


VISION

Looking at the future of learning

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Learning environments for the future

Building Schools for the Future project and other innovative learning spaces

Personalised learning

What does it mean, now and in the future?

Pre-school and technology

Can ICT help the under-5s?

Science education

To produce scientists or for everybody?

Interactive education

Could interactive technology help learning?

About Futurelab

Futurelab is helping to transform the way people learn. We're working with others to create rich learning resources that are involving, interactive and imaginative through the following activities:

- Support for new learning technologies, turning ideas into working prototypes: www.futurelab.org.uk/your_ideas
- Learning research programme that evaluates the impact of technology on learning and teaching, and publishes the learning outcomes of new educational prototypes: www.futurelab.org.uk/research
- Literature reviews that offer a route map through the vast body of research into education and technology: www.futurelab.org.uk/research/lit_reviews.htm
- Bi-annual conferences that explore emerging themes and share ideas across a diverse range of audiences: www.futurelab.org.uk/events
- Industry membership scheme offering networking opportunities and exclusive access to our project and research developments ahead of the crowd: www.futurelab.org.uk/about_us/industry.htm

How to get involved

Have you ever considered using your skills to do something different? Are you interested in innovation, technology or education? If the answer to these questions is yes, then Futurelab invites you to contribute to a digital revolution in education. You might be a software developer, web designer, animator, teacher, researcher, policy maker or none of the above - if you have creative, technological or educational skills, we would like to hear from you.

If you would like to be added to the Futurelab mailing list to receive future editions or further copies of this edition of VISION, or if you would like to discuss any of the issues raised in this magazine, then e-mail: vision@futurelab.org.uk. VISION is also available to download free from our website - www.futurelab.org.uk/viewpoint.

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Contents

Learning environments for the future	01
An interactive education	05
Getting creative	08
The purpose of science education	09
Personalised learning	11
Technology update	14
Pre-school and technology	15

Welcome to

VISION

In this edition of VISION, we set out some serious challenges around what learning should look like in the future.



What new sites, spaces, tools and approaches are needed to support a learner-centred education system? And what role might digital technologies play in supporting these changes?

While our classrooms have changed little in the last 100 years, our approach to teaching and learning has moved on and is set to evolve

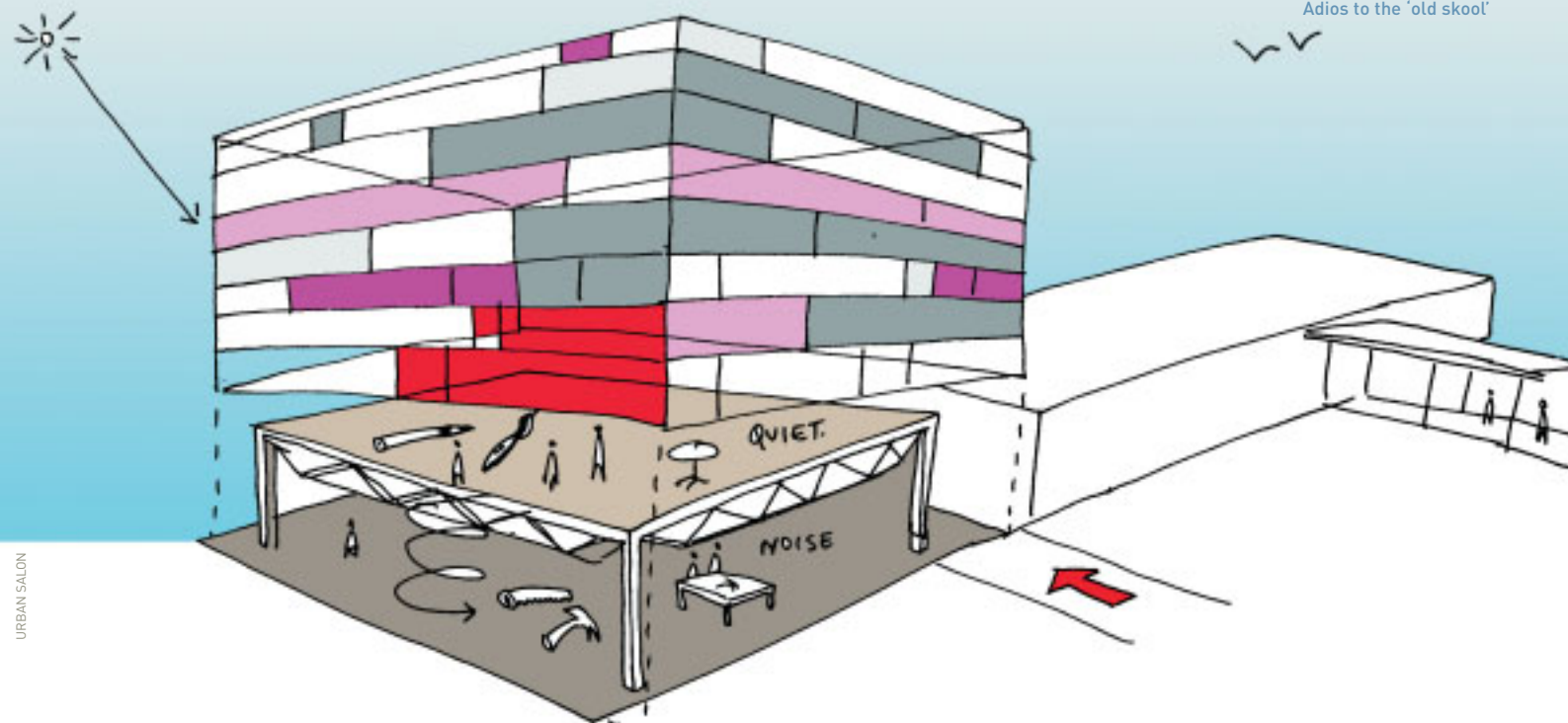
further with the introduction of a more personalised model. Are we taking the opportunity provided by the **Building Schools for the Future** programme to design radically new learning spaces that support the changing needs of learners, teachers and communities?

Amid all the talk of **personalisation**, how can we develop an education system that conforms to the learner rather than the other way round? And if young people are to take greater ownership and responsibility for their learning, what impact does this have on the National Curriculum?

