The Netherhall School, Cambridge - through the technology ceiling

This report was completed in August 1997. Since then, the school has continued to develop its ICT activitie, rebuilding has proceeded with associated changes, and at the end of October 1997 the school launched a new website. This provides a great deal of information about the school and all its activities. The site can be found at www.netherhall.cambs.sch.uk

The Netherhall School is a large city comprehensive with 1400 children aged from 11-18. It is well known for its use of information technology but, like all secondary schools, constraints of time, resource and curriculum impose limitations. The use of email to create a local network linking home, school and community could enable the school to break through the technology ceiling. The MAILBOX observation has observed the first stages of this process, from concept to take off. The experience has endorsed the recent Stevenson report description of requirements for effective integration of information and communications technologies in school: vision, commitment, stamina.

Local context

Cambridge has for long been a silicon city. Partly through the presence of Cambridge University and its academic community, partly through a local environment favourable to such enterprise including a science park, it early attracted a cluster of companies devoted to innovation and development in all aspects of information technology. In June 1997 Bill Gates announced that he was establishing a Microsoft research centre in Cambridge.

Now it aims to become a digital city. From 1994 an initiative known as the Cambridge Trial has given a headstart to understanding how to set up partnerships containing different organisations and cultures. Public access to the Internet, through libraries and other community facilities, has led to community projects, youth, ethnic groups, local communities, special needs. The local cable company, Cambridge Cable, has sponsored connections for some of these projects, is interested in working more with schools. The Netherhall School became a partner in 1996 when 6th form pupils began developing multimedia software and interactive television materials for the Cambridge Trial.

The Netherhall School is one of 6 secondary comprehensive schools in Cambridge (there are also several private schools). All Cambridge schools have intakes with a wide mix of ability range, social and economic background, and ethnic origin. While Cambridge is not a large city, and children can travel easily to any city school, the Netherhall draws most of its pupils from 6 neighbourhood primary schools. It is the children, teachers, and parents of Netherhall itself and these six schools that are the subjects of this experience.

Many parents in a community such as this have much to offer children in local schools. Electronic communication can be a means to enable them to share their knowledge and experience not just with their own children but with others throughout the community. Already, a significant number of the Netherhall parents - about 20% of parents of 6th formers, perhaps less of younger children - are connected to the Internet, at home or at work. Netherhall's contribution to MAILBOX has been to find a way to link children, schools and parents in a local learning network.

The School

The Netherhall School in 1997 is, on first arrival, something of a shock. The school is in a state of transition. It is housed on a building site - a new school is being erected on the same site as the old. Contractors with building plant everywhere and, in Winter, a great deal of mud. As new buildings go up, old ones come down. On each visit, finding your way around is a new challenge.

Inside, complete contrast. The school is orderly and disciplined. There is something of a feel of camping out - children and staff cramped together at lunch time in a single temporary canteen for example. The fact that these difficult circumstances do not, to an outsider, disrupt school in any significant way, says much about the school.

Use of computers in the school has evolved since the first one arrived in 1978. In 1981 it was designated a national centre for the Microelectronics in Education project. The school currently has about 245 computers for 1400 children (1: 5). Most are small screen i.e. for individual use. Many are old. There are 4 internally networked computer rooms, normally open 8-6, and the computers are always on - subject to temporary disruption as buildings come and go.

The new school building provides an opportunity to create a school intranet using the latest types of networking - including fibre optic and ATN. Over 80 computers are already networked on a main backbone. The aim is for school wide email, and an email address for each child. The network is, since June 1997, connected to the Internet through a leased line, and there is also a broadband "superhighway" link associated with the Cambridge Trial. The new arrangement will minimise telecommunications charges.

Internet can now be accessed through any computer on the Intranet, but the main computer lab is frequently used. A few teachers come regularly to the computer lab to search the Web and download material for teaching in advance of lessons. One geography teacher brings classes in for active searching. The technology department has its own on-line computers. The lower school library is on-line, but the upper school library is temporarily off-line, because of rebuilding. The school is installing a suite of 16 network computers in its new library to provide large scale access. There used to be more on-line access in staff areas, and some staff have commented that they miss having easy access.

At present, for the email project the school uses a dial-up link for convenience and management, located in the room used by the IT staff. The school has just finalised its Internet policy document. This is seen as a prerequisite for free access to Internet for pupils. When it is activated, a pupil will receive a permit to use the Internet once the signed approval of a parent is received. Open access throughout the school will then be available. For whole school email the ISDN line is used with network access through a Sun Netra which also provides web access.

