to spread video conferencing into their schemes of work. Others involved ICT co-ordinators identifying subject-specific opportunities for video conferencing, so that a more embedded approach to its use might be developed. However, there was little evidence of whole-school policies yet being developed that built video conferencing into forthcoming curriculum plans. This was either because some principals had still to be convinced of the effectiveness of video conferencing as an important vehicle for the delivery of a curriculum area, or they were concerned that, having signalled the importance of video conferencing for enthusing and motivating pupils of all ages, they would be unable to meet demands for access across the whole curriculum.

Sustainability

In examining issues of sustainability, the main problem presented by principals and teachers was concern that a rapidly increased demand for video conferencing facilities would lead to unsupportable claims for new or more expensive equipment and increased bandwidth. The financial and organisational difficulties that might be brought about by an expansion of facilities were almost always associated with the positive appeal of video conferencing projects in schools. For example, when asked to consider a scenario where the equipment might be taken away, all schools said that they would “find the money from somewhere”, even if it meant having to downgrade to lower-specification technology.

4.12. Conclusions

What has emerged from the evaluation is clear evidence of the educational potential of this technology, facilitating pupil advancements which include the development of self-confidence, social and communication skills, the acquisition of new knowledge and understanding through exposure to subject experts, the raising of cultural awareness, the promotion of cognitive development and the raising of academic achievement. The DfES Video Conferencing in the Classroom Project [<http://www.global-leap.com>] has provided participating schools with facilities, the support and the opportunities to develop these activities. It is against this positive background that we make the following recommendations for schools.

4.13. Recommendations

- Video conferencing should be embedded into school planning. A teaching and learning focus in the school plan should demonstrate to other staff, parents and

pupils precisely where and how video conferencing is being used to enhance learning.

- Senior management in schools introducing video conferencing should demonstrate strong support to give credibility of the medium to other staff and to parents.
- To alleviate potential resistance, parents need to be given a clear explanation of the video-conferencing experience before their children engage in it.
- Teachers need to be aware of potential resistance to video conferencing from pupils and have to be able to provide an environment and preparation that is encouraging and sensitive to this.
- Schools need to provide a basic level of training to increase confidence as well as demonstrate good practice and the potential of video conferencing. Much training focuses on how to use equipment and mediate a conference. These practical issues should be augmented with a focus on teaching and learning issues.

References

Arnold, T, Cayley, S and Griffith, M (2004), *Video Conferencing in the Classroom: Communications Technology Across the Curriculum*, DfES Video Conferencing in the Classroom Project/www.global-leap.com.

Glossary of terms

Bandwidth	Defines the amount of information that can be sent and received in a certain timeframe. The greater the bandwidth, the greater the information carrying capacity of the medium.
Bridge	A device or service that connects and passes data, voice, or video between two or more video-conferencing set-ups. (See MCU.)
Broadband	A generic term applied to networks having bandwidth significantly greater than traditional telephone networks. Although definitions of bandwidth differ, broadband systems are generally capable of carrying large amounts of data.
Desktop video conferencing	Video conferencing on a personal computer.
Far end	The location where the other participants of the video conference are located. Signal is received to the near-end site from the far-end site.
ISDN	Integrated Services Digital Network. A type of telephone network that uses digital service right up to the end user's equipment. It provides seamless communications via a dedicated line between individual desktop and group video-conferencing systems.
MCU	Multiple Control Unit. A device or service which enables multiple participants to join in a conference. Also known as a bridge.
Multipoint/Multisite	Video conferencing with more than two sites. The sites must connect via a bridge or MCU. (Compare with point-to-point.)
Mbps	Megabits per second. A bit is a basic unit of binary (digital) data (a single one or zero that is transmitted). Collections of bits can be used to represent more complex values.
Point-to-point	Video conferencing between two sites. (Compare with multipoint.)
Protocol	An agreed format for transmitting data between two devices.
TCP/IP	Transmission Control Protocol/Internet Protocol – networking protocols that let different types of equipment communicate over the internet or other packet-based networks.

Some of these definitions are taken or adapted from the following sites:

http://picturephone.com/products/learn_glossary.htm#lmne

http://picturephone.com/products/learn_glossary.htm