The science curriculum, in particular, comes under scrutiny as we question the purpose of **science education** in schools and the role of the Twenty First Century Science syllabus which will be widely introduced from September 2006. We look at how digital technologies can support learning for those born in the first years of the 21st century, the under-5s. We step back and ask whether ICT really can add value in the **pre-school** context and, if so, how we can develop devices that are appropriate to young children. Finally, we ask why **interactive television** has failed to live up to its promise and what potential there is for iTV and other interactive technology to support learning in the future.

Clearly these are not small challenges and the combined wit and wisdom of those in industry, practice, policy and research will be needed if real progress is to be made. We look forward to your views and to working with you to define solutions to some of the questions raised in this edition of VISION.

Annika Small
Managing Director
Futurelab

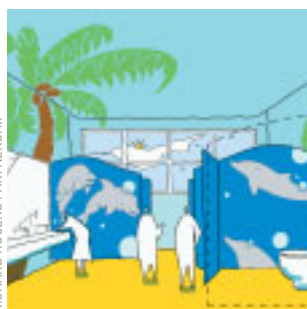


Adios to the 'old skool'

Let's build schools for the future



MARKYS BARFIELD



RICHARD ROGERS PARTNERSHIP

The much-vaunted Building Schools for the Future (BSF) programme is projected to spend £2.2 billion per year on building and refurbishing secondary schools in England over the next 10-15 years. The idea is to create world class, flexible and adaptable teaching and learning environments compatible with the 21st century.

It's a bold scheme, and comes at an ideal time. Education has traditionally been seen as something that happens to learners, based on a post-World War II 'one-size-fits-all' strategy which aimed to provide a solid basic education for all. But the world is changing and, in the 21st century, people will increasingly need to be flexible, technology-savvy lifelong learners, with a very different skill-set from their forebears.

BSF is an ideal opportunity to create schools that acknowledge these new demands for education, and to draw on recent high-profile studies into the design of new learning environments which have shown how innovative building and classroom design impact on the effectiveness and experience of learners, teachers and the wider community of users. At the same time, new approaches to teaching and learning need to be incorporated into these designs, such as e-learning, e-assessment, remote and personalised learning, curricula designed around the development of life skills and student-initiated learning.

As it orientates itself to the future, school design will need to reflect and enable all of these emerging possibilities, and to rethink what we understand by 'the school' and 'the classroom'.

"THE ARCHITECTS NEED TO CHALLENGE BOTH TIME AND SPACE"

So does BSF go far enough? Catherine Burke, co-author of 'The School I'd Like: Children and Young People's Reflections on an Education for the 21st Century' (RoutledgeFalmer, 2003), thinks not. "I've talked to some contemporary architects and I don't think they are really building 'the school I'd like'," she says. "They need to be more prepared to challenge both time and space, rather than just rearranging traditional classrooms and buildings in a more modern way. To achieve this, we all need to listen more to children and hear their needs."

'The School I'd Like' came into being when Burke contacted The Guardian in 2001, to see if they would be interested in re-running a 1967 competition (originally in the Observer) which had asked secondary school children about their experiences and invited them to imagine their educational utopia. Many of the original participants mentioned physical discomfort, lack of respect and a feeling of being out of control, which was reflected in the buildings, classrooms, and in the way they were being taught. The children wanted to work more cooperatively, in circles rather than rows. They wanted to break down barriers and hierarchy, and for their voices to be heard.

"LINES FEEL BAD AND ORDERED. CIRCLES FEEL COOPERATIVE"

The Guardian agreed, and this time the competition was extended to include primary school children as well. Over 15,000 entries

were received. "We were amazed," Burke recalled. "Children are kept so permanently busy these days, so we thought that not many would find the time. But it really took hold of their imaginations."

The results were - sadly - astonishingly similar to those from the previous competition, indicating that little has changed in over 30 years. Quite apart from the inevitable Tardis-like wish-list of voice-activated pencils and field trips in rockets and giant submarines, lots of domes appeared in the children's designs. "Lines feel bad and ordered," said one entrant. "Circles feel cooperative."

"CHILDREN ARE NOT A PROBLEM TO BE CORRALLED AND CURFEWED, BUT AN INCREDIBLY RICH SOURCE OF WISDOM AND CREATIVITY"

The children wanted school to be safe and comfortable, built without physical and emotional walls and barriers, and for teachers to be more willing to listen and be flexible. But their ideas also extended into the philosophical. "Education should not close children's eyes to the wonder of learning," said one pupil. "It should feed our minds."

Relevance to adult life and adult ways of working was another concern, leading to questions about how the subjects themselves are taught. This, in turn, queries the traditional classroom, curriculum and exam set-up. As one participant asked, "Why is knowledge split into chunks? Life isn't."

Burke, herself an educational historian, was fascinated by the findings and thinks that they should be recognised by the BSF project - which hopefully they will be, as BSF features the findings from the competition in its communications, such as its website, www.bsf.gov.uk. Indeed, those involved in BSF are keen to point out that they are aware of innovative thinking going on elsewhere and are in no doubt about the significance of the project. Steve Moss, Education ICT Adviser for Partnerships for Schools, which is responsible for implementing BSF: "We have a key role in challenging local authorities as they develop the education visions which will underpin their school designs and also in helping the architects, construction industry and ICT suppliers to understand the transformations their designs must facilitate."

Burke agrees with the need for a wide scope: "Design, technology and the curriculum itself all have to be integrated if we are to even get close." She cites the example of Prestolee school in Bolton. The school was transformed during the 1920s-1950s by the head teacher, Edward Francis O'Neill, who challenged the very concept of the classroom. Flying in the face of tradition, he focused instead on "developing the innate characteristics of children", which he identified

as trustfulness, truthfulness, helpfulness, discovery, activity, initiative, concentration and gregariousness. There were moveable 'science tables' to work on rather than fixed labs; a 'magic garden' of flowers, vegetables and water features; and the children were encouraged to cooperate in making things and to 'learn by doing'. "We can learn from the past as well as from the children of today," says Burke.