The school has reached this point as a result of positive planning and evolution in response to need. Computing activity is linked to curriculum. All staff must integrate teaching of IT relevant to their subject up to Key Stage 4 (age 14 - 16).

The IT professional staff lead and manage this process, as well as providing technical support throughout the school. The staff resource is tiny at present: 2 teachers - Head of IT and Network Manager - and 1 technical support officer manage everything, including links with outside. Both teachers also have a heavy teaching load (60% of time class teaching for the Head of IT and 80% for the network manager) as well as their IT work. There is a representative for IT in each teaching department - i.e. a team of about 20 - but these representatives all have a full teaching load and no formal allocation of time or resource for IT work.

What the school does now in IT

School teaching and provision of IT was highly praised in a 1993 OFSTED report, which mentions "an increasing ability to use IT for a range of tasks in a variety of curriculum contexts". Word processing is taught as part of the English curriculum. Children are well-taught and many pass beyond the objectives for IT set out in the national curriculum.

The school web pages show some of the special things the school is doing. A team of over 40 6th form children (16-18) is now working on creating multimedia educational software, which can be viewed through interactive television sets at home or at school. The children are experienced at demonstrating IT applications, with a strong presence at national fora and exhibitions, and have won national awards for their work with IT. The web pages will soon be replaced with a new exciting fully interactive site, at present under development with the participation of children.

Use of the Internet and electronic mail in school has so far been low profile - deliberately, while management issues have been sorted out. There have been some projects: last year 12 year olds took part in a millennium forum with the Mayor of Cambridge as part of their English class work. The coming of the school network changes that. The children already have the competence with IT to move quickly on to network skills.

MAILBOX - THE STORY

Planning the project

The idea: there is a limit to what you can do in school with the Internet. Constraints of time, place, subject, resource - this is what is meant by "the technology ceiling". A network linking home, school, community could break through the technology ceiling. The MAILBOX project offered an opportunity both to set this up and to study it.
The context: Intranet under construction in school; an ISDN connection planned, and in place from June 1997.

The opportunity: Set up local network linking home, school community, to provide maximum benefit and access to pupils in school. The network would involve new links, connecting up to 6 feeder primary schools to Netherhall, and providing two teachers from each primary school with computers to use at home and a network connection. Parents who already had connections would be invited to join. The first activity would be a panel of parents from Netherhall who would answer questions sent in by the primary children. The secondary children would moderate the exchange.
The elements:
- the system: hardware, connections and software
- the management
- the secondary school
- the primary schools
- the parents
- the springboard activities

The results: *see accompanying diagram* ***Socrates Electronic Communications Project in Schools***
By the beginning of June 1997 four primary schools were linked to Netherhall and to the Internet, and were actively using the facilities. One fifth of school age children in the city, together with teachers and parents, were now linked in a single network and exploring its potential.

Setting up the network - hardware, connections, software
The strategy was to create the superhighway infrastructure and then generate new initiatives. The home-school-community structure had to be right - robust, inexpensive, scaleable.

The first two months of the project - December and January - the school devoted to identifying partners and getting their agreement to help the school. The next three months was spent in getting the network operational on the terms agreed. It was June before the project was truly active as an educational venture - as the school year came to an end a prototype was in place.
A short technical annex will be added later

The management
The driving force to the whole initiative is the Head of IT, Mr Alastair Wells. His vision inspires and guides his colleagues as well as the children in the school, his commitment is clear-sighted and total, enough to carry others with him. His stamina is evident in the MAILBOX story. Without it, there would be nothing to show.

There have been three critical factors in getting the project started:

∑ marketing the idea to potential stakeholders, building partnerships and creating a team
∑ orchestration of the set-up process, following through a sequence of events and ensuring that as one piece of the jigsaw was put into place the next was ready
∑ time: the start up took longer than expected. In retrospect the time scale envisaged was unrealistic. But the interval before start-up was used for planning and to increase the enthusiasm of the stakeholders. After just over 3 months a network covering one fifth of the city's school age children was in place and operating.

The partners and their roles
On 17 February 1997 a planning meeting took place between Netherhall school and seven companies who were to be partners in the enterprise: Cambridge Cable - offering to connect up experts and primary school teachers; Pipex and UUnet as Internet providers; Sun providing a Netra webserver; Xemplar who would provide prototype Network computers and Emates on loan to the schools; Argonet, who would provide modems and software for Internet access designed for schools, and Education Online which would provide content, support for teachers, and experience of community-based partnership. The parts of a system that would link schools and homes were agreed and the commercial partners agreed to provide equipment and facilities free over a trial period. Cambridge Cable would take on some of the technical co-ordination over the period of establishing the network.