Just as at Prestolee, 'The School I'd Like' found that children want school to be a place they want to be in. Sarah Noyce, a primary school pupil, summed up why all entrants wished their dream school would come true. "So if I had a choice, I would still want to go to school," she said. As John Clifford, winner of the 1967 competition and a judge on this one, observed, "It all proves that children are not a problem to be corralled and curfewed, but an incredibly rich resource of wisdom and creative thinking that we should listen to."¹

This is a concept with which Bruce Jilk, renowned school architect from Minnesota, could not agree more. "We need to start with learning behaviours," he said. "If we don't do that, designing hi-tech classrooms is about as much use as rearranging deckchairs on the Titanic." That's why he feels many new schemes, including the BSF, are often too narrowly focused. "We may well end up with a better environment; more light, cleaner air," he explained. "That's all good, but is not directly connected to enhancing learning in itself. The problem is, there are so many adult stakeholders - the Government, the tax payer, the expectations and presumptions of the voting public - and these all come before the needs of the child."

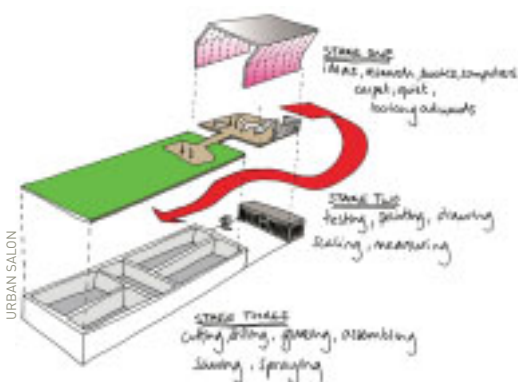
"DESIGNING HI-TECH CLASSROOMS CAN BE ABOUT AS MUCH USE AS REARRANGING DECKCHAIRS ON THE TITANIC"

Jilk has been responsible for several challenging new concepts in education, including the Zoo School in Minneapolis. A state school of 400 students, it has an active partnership with Minnesota Zoo. The students are 'workers', and teachers take a far less central role. The students move around, undertaking activities in largely self-determining 'pods' of about ten to a group, with ten 'pods' to a 'house' - a large, flexible-use room. The 'houses' all face a hub, where central facilities such as the canteen and library are housed. Design came second to the students' academic programme and needs, which were themselves adapted from the traditional curriculum into innovative teaching practice.

In creating this environment, Jilk removed the very concept of the formal classroom. As one student, Kelly Carlin, said, "I'm not learning in a box of fluorescent lights any more. I'm learning in a classroom, but also by a pond, in a park, in



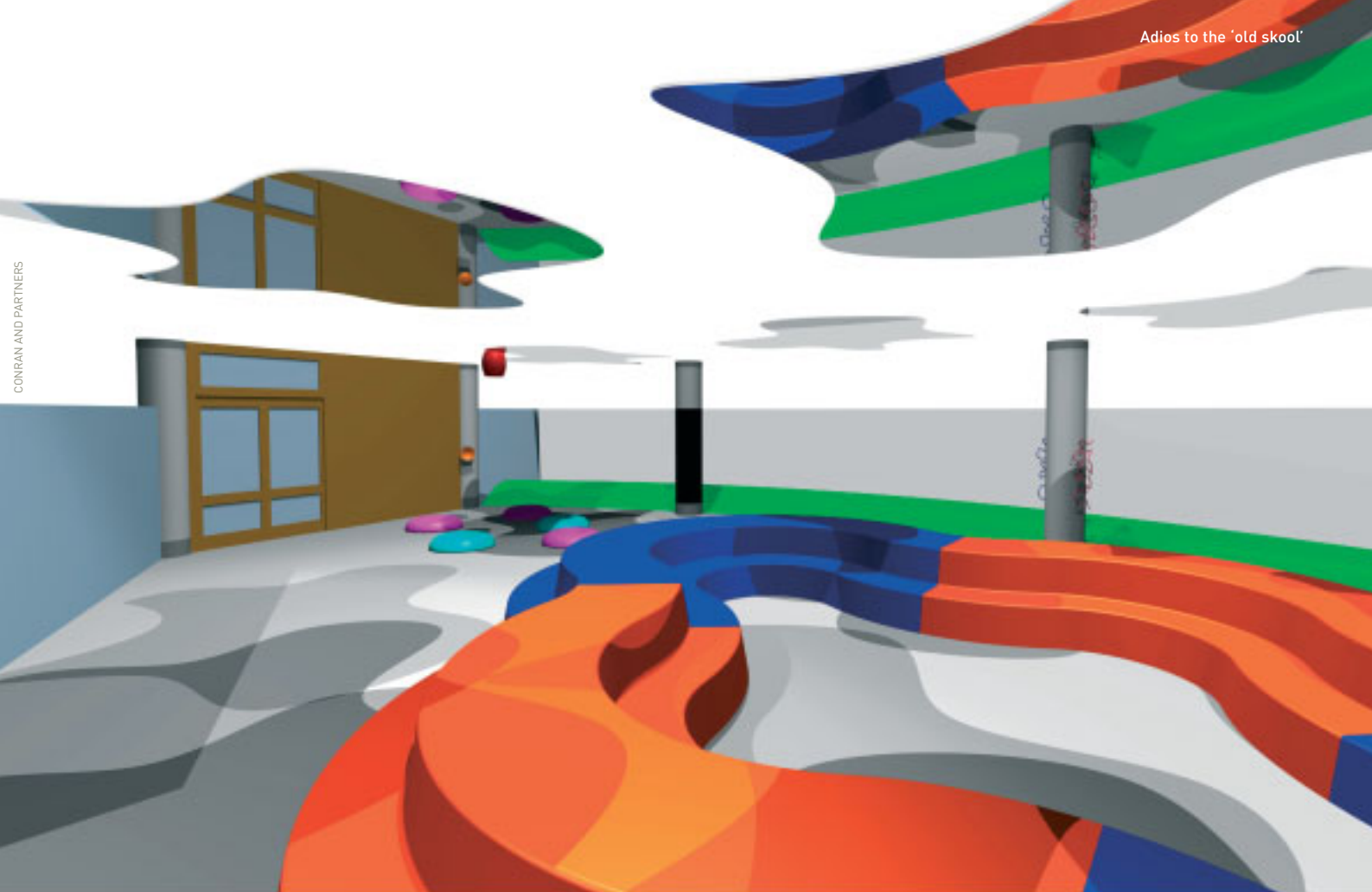
DESIGN COUNCIL / ST MARGARET'S HIGH SCHOOL



URBAN SALON

¹ Quotes from Guardian article by Dea Birkett entitled 'It is the school we'd like'.

² Copyright (c) 2002. The George Lucas Educational Foundation.



the field... and it has a significant impact on the community.”² With a focus on learning the factual, social and civic aspects of each subject at the same time, an integrated, community-oriented thinking is nurtured that can benefit the students greatly in their adult lives.

“MOST SCHOOLS ARE LIKE PRODUCTION LINES”

Jilk is rightfully proud of this project, not least because when he visits the school - which is frequently - the children often run out to thank him. “Most schools are like production lines,” he said, “and if you put 30 kids in rows in front of a teacher, that will just be perpetuated. The key is to work together for change that will be meaningful to learners.” And if you can do that, you banish boredom and apathy, and improved results and well-socialised citizens usually follow.

Whilst the concept of starting with learning behaviour and integrating design, technology and the curriculum is vital to Jilk and Burke, the physical classroom environment does make a difference too.

In the UK the Design Council, which is campaigning for improved learning environments, is working with St Margaret’s High School in Liverpool to develop a prototype for a 360-degree classroom.

The concept is that, instead of the teacher facing rows of disengaged students, he or she can circle them on a curved ‘race-track’ whilst the children work cooperatively in groups in the middle, sitting at ‘Q-Pods’ (special table and chair units on wheels). A multimedia projection centre is locked in the middle, and the white writing boards the groups work on can be fitted onto walls at the back so everyone can discuss the project together. They can also be used as screens for computer projections. “Potentially it eradicates the ‘attention zone’ - that small area in front of the teacher in a traditional classroom where 90% of his or her attention goes, ensuring everyone is engaged. And the Q-Pod chairs are far better for growing spines than cheap, wooden ones,” said Toby Greany, campaign leader at the Design Council.

INSTEAD OF THE TEACHER FACING ROWS OF DISENGAGED STUDENTS, HE OR SHE CAN CIRCLE THEM ON A CURVED ‘RACE-TRACK’

Designs like these, with the fluidity of movement they allow, will also be better placed to accommodate the increasing involvement of new technology in education. For example, Futurelab has developed a prototype learning

technology called Space Mission: Ice Moon, in collaboration with the National Space Centre, which puts pupils into the roles of experts in an Emergency Response Team after a disaster in space. Working in teams, up to 30 pupils use video-conferencing, web chat and interactive materials to resolve the disaster, putting into practice all their skills as scientists, mathematicians, planetary geographers and communicators. This kind of project would be far harder to implement in a traditional classroom set-up.

“We hope projects like this will become part of the future of education,” said Keri Facer, Director of Learning Research at Futurelab. “And it’s vital that BSF understands that learners, supported by mobile and wireless technologies and new curriculum approaches, will expect more control, flexibility and diversity from their learning environments in the future.”

Ultimately, for the BSF project to be a worthwhile investment in the future, the Government will need to practice the ‘joined-up thinking’ we hear so much about. It will need to link the elements of changing educational requirements, fast-moving technology, and exterior and interior design. It should also factor in the potential of more open and collaborative approaches to teaching, take on board different learning styles and options to offer genuine flexibility in its designs, and above all, put the needs of the learner first.

Schools for the Future

Making it better by design



The Design Council ran a seminar series in 2004 on School Learning Environments, one of which asked "Billions of pounds are going into refurbishing or rebuilding UK schools, but will the money be well spent?"

At the event, there were concerns that the Building Schools for the Future (BSF) programme may miss the chance to alter the design of learning environments, which have changed very little since early in the 20th century. Meanwhile, learning has changed considerably and is set to evolve again with a move towards a more personalised model, enabled by technology, in which pupils will be encouraged to take more control of their education. The Design Council is calling for a new 'inside out' approach to designing learning environments which involves teachers and students from an early stage of the design process.

Professor Stephen Heppell, Director of Ultralab, who took part in the seminar, sees learning moving from a single curriculum to 'peer-to-peer exchange'. He said: "Children will swap coursework and curricula the way they swap music now. The teacher will be the facilitator for that." And he warned that for schools to survive, their design would

need a substantial shift from the 30 desks and chairs in rows that still mark most current learning environments. One way to trigger that process was to ring-fence part of the capital budget for research into users' needs at the earliest phase of the design process. He continued: "There's no reason to say that schools are going to make it any more than post offices will. They're not going to survive automatically. We have to intervene with the schools our communities need. We need to spend 3.7% on R&D for radical new schools."

However, the most enduring finding from the seminar, articulated by Sean McDougall from the Design Council, was: "Although the emphasis is being placed on renewal of buildings, we also have a pressing need to renew the systems which underpin education. The danger is that we will end up arranging new buildings around what is basically a Victorian teaching model unsuited to the needs of children in the 21st century."

A literature review by the Design Council entitled 'The Impact of School Environments' is available to download from www.ncl.ac.uk/cflat/news/DCReport.pdf



Joined up thinking

joinedupdesignforschools is a unique initiative, by the Sorrell Foundation, that puts pupils together with the UK's leading designers to provide solutions for practical improvements in schools. 10,000 pupils in over 60 schools have benefited from the programme, with nearly 700 pupils directly involved in individual projects. Over 150 designers, including Paul Smith and Kevin McCloud have worked with pupils across the UK.

In each participating school, teams of pupils were asked to identify a problem in their school that they would like solved. The outcome was 14 common complaints that pupils have about their schools, ranging from the need for dedicated social space and inspiring learning areas to civilised dinner spaces, vandal-proof toilets and modern, comfortable school uniforms. They then worked with designers over a three-month period to develop a concept which could be presented staff, pupils, governors and parents.

Being shown as a UK exhibition tour from October 2005 to June 2006, joinedupdesignforschools provides examples of the positive results that emerge when pupils are involved in the design process and, it is hoped, will help inform practice for new school builds and refurbishments.

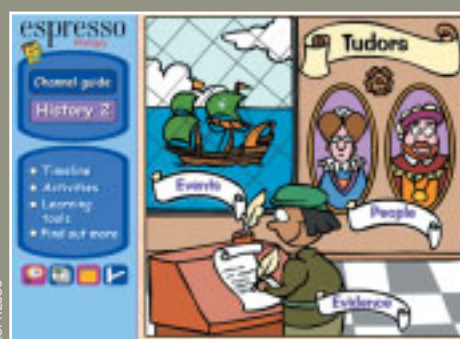
For further information and images, go to: www.sorrellfoundation.com



WILLIAM WARREN / BRECKNOCK PRIMARY SCHOOL

'Interactive' and 'television' are not words that go together well: TV demands little active intervention from its consumers. And so far, the services that have appeared under the name interactive television (iTV) have proved less than remarkable, certainly when compared with the internet.