At the meeting, the partners were all ready to contribute to the trial, but most were hesitant to commit themselves beyond that. They realised the potential of working in partnership with schools and were interested in working together to develop a model for business partnership in the school sector. Some were concerned as to whether the system would be replicable or sustainable over the longer term. A meeting of business partners to review the project is likely to take place shortly.

Xemplar was keen to try out its new Network and Emate computers:

- ∑ The Network computer was developed by Acorn as a reference example. It has no local storage, no floppy drive. It works through a network connector - you plug it in - and can be used with a keyboard and mouse. It works with a TV for screen display. It works with a Smart card instead of password, and could be used with personal cards for children, can be connected to printer. The idea is that for schools it can be an alternative to a PC for instant email and web access - a browsing tool. It reduces administration costs - it is so simple it does not need technical support, staff development etc. You can add on things, but that makes it more complex and increases costs of use.
- ∑ The Emate: (then) only 1 working prototype in Europe; Apple's laptop designed for schools. Robust. No sharp corners. 28 hour batteries, only 50 minutes to recharge. It does not directly link to Net so you need a modem, supplied through a slot-in card.

Both these options will retail at considerably less cost than PCs. The project was to have one on loan for each primary school involved. In the end 6 Network computers and 2 emates were supplied. Each primary school benefitted from the loan or donation of equipment worth about 1000ECU per school.

Getting going

After the meeting it took time to get the project moving. Every step forward was as a result of repeated effort from Mr Wells. Some of the hardware was newly available, there were some delivery delays, and in some cases heavy paperwork. Mr Wells kept things moving, by telephone and email:

To Cambridge Cable (February):

> As for the teachers at their home they will be expecting you to get in touch very soon so let's say from next Monday. I'm not sure if we will have hardware for them all but they can take a computer home from school and connect it up so the installation is still important.

And to me (end April):

> Also to stimulate classwork I have asked them to get questions going via fax for the moment - well it is electronic communication as well I suppose.

In the end, by May, the partners had delivered. Most of the management had come from the Netherhall School, although Cambridge Cable had been willing to help. It seems that in a school-business partnership such as this, the school has to take the lead, as it alone understands the needs of the other education partners. The amount of work involved was greater than expected.

The secondary school team - children and teacher

The email interface was to be managed largely by year 10 children, aged 14-15, who would volunteer for the task. Year 10 children do not have important examinations. Mr Brian Gillinder, the second IT teacher (Network Manager) would manage the team. They would operate in lunch hours and occasionally after school. The group would be called "the E team".

Setting up the E team

February. A message to year 10 classes asked for 5 volunteers. 7 boys, 2 girls turn up, to a lunch break meeting, and one apology. Two year 12 pupils amongst these. Of these, 2 have Internet at home. The teachers immediately decided to tap into the enthusiasm by having a team of 10 pupils, two each day.

The meeting starts with digital photos of each person and ID forms completed, to give the children a sense of participation in something important. Then Mr Wells introduces the project. Each feeder school will send in questions and queries. The first stage is to establish connections with Netherhall, but schools will also be able to link to each other.

Primary schools have been asked to suggest themes. The ideas that have come so far are religion and language. Questions will be put to students and parents. The parents will only be able to communicate with children via postmasters.

The postmasters - the E team - will collect questions, discuss, collect answers, send back the replies. They will send all questions from all schools to all schools. Later there would be a game: 10 questions - the first to reply all right gets a prize.

The challenge for E-team is **to manage the network**. They will be trained to use email. One pair will be on duty each day of week. They will get their own Mailboxes.

The children are keen and lively. They ask thoughtful questions, for example will they get help with handling different character sets for debate over languages. They like the idea of working to help younger children. Later in the day there is to be a meeting with teachers from primary schools. The children are asked if some will stay after school for that session. Almost all of them do (see later).

E-team training

March: 3 girls, 4 boys. Mr Gillinder takes them into the very congested inner office to use an Acorn RISC computer which is fitted to emulate a PC and run windows Internet applications. The email system is first demonstrated on the old system - a slow dial-up system. The project will use the new system.