An interactive education



ESPRESSO



SKY GAMESSTAR



SKY GAMESSTAR

'Pressing the red button', the remote control button normally used to activate iTV - not be confused with the television channel ITV - often leads to pages of words that seem to be little more than a better-designed version of the teletext services, launched 30 years ago. Even when successful, it often only allows the user to choose from a variety of extra channels, such as different tennis matches at Wimbledon. In fact, currently often the most effective way to 'interact' with television is by using the, usually premium-rate, telephone voting polls associated with programmes.

Jo Morrison, Creative Director at Futurelab, says that many people's first experiences were poor. Different broadcasting systems used different technology, so it was very difficult, and costly, to produce content for all the platforms required. This, in turn, meant that people's experience varied depending on the service provider/platform and so there was no guarantee of a common level of quality. "Another thing was that the red button took you to a 'walled garden' (a limited set of pages available to viewers), and a lot of the material there was in the form of brochures," she says. "Why would you want to read a financial services brochure on the television?"

The 'walled garden' represents the biggest problem for iTV: television was not designed for interactivity. Classically, broadcasting works one-way, meaning that the results of all the possible choices in an 'interactive' service like teletext have to be sent to everyone.

With the world wide web, every page is requested and sent to order individually by web servers, allowing customised access to billions of fixed pages, as well as bespoke pages which are created as they are requested, drawing the latest material from databases.

MANY PEOPLE'S FIRST EXPERIENCES OF INTERACTIVE TV WERE POOR

Another problem is availability. Terrestrial television, whether analogue (the method still used by around 8.5 million UK households) or Freeview digital (5.2 million), has no 'return path', or data channel from the viewer to the broadcaster, and so is not truly interactive. The 7.4 million subscribers to Sky's satellite service are meant to leave their box plugged into their telephone line, allowing subscriber information to be transferred and access to paid iTV services such as games and betting, but this is basically a slow dial-up modem and, as it shares the phone line, it is normally used only for short periods. Only digital cable television - used by just 2.6 million households - offers an always-on, high bandwidth return path and so can really be considered to be interactive.

This looks likely to change however, for example Sky's recent purchase of Easynet, a broadband internet service provider, should mean that their services will offer a much faster return path. Also BT is working on linking broadband internet lines to Freeview

boxes, with the idea of allowing thousands of 'broadcasters' such as, for example, football teams and community groups to interact with millions of households. Freeview is growing fast, as it is the cheapest way to go digital - and all households will have to make this move between 2008 and 2012, the period in which the UK's analogue terrestrial transmitters will be turned off. But, even though availability is unlikely to continue to be such a problem, there are still likely to be difficulties in using iTV for education and learning.

Stuart Nolan, Senior Lecturer in Creative Technologies at Huddersfield University and a fellow, agrees. He has researched distance learning and iTV, the type of formal education, such as Open University courses, that television has been best-suited to so far.

THE BBC SEES iTV AS MORE SUITABLE FOR INFORMAL LEARNING, NOT PART OF A FORMAL COURSE

Nolan says that even homes with several televisions usually have just one with the set-top box usually required for iTV. With distance learning, "people tend to want a quiet room, where they go and learn. They don't do that in the living room. So we have what some people call a real estate issue." The same could well apply to children and homework.



BBC / FREEVIEW

Nolan says that interactivity is valuable in distance learning, because it allows the institution to check that students are making progress, and allows those students to discuss issues with tutors and each other. Although not necessarily through the TV. "Why not just use a PC?" he asks.

Computers with broadband are already capable of delivering reasonable-quality video, and this will improve as internet connection speeds increase. Arguably, that makes computers a source of iTV themselves - and so ideal for interactivity.

The BBC's middle name may be 'broadcasting', but Philip Benton, Managing Editor of Learning and Interactive at the corporation, agrees. "While the BBC is working in a number of broadly 'knowledge building' areas of output via iTV, it isn't a platform we are currently pursuing for delivery of formal education output," says Benton. "It's our view that the increase in broadband take-up means that the online service now offers much greater potential for effective delivery of a richer and more powerful interactive educational experience." The BBC sees iTV as more suitable for informal learning, such as offering additional material to programmes which are broadly educational, but not part of a formal course.

However internet availability is also an issue. Some research suggests that computer ownership will level out at 60% of UK households (possibly higher for those with children) and, even though all schools have PCs, learners themselves aren't always able to access them.

USER-GENERATED MATERIAL IS A STRONG CANDIDATE FOR INTERACTIVITY: "CHILDREN COULD DISTRIBUTE THEIR WORK TO FRIENDS, PARENTS AND THEIR PEERS"

Even so, Espresso Education delivers its material for schools through the internet. It has access to Independent Television News' vast library, including footage from companies such as Reuters and British Pathé and so thinks of itself as a broadcaster. This material is used in Espresso's weekly package of audio-visual material, which is sent to schools during the



ESPRESSO

night then stored locally to avoid downloading delays during lessons.

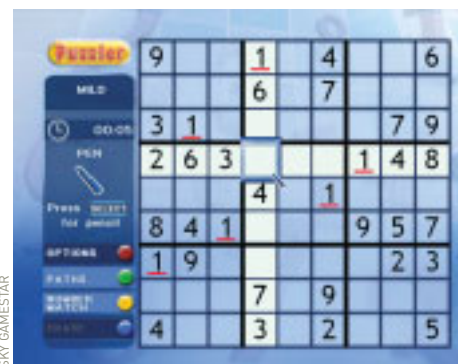
Pupils then work through Espresso's material individually. "It allows children to learn at their own pace, as they are in control of the video," says David Summers, Editorial Director of Espresso Education. "They often watch it numerous times, as they can interrogate it much more closely that way." One idea for future development is more 'hyperlinking' within material - the equivalent of web page links, allowing users to choose what they look at next - although Summers adds: "There's still a lot of research to be done in that area, on keeping a sense of narrative, seeing where children are and what they are trying to learn."

"I THINK IT MADE ME A BETTER TEACHER, HAVING TO DEMONSTRATE AN IDEA IN DIFFERENT MEDIA"

He says that Espresso is already allowing pupils to add its audio-visual material to their own projects. Soon, they will also be able to edit in pictures they have filmed, using low-cost video cameras. He says this allows children to develop an understanding of the grammar of broadcasting, as well as being ideal for projects where news material is of use - which, as well as the likes of history, can include geography (footage of extreme weather), citizenship and science. The results can be used by Espresso to send to all their school clients, allowing pupils to help produce learning materials for other pupils.

Peter Bates, Senior Partner of PJB Associates and a consultant on iTV and education, says that user-generated material is a strong candidate for interactivity however it is broadcast: "It could be an opportunity for schoolchildren to distribute their work to friends, parents and their peers," he says. Bates thinks this could extend to all kinds of learning: iTV could enable the virtual equivalent of book groups, where you can watch a programme and use iTV to join a 'chat room' of other viewers, to discuss it either while or just after it is shown.

But it's not just user-generated content that might be required to make iTV suitable for learning. Educators too may be required to produce audio-visual content, requiring skills, time and technology somewhat beyond the



SKY GAMESTAR

word processor and printer needed to generate words, or the skills required to teach in a classroom.

Stuart Nolan says that, when the Economist magazine started a television service, it upset some journalists: they went from being anonymous figures to being personalities, having to dress and behave in a certain way when on camera. "Some people come out well on camera, some don't," he says. Are educators ready and willing to take part in this medium?

Martin Owen, Director of Learning at Futurelab, says that, when he did a PGCE in the early 1970s, he was able to train in video work, producing an animation to show energy transfer in electrical circuits. "I think it made me a better teacher, having to demonstrate an idea in different media," he says. "If it was true then, it's even truer now."

So what does all this mean for interactive education, both inside and outside of school? If all the required equipment is in place, interactive education (whether via television or broadband) looks to be viable in schools now. But given the questionable suitability of the family television for distance learning, the range of broadcast systems and technologies used in the home and the substantial numbers of households lacking any such equipment (either computers or the right kind of digital TV system), it looks likely that interactive learning will stay predominantly within formal places of education for the time being.

All figures on household use of television services are from Ofcom, and refer to June 2005.

References

Bates' (2003) 'A Study into TV-based Interactive Learning to the Home' (www.pjb.co.uk/t-learning.htm) provides an interesting overview and introduction to learning with/through iTV.

Kim and Sawhney's 'A machine-like new medium - theoretical examination of interactive TV' (Media, Culture & Society 2002, Vol 24: 217-233) is a rigorous investigation of the cultural perspective of iTV.

Fallahkhaier et al's (2004) 'A Dual Device Scenario for Informal Language Learning With Interactive Television Meets the Mobile Phone' (www.it.bton.ac.uk/staff/lp22/LynP.html#Research) provides an interesting converged approach for the use of iTV.

What could the future hold?

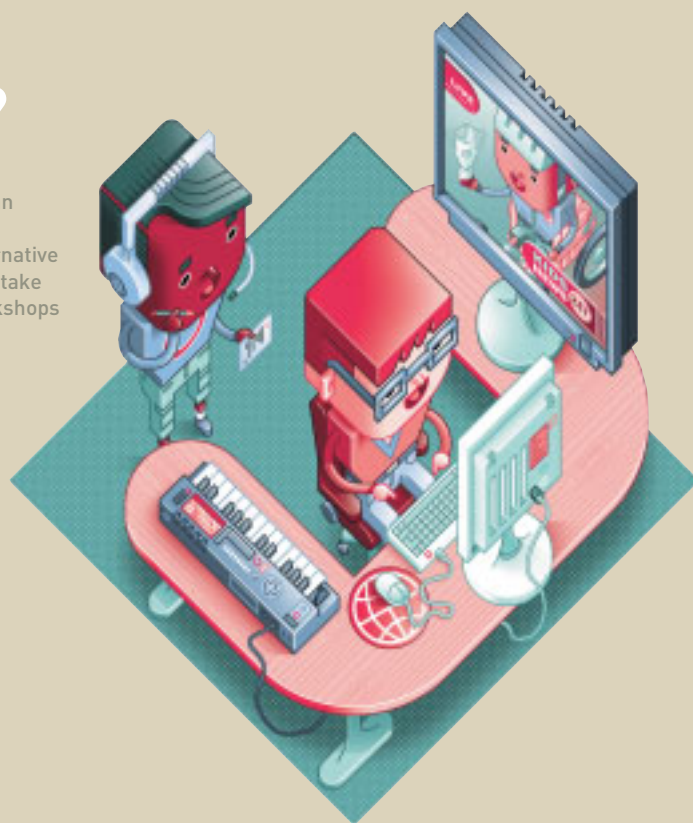
Futurelab recently held a series of Innovations Workshops which brought together experts from research, design and practice to investigate how new technologies can impact upon learning in 5, 10 and 15 years' time. One of these was on 'Future TV: involving learners in creating their own learning environment', which created alternative visions of the future use of iTV so that learners could personalise, interrogate and take control of broadcast materials. The resultant reports from this and the other workshops can be found at www.futurelab.org.uk/events/past/innovations_intro.htm.

FREE poster

Futurelab has produced a set of four posters which demonstrate, in a visually stimulating and fun way, the ideas that came from the workshops on:

- Interactive TV
- Pre-school learners
- Third generation phones (3G)
- Music learning, performance and appreciation

These posters are freely available to the ICT/technology, creative and education communities. If you would like copies of these posters, contact Futurelab on 0117 915 8200 or e-mail innovations.workshops@futurelab.org.uk.



Interactive play time

One source of interactivity could come as a surprise: toys. Particularly relevant is work between media company Warner Brothers and toymaker Hasbro to produce toys which are programmed to receive updates from television broadcasts with which the toy is associated, so a toy action figure could refer to the adventures the child has seen in the character's tie-in television programme.

This idea could be adapted for educational purposes. Martin Owen, Director of Learning at Futurelab, agrees. "In the 1970s, when they made Sesame Street, there was an assumption that parents would watch with their children," he says. "In the 2000s, if you take a programme like Teletubbies or Blue's Clues, there's no such assumption. In fact, there's an assumption that children could well be watching on their own but that they will watch it again and again. If there's an intermediary object such as a toy, which is aware that you have watched this programme and can interact with you, then the possibilities become more interesting."