The situation is very cramped, everyone clustered round Mr Gillinder sitting at the computer. Other computers all round but nobody else can get at them while the email session is going on. The system takes some time to get going - the software has to be loaded.

The objective of the session is to show the children how to use email. Two have used it before at home. Mr Gillinder talks them through - he explains the present system is very slow. It is too slow for Netscape or Internet explorer - they use other computers for that. Eventually the software is loaded. There is a menu of applications including chat - the children will be able to use any of these once they've dealt with the day's mail. They will also be told the school password. There are four email addresses - 2 for the school, one each for the 2 IT teachers. As a test, a message from one school address is sent to the other - the teacher types. Then the modem dial up link is initialised - but it takes several attempts to get through, it's too busy. Eventual success, but someone has sent a picture to a geography teacher which takes ages to download and the line drops before the mail is sent. The bell goes - the children at least have an idea how it is supposed to work. They will have another session, this time hands on, as soon as the link is in to the schools and the new Argonet Voyager software in use.

The primary schools - getting them on board

February: The primary schools are all lined up ready to take part. The teachers in charge of IT are going to come today after school to find out what the Internet, email and MAILBOX are all about. At 4 p.m. the main computer room is as tense as a tripwire - there are network problems - will the demonstration of Argonet's teacher friendly software work?

Six pupils turn up to help, they put on special jerseys, they make tea and lay out buns. They enjoy this but find it a bit challenging - entertaining is not part of the normal curriculum.

By 4.15 only one school present of 5 expected. Why? At 4.30 the meeting starts. The school is interested because the hardware attracts; it has only 2 computers with modems, both already used very actively for curriculum content. It would be difficult to use the same computers for Internet, the school needs something extra. Mr Wells explains the options for hardware - the Network Computer and the Emate. He explains too that the E-team will provide services - downloading, printing, making disks. They go on to discuss possible uses. The primary year 6 and 7 children often talk about transition to new school. Years 4 and 6 will do topics on local studies next term, on their perceptions of local community - a good topic for an electronic classroom

The meeting ends. Afterwards Mr Wells is disappointed. He will now have to visit each school individually to get the relevant teachers more involved. He is fast to act - barely a week later I get an email:

> I have all but one of the schools on board - they are all very excited about the project.

In the end 4 schools sign up - all four fully committed to the project.

What the primary schools want to do

The Netherhall School asked each primary to complete a questionnaire to get ideas for topics to focus on. The first list was as follows:

> ***School 1***
> Local Environment/History
> Britain since the 1930's
> Religious Festivals

School 2
Religious Studies

School 3
Geographical and Historical topics.
Weather - local and world wide.
Cultural links.
Links to other schools.
Another countries perspective e.g. Japan in Victorian times.

School 4
Local Study - exploring citizenship and the wider world.

By June, when the schools had been using the system for a few weeks, a new interest emerged in one school - how to manage connectedness in the school environment. This school had installed a network connection point in each classroom, and was intending to move its Network compoter from classroom to classroom on demand.

One primary school
The Morley Memorial School. There are over 400 children in school, and 32 computers. The school has Internet/email in school office. They have been awarded a small grant to set up a project for bilingual children to communicate with other children from their home culture. The 400 children have 57 dufferent mother tongues. So the school's interest in Mailbox derives from cultural focus. They have decided to use the subject of Religious Education. They want children to benefit from access to websites world wide. Also religious education usually doesn't have an IT focus - they want to try it. They want to be able to say "look what this community has done".

Connecting the schools

The primary schools decided what equipment they wanted, from that on offer. Mr Wells first collected data on their needs, by fax questionnaire and then provided very careful briefing. The Netherhall took on responsibility for receiving the hardware and then distributing it to schools, connecting it, training staff to use it and providing technical support. At this point, after the long wait for the hardware, another problem arose, finding a suitable time for connection:

> I have the modems and software and you could all be connected to the Internet now! - my IT technician is willing to come to all the schools and install the software for you but we are experiencing difficulties in arranging dates to do this. She has been in contact with all the schools involved but so far in two weeks she has not been able to arrange or visit one school!
>
> I need your help to accelerate the installation of the modems and software - as long as you can point to a suitable computer in your school my IT technician can work quietly in the background, configure the software and have everything ready to go.
>
> The Internet software is very easy to use and I have enclosed a demo disc for you to view. We can also offer 1 : 1 training during school hours or after school if that is better, or collectively as a group. Training as a group would allow us all to meet and discuss the project and so I would like to hold a meeting as soon as possible but after all the software has been installed. Contacting each other as teachers becomes much easier through email and the same message can be sent to everyone once rather than producing five copies of everything ,which we are currently doing to get this project off the ground.