Talk into action

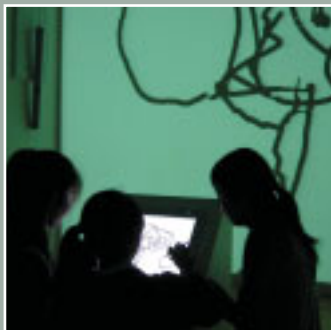
Interactive video

Interactive video, which enables viewers to interact directly with objects of interest in streamed content such as video and websites, is available from technology innovators Coull. These objects can then be linked to associated websites or other information. One example in the field of learning is Chef TV (coullmedia.ld.mediawave.co.uk/chefv/demo1/player.html), where Coull has been working closely with Cambrian Training to embed the interactive technology into cooking videos for use in training on local/regional dishes. Coull is currently considering further applications for interactive video to the learning and education market.

For further information, go to:
www.coull.biz

Getting creative

Creativity is central to a thriving, imaginative and innovative world. It is also crucial to education, in terms of the approaches and tools used to teach, and in the act of learning. Here we celebrate some exciting and truly innovative creative ideas from around the world.



AMIT PITARU

Sonic the sculptor

SonicWireSculptor is a novel 3D drawing tool and a unique musical instrument, but perhaps most important - it's just fun to play with. It is an audio-visual tool which combines the input of a drawing programme with a sonic composition programme. Users input data via a 'pen' to draw a visual representation of sound, with pressure (line width on the drawing) controlling volume. Pitch is defined as intervals on the vertical axis of the screen, while the horizontal axis represents time intervals.

www.pitaru.com/sws



TOKYO INSTITUTE OF TECHNOLOGY

Two worlds collide

A group of students at Tokyo Institute of Technology have created Kobito: Virtual Brownies, which allows us to 'interact' with virtual creatures called kobitos. The system, developed using computer vision, artificial intelligence and haptic feedback technologies, consists of a movable display device called the 'kobito window' that blends video images and virtual 3D depictions of kobitos. The goal is to make the virtual creatures exist in the real, physical world, with the real objects functioning as a kind of 'haptic interface'. Beyond entertainment, this technology could be very useful in other areas of daily life such as healthcare.

rogiken.org/vr/english.html

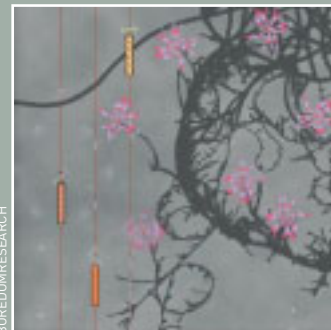


BRIAN KNEP

Take to the floor

Brian Knep, an artist whose works explore physical and spiritual relationships, has created a series of interactive floor pieces (known as the Healing Series) that react to visitors' behaviours and try to encourage interaction. When a piece encounters an object, such as a gallery visitor, its pattern is 'repelled', creating a 'wound'. When the foreign body leaves, the pattern 'heals' itself. Visitors can stop to dance, lie down, or roll on the pieces, watching the pattern react.

www.blep.com



BOREDOMRESEARCH

Life's a glass

Ornamental Bug Garden 001 is the first in a series of digital self-contained 'wall hangings' built by boredomresearch. Behind a plane of glass hanging on a wall is a living, breathing colony of digital bugs and other components, such as branches, generated using algorithms. As the elements catapult around the ornamental bug garden, they collide with each other to create a symphony of sound. The installation is a closed ecosystem so, in addition to considering the shape, colour and form of the elements used within the garden, boredomresearch had to consider their effect on the overall ecology of the system.

www.boredomresearch.net



LUKE HOVERMAN

Can business sustain life?

Collaborative artists Doug Easterly and Matt Kenyon have created Spore 1.1, a self-sustaining system which submits a standard rubber plant to the success or failure of the North American DIY store where it was bought. Through a series of computing techniques and mechanics, the fluctuations of the shop's stock price on the internet alters the supply of water to the plant, so that a drop in stock price means the plant is not watered. If it dies, the shop has to honour its guarantee to

replace any plant they sell for up to one year from the purchase date. The system explores the contrast of local consumer freedom (return policies) with the wider control of giant and multinational organisations (the stock exchange). The next iteration, Spore 2.0, will use wireless internet signals to encourage slime mould growth in urban settings.

swamp.nu/work/spore/spore.html

Getting reflective

Mirror Space is an interactive installation by Brigitta Zics in collaboration with Jörg Lindenmaier, Jeroma Thoma and the Academy of Media Arts in Cologne, which projects a personalised image onto a large mirror-like screen. Position and movement data from the visitor is collected and combined with data collected simultaneously from the internet. The resultant generated image behaves like the physical presence of a real mirror-image:

it changes its position, dimensions and features according to the movement of the viewer. The reflections of individual visitors on the screens also interact with each generated 'mirror-image'. The representation of a visitor is active and alterable as long as the visitor remains in the data-space of the installation.

www.zics.net/mirror_space



BRIGITTA ZICS

What is the purpose of science education in our schools? Is it to produce well-informed citizens equipped to have at least a basic understanding of some of the big issues that face society, such as global warming and genetic engineering? Or is to turn out the next generation of scientists, engineers and technicians?

Science in schools: catering for all

The answer is, most people would agree, 'both'. Indeed the two aims are not mutually exclusive: tomorrow's scientists and technologists will also be citizens who need to have a broad knowledge of a range of topics. So the question then arises: is science taught in a way that achieves these twin goals?

The way in which science is taught, particularly at GCSE, has been debated extensively over recent years, with some educators unhappy that the present system does not sufficiently cater for children who have no particular interest in pursuing science beyond 16, and others concerned that courses provide too little stimulation for students with a deep interest in and aptitude for science.

“THERE IS GROWING EVIDENCE THAT MANY STUDENTS LEAVE SCIENCE EDUCATION AT 16 FEELING THAT THE CURRICULUM HAS DONE VERY LITTLE FOR THEM”

One result of this debate is that, from September 2006, science at GCSE is to be radically overhauled in an attempt to provide an appropriate science education for all students.

The new model is based upon an innovative syllabus called Twenty First Century Science, developed jointly by the Nuffield Curriculum Centre and the Science Education Group at the University of York.

Jenifer Burden is a co-director of Twenty First Century Science: “Only a minority of students will go on to be future scientists, and there is growing evidence that many students leave science education at 16 feeling that the curriculum has done very little for them,” she says. “The needs of future scientists and non-scientists are of equal importance, but neither group of students is being particularly well served by the current system.”