Once a suitable time was found, installation took a few minutes, and briefing the teachers to use the network machines took barely a quarter of an hour - confirmation that both hardware and software had been well-chosen, and that the right choice dramatically increases teacher confidence.

The parents

Netherhall School parents received a circular letter in February with the school newsletter to tell them about the MAILBOX project and invite them to join the panel of experts. The response was enthusiastic - within a few days the following fields of expertise were on offer:

Architecture and Building Design
Astronomy
Basics of Business
Chemistry
Communications
Computing
Education
Electronics
Engineering
Food and Nutrition
French and German
Geology
Maths
Music
Ornithology
Paper manufacture and recycling
Persian Art
Physics
Printing technologies
Religion
Science
Sociology
Speech recognition
Veterinary Surgery

By the time the project was launched there were over 30 areas of expertise on the roll. The parents had to wait many weeks for the project to take off. Mr Wells kept them up to date on progress, with regular news bulletins. In late April for example he wrote:

> Dear Parent,
>
> I am writing to provide you with an update on the progress of the Socrates EC electronic communications project. We have been busy setting up email accounts for our feeder schools and making sure they have the correct configuration on their computers. As we have only just received the modems and accounts from our Internet access sponsor this will take another week to put in place. It may well take another week to complete staff training in these schools and then we can expect to distribute some questions from pupils in the feeder schools and from The Netherhall School.
>
> Your patience and continued support is very much appreciated.
>
> Yours sincerely,
> Alastair Wells
> Head of IT
> The Netherhall School

Throughout the process, Mr Wells was careful to keep all partners well-informed. It undoubtedly paid off in retaining participants' commitment over the period while the project was swaying down the runway to take-off. The primary school teachers too were kept informed on the content issues while waiting for the system to be installed:

> With regard to the 'Expert Parents' I am keeping them informed of progress and some have replied to say how much they are looking forward to questions from the children. Many are very academic but are fully prepared for questions from 'little people' on Astronomy, Veterinary Surgery and Persian Art. Questions could be as simple as the best exercise for a guinea pig, or what is meant by phases of the moon or what is the Internet?
>
> Given the delay in setting up hardware we would still like to receive questions.

As Easter passed, the time was ripe to launch the project with no further delay - using fax where an email connection was missing!

The project takes off

April: My first visit to the school after Easter is to see an emailing session. I arrive at lunch-time. Three members of the E-team arrive. The top class primary children have sent in questions, by fax, about what secondary school is like. Over 5 days, the E-team formed the questions into a questionnaire, distributed it to first year children, collected the results and analysed the answers. They are now ready to send the answers back.

The session is technically rather unsatisfactory. The new Internet software is installed, but today it will not work. In the end the children send off their reports using the old email system. Each sent their own report - they were already all comfortable using email and chatted about the differences between systems they were now familiar with.

This is what one of them sent:

> Here are some answers to your questions.
> We asked about 60 year 7 students to answer them for you.
> Here is a collection of their answers:
>
> Q. do you have lots of home work and if so do you get it every night.
>
> A. Not every night
> A. I have a lot of homework but not every night
> A. Sometimes but not every night
> A. No
> A. Yes
> A. Most nights
> A. I near enough get homework everyday
>
> Q. what is your favourite subject?
>
> A. P.E
> A. English ,Science and R.E. I do not like some teachers
> A. History and English
> A. Art
> A. French ,Art
> A. Art ,Maths ,P.E ,Technology
>
> Q. On your first day how do you know your way around?
>
> A. With a map
> A. No
> A. I asked a teacher
> A. Map
> A. Been here before with sister
> A. Not really
>
> Q. Is your uniform comfortable?
>
> A. No
> A. Not really
> A. I put up with it
> A. Its alright
> A. When its hot its not comfortable

The secondary pupils are clearly enjoying this. They had put a tremendous amount of work into this first exercise of “making contact” with the primary children - creating an typing up questionnaires, distributing them to over 70 pupils, collecting and collating the answers and typing up their reports - all in 5 days including a weekend! For them, the technical problems with the communications system are trivial - the activity for them is seamless.

For the staff, it is frantic and frustrating. And there is so much other work going on. Even as we talk a university student on work experience is in the same room working on the school web pages, the technician is working at her computer in another corner - and the room is only about 2 by 6 metres!

Afterword

Informal follow up suggests that this interchange has helped remove children's fears about changing school. It will be interesting to monitor this further in September.

The questions start

May: Gradually the primary schools start to be more active. Mr Wells stimulates their involvement. He writes to one school:

> **Thank you from Mr Wells**
> Dear Mrs Murphy's Class,
>
> Welcome to the Socrates project brought to you via the Internet.
>
> Do you know what the Socrates project is?
>
> I wonder how many of you know what the Internet is and what the World Wide Web is? There is a difference. If you don't know the answer you can email some of my students and they will reply with some answers.
>
> You can ask them all sorts of questions about life in the school, subjects studied, favourite activities, plays ,trips etc etc.
>
> Mrs Murphy also has a list of experts ready to answer questions from Astronomy to Geology and Music.
>
> Mrs Murphy could also discuss education issues as one of our experts is a Professor of Education!
>
> You can send one question at a time or lots of questions in one go - it doesn't matter.
>
> I am sure you will have fun sending us some emails and exploring the World Wide Web.
>
> Thank you very much for letting me take some pictures of you all today. I will make sure that I send you some copies to show people when they come to talk to you about using the Internet.
>
> I hope I can come and see you all again sometime soon.
>
> Mr Wells

Questions and answers

By June, it's all happening, and working really well. Mr Wells had to create a special database to process the questions and answers - over 60 by early June. Here are some examples:

> <u>"What is the biggest traction engine built?"</u>
> "I had to check with an Expert Parent of my own on the Traction Engine question. As a boy I can remember a small Traction Engine still being used on Farm work around Fulbourn for a while, before Combines took over completely, but whatever it was it was small. I think the question of which was the biggest built might have two answers, depending on how you measure the size. The biggest machines in terms of weight and power were the Fowler Steam Ploughing Engines. These were used in pairs, one at each end of a field, with a large double bladed plough which was pulled backwards and forwards between the Engines. This was done using a large steel rope on winches slung under the Engines. The drivers would signal to each other using the whistles to make sure that the rope was pulled in and let out

correctly whilst, usually, two men rode on the plough and operated it. The Engines would be used for all sorts of other jobs besides ploughing and their large reserves of power made them extremely useful. If you measure size by length, width and height some of the larger Fairground Engines might come out on top as they had large canopies fitted above the Boiler with lights and decorations to attract people to the Fair. They were used to supply electrical power for the rides and the lights before the diesel generators we use today came along. It is possible to see a large number of these machines today as many have been restored and are used throughout the Country at special Fairs and Rallys where they can be seen in action. The local Rally at Haddenham is usually held in September and there is often a pair of Fowler Ploughing Engines giving a demonstration there as well as many other types. See the local press for details!"

"How many different kinds of Rolls Royce engines have been produced?"
"I suspect that Rolls Royce themselves might have problems answering the second question you gave me. Everyone knows about Rolls Royce cars and the engines they build to power them, but that is far from the full story. Rolls Royce make many different types of aero engine, and have done for a very long time. The Merlin engine which powered the famous Spitfire druring the Second World War was built by Rolls Royce and some of the larger passenger aircraft of today are powered by modern Rolls Royce Jet Engines. Concorde is powered by Rolls Royce Olympus jet Engines. They also make engines for Helicopters and Army Tanks. During my early carreer at sea as a Marine Engineer I had to look after two large diesel generators which were built by Rolls Royce and I believe they also make Gas turbine engines for power generation and Ship propulsion as well. Rolls Royce also work with other Companies in co-operation to produce new Engines. Did you know they are in partnership with BMW for instance? There is a vast amount of information on Rolls Royce and what they do on the Internet if you are interested. If you have enough money you can even buy one of their cars!"

"How many species of birds are there?"
"British Isles = approx. 550 Europe (including North Africa/Middle East) = approx. 750 World = approx 10,000"

"How is information written on CD's and floppy disks?"
"On music and computer CD's, the information is held in the form of a long spiral line of pits or craters winding around the centre of the CD. The information is read by shining a laser onto the track with amount of reflection being used to decide whether a pit is present or not. On floppy disks the information is stored magnetically with small areas of the disk being set to that of a north or south magnet. As the disk rotates it moves under a head which can detect and alter (if wanted) the magnetic state of each small area."

"Do worm holes really exist?"
"The long and the short of this is that no-one knows, some scientists think they might, others think that they don't. Like lots of questions in science this really has to be resolved by observation rather than theory. So far we haven't detected any evidence for them but if they do exist they could allow interesting devices like time machines."

"How many chemicals are there and which is the most popular?"
“In the early 1980s there were five million known chemicals. I believe the number is now seven million, but I cannot presently track down where I saw this figure. The most popular is sulphuric acid - more sulphuric acid is manufactured than any other compound, possibly because it is used in the manufacture of many other compounds. More than two million tonnes of sulphuric acid is manufactured in the UK each year. The amount of sulphuric acid manufactured by a country has been suggested as an indicator of the strength of the country's economy."

"In which year was the first penny produced?"

"This is a difficult question to answer because there is no proper records about this and no-one really knows. The earliest penny was probably in use sometime between the 11th and 13th centuries. About this time the groat was the coin that was used but the word penny probably came into use about that time for a small coin. The word is believed to be from the German word ""pfennig"" or the Dutch word ""penning"" or from the Old English word ""penig"". The Romans had a word ""denarius"" for their small coins and this gave the letter ""d"" in the old currency of pounds, shillings and pence or ""Lsd"" - the pound sign will not pass through the email system! The original pennies used in England were made of silver and were worth 1/240 of one pound, there were 12 in a shilling and 20 shillings in a pound. The later pennies in use up until 1860 were struck (made) from copper but after 1860 they were made from bronze. The change in metals was because the pennies were worth less in terms of what they could buy than was the metal from which they were made! Since the change to decimal currency, the penny has been called the ""new penny"" and is worth 1/100 of a pound, exactly 2.4 times it's original value compared to the pound. An annual tax, now a voluntary contribution, of one penny paid to the papal see is still called ""Peter's pence"". Americans still use the word ""penny"" for their smallest coin, the cent, even though it is not really the proper name, and the word is still used eg. ""not worth a penny"", ""penniless"" to indicate small amounts."

"What is a black hole?"

"All matter attracts other matter through the force of gravity. In most objects another force comes into play opposing the force of gravity. For example, in the Sun, energy is being released and makes the material very hot so that it exerts a pressure which opposes gravity. When a star runs out of energy the material cools and gravity pulls it in. If a star is large enough (about three times the mass of the Sun) gravity can causes it to collapse to a point. It is then called a black hole because nothing can escape from it and anything falling in will never get out. A black hole cannot be 'seen' but it has a huge gravitational pull on things very close to it and its effects on surrounding objects can therefore be observed. Black holes have almost certainly been detected in this way."

"Is it true that there are other life forms in space and are they intelligent?"

"We don't know for certain that other life forms, intelligent or otherwise, exist. However the Universe is vast and there are millions and millions of stars like the Sun which could have planets like Earth. I therefore think it highly likely that life does occur elsewhere."

"What should a footballer eat?"

"The most important requirement for everyone is to have a balanced diet. Your body needs protein, carbohydrate, fat, vitamins, minerals, roughage and liquid. The diet must match energy needs. A balanced diet should contain around 15% protein (meat, fish, cheese, pulses etc), 30% fat (vegetable fats and oils rather than animal fats) and 55% carbohydrates (brown bread, pasta, potato rather than sugary foods). Eating losts of fresh fruit and vegetables (5 servings per day) gives you carbohydrate, roughage, vitamins and minerals. The diet for any athlete in training, including footballers, differs only from the ordinary well balanced diet in that it must provide extra sources of energy, preferably in the form of carbohydrate. This is needed to maintain glycogen stores in muscle for the quick release of energy. Playing any type of sport involves large losses of fluid in the sweat. It is important therefore that these losses are promptly made up by the necessary fluid intake. A very minor degree of dehydration can impair the efficiency of muscles."

Comment

I have yet to go to the primary schools and see how they generate their questions and deal with the answers, but there are a number of interesting points that come from the correspondence:

Forming the questions
We have already seen that questions from primary schools are related to curriculum themes. At an early stage it emerged that primary teachers needed not only to moderate questions but also to assist children to formulate them so that they could be answered. Mr Wells took the opportunity of a review meeting to explain to teachers that:

> "Specific questions on a topic to staff and expert pupils work well but lots of short answers to specific pupils or irrelevant questions like "how many pupils support Man United" were impossible to answer."

It seems that the skill of forming questions - of dialogue in print - needs development with both teachers and pupils.

Support for teachers
Regular review meetings between the Netherhall IT team and the primary teachers provide an opportunity not only to discuss progress and resolve problems but also for Mr Wells to provide training in technical skills to the primary teachers. In the last meeting, for example, he showed them how to save attached files, including graphics. The topic for the next meeting has already been decided - participating teachers will thus benefit from regular needs-based training.

Handling the questions
I saw two boys from the E-team arrive at lunch -time to see what questions had come in. A set of questions on religion. Mr Wells printed off the questions, they all looked through them quickly and decided one or two were too general to be answerable. Some were on Islam and Hinduism - a brief discussion of how to find answers suggested that the boys immediately saw this as a research exercise - not merely a post-box exercise where the questions would simply be posted on to a parent. The boys faced the questions with confidence and enthusiasm. They seemed able to distinguish between questions which were hard and easy to answer, and immediately started to discuss strategies for answering. They started talking about whether they had any personal contacts who were Muslim or Hindu, then spotted one of the Religious Education teachers by chance at one of the computers in the lab and immediately started discussing with her how they might get answers. They went off to class with a diskette, so they could enter each answer as they found it. Later the same afternoon they returned with something on disk ready to send off - perhaps a selection of questions for a parent-expert. It would be interesting to watch them further to see how their research skills develop.

Parent-expert involvement
The experts are taking their involvement very seriously. One clergyman-parent for example took on a list of 13 questions on religion, some rather difficult to answer. Another expert dealt with this one as follows:

> Question (from an 8 year old): what is infinity times zero?
>
> Answer: infinity is not a number and so it cannot be multiplied by zero.
> This is because multiplication is an operation for combining two numbers to produce a third.

The answer came from a member of Cambridge University mathematics department. He followed up with a note to Mr Wells:

> As I wrote [the reply] I felt that he was going to be disappointed. I thought about writing more, trying to give him an idea of what infinity actually was (or at least how it manifests itself) but then thought it better to keep it short. If he wants the right to reply then I'm happy for him to follow it up. It's the type of subject that still captures people's interest when you raise it in the coffee room here.

Broadening the resource
This project has captured imaginations. It has already had some press coverage, generated by some of the sponsors - who are increasingly enthusiastic about the project. Its simplicity and easy usability has helped it take off. The expert panel now has a wider base than parents - some university teachers have agreed to be on the panel.

A local database open to all
As soon as he realised the scope of response coming in, Mr Wells created a database to store the answers. Already the E team can scan this to avoid duplication in case repeat questions come in. As soon as the school's new web site is opened, the database will be put up on it.

Sustaining the project
The use made of the network has been entirely based on need - curriculum needs expressed by the primary schools and - less explicitly - the need for children and teachers to gain familiarity with the potential of network access and acquire the necessary skills. It is, apparently, accepted without question in the school and its community that networking access and skills will soon be essential. Already, the primary teachers are discussing with Netherhall how they can exploit the potential - the next review meeting will centre on the question "How will email/web evolve in your school?" There are however major issues to be resolved if the network is to survive and develop. The most immediate concern the future of the hardware at present on loan and the human resource constraints at the Netherhall where additional staff is badly needed. The Netherhall School hopes that exposure of the project in the press or on the conference platform will lead to the necessary support once MAILBOX is over.

Conclusion and Reflection
MAILBOX has given the Netherhall School and its partners the stimulus to do something entirely new - to go through the technology ceiling, start removing constraints of time and place from Internet access, and link up a large proportion of a community. To do so, the school has created an innovative business-education partnership. The significance of what has emerged goes far beyond the MAILBOX brief. But it has also offered a number of insights for MAILBOX partners. In many cases, the Netherhall case reinforces the findings in other contexts. One surprise is the remarkable similarity of approach to correspondence of both children and parent-experts, marked by enthusiasm and deep concern to communicate clearly and appropriately. But most important is the model provided for potential integration of communications technology in secondary schools. As elsewhere, we see the importance of staff training and of curriculum relevance as a basis for activity. But here alone we see the implementation of a strategy to create both school intranet and a local network, and make it accessible to all. This requires vision, careful planning, step by step implementation, commitment and good management. The almost instantaneous success of the local network once the connections were activated is particularly striking. Technology choice, project management, and educational interest combined harmoniously.

Additional resources:
The Netherhall School web pages.

OFSTED school inspection report - can be accessed through the web.

Department for Education (1995) <u>*Information Technology in the National Curriculum*</u> *- sets out statutory requirements for IT.*

School promotional material and other documentation.