Professor Robin Millar, of the University of York, is another of the course's co-directors.

“Over the years we have broadened the clientele as we have moved towards science education for all, but I do not think that anyone has seriously taken on board the changes in the curriculum that are needed to make it work,” he says. “Twenty-five years ago, there were O-levels designed for the most academic 25% of pupils. Structurally the curriculum has remained the same, with the same aspiration to teach pure science ideas for their own sake. It is difficult to motivate a large proportion of the population with that approach and I do not think anyone would claim that the basic understanding of science in the broad population is as good as we would wish.”

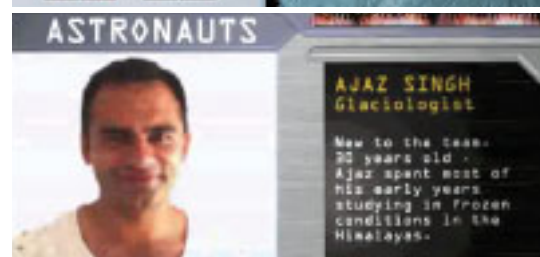
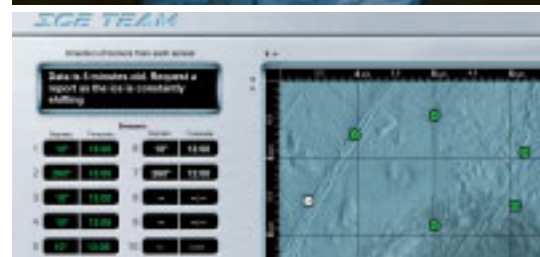
The key innovation of Twenty First Century Science is to separate the curriculum into two distinct parts. Half the time is spent studying core topics aimed at improving students' 'scientific literacy'. “What we mean by this is the science that someone needs to know in order to participate effectively as a citizen - a bigger idea of science and its role in society rather than a series of disconnected facts,” says Burden. “For example, we want students to understand the ideas of increased risk and to be able to distinguish between correlation and cause.”

For the other half of their science curriculum, students are able to select from a range of courses, with more academically demanding study, for those who want to pursue science beyond 16, for example.

“THERE IS NO LOGIC IN TEACHING SCIENCE IN ANOTHER WAY UP TO 14, THEN CHANGING”

This new course has been successfully evaluated in 78 schools across England and Wales, the outcome being that, in the summer of 2005, more than 6,000 students were awarded GCSEs. “We were extremely pleased with the results, as were the schools,” Burden says.

Given that young people begin to learn about science several years before the GCSE course starts, consultations are underway to ascertain if a similar model should be introduced earlier



in the education process to address the range of younger students' needs and aspirations in science. “The Qualifications and Curriculum Authority has started to consult on a new curriculum for Key Stage 3 - that is 11-14 year-olds - with a view to introducing a new curriculum in 2008,” says Burden.

Millar says, “Clearly if our model works at 15 and 16 there is no logic in teaching in another way up to 14, then changing. However, in the real world of policy you get opportunities to work on an idea in a particular niche. We have established the feasibility of this model at GCSE level, and we would quite like to explore similar approaches at Key Stage 3, to make the curriculum more flexible.”

For Mark Ellse, Principal of the independent Chase Academy in Cannock, the main issue that science education is failing to address is maintaining and nurturing the interest of the would-be scientist.

Ellse, an A-level physics chief examiner and author of several science text books, believes that the real area for concern is the supply of future scientists and technicians. Many children are turned off science, Ellse says, by being exposed to complex ideas too early in their education.

"There seems to be this idea that you have to teach children about science from the age of zero to make them interested," Ellse says. "From the age of 5 or 6, children are being subjected to a drip-feed of science that is not well taught and is taught very slowly and, by the time that GCSE comes around, all of their enthusiasm, which my generation had, has been drained out of them.

"One of the biggest problems is that pupils are taught science before they can understand it so they get the idea that it is 'OK' not to understand it. For instance, children are first introduced to electrical circuits in the infant school - before many of them can read! - then in junior school and yet again in the first years of secondary school. At GCSE, when they finally have the intellectual skills to understand electricity, they study electricity for a fourth time, but by then the appetite for deep understanding has gone."

"ONE OF THE BIGGEST PROBLEMS IS THAT PUPILS ARE TAUGHT SCIENCE BEFORE THEY CAN UNDERSTAND IT"

Ellse also suggests that science education suffers from too much political interference. "The effects of science education are long-term and do not fit into four-year election cycles," he says. "It is essential that education stops being a political football. You won't get good science teaching from the ideas of whoever happens to be the Minister for Education at the time."

More radically, Ellse would like to see a kind of Darwinian evolution of science teaching within schools, with individual schools free to try their own ideas. "Different schools should be able to try different things to see what works and what does not. You would have to accept that some will work better than others. For instance, there will be places where primary school science is done very effectively by enthusiasts and is allowed to continue, and others where it is ineffective and should be allowed to die. Would that matter? I am delighted by the fact that I did not do science until I was 11. What is really essential is to have diversity in the system."

Clearly Ellse's thoughts are radical and provocative, and it seems unlikely that it would be acceptable to large swathes of the population to have primary schools in which science is not taught. Nevertheless, his comments demonstrate that the issue of science education is not straightforward. Time will tell as to whether or not the new initiative of the Twenty First Century Science succeeds in its dual aim of producing a scientifically literate population as well as scientists and technologists of the future.

Talk into action Innovations in science education

Across the country bold initiatives are being developed to make science more accessible, more relevant and more fun for pupils...

Planet Jemma

This is an initiative aimed at getting girls aged between 11 and 16 interested in physics. It is in effect a web-based interactive mini-soap, featuring physics undergraduate Jemma undergoing the trials and tribulations of any normal young woman, but against a backdrop of learning about physics. The project is deliberately not directly linked to the school science curriculum, with the intention that it is inspirational rather than purely educational.

www.planetjemma.com

Science Upd8

This is a unique online resource that caters for a hitherto un-met need for topical, relevant science that is presented in a way that teachers can download and use in lessons. Topicality is the key. The latest breakthroughs and science behind the news are rapidly translated into easy-to-use, inspiring activities.

www.upd8.org.uk

At-Bristol

At-Bristol works with a number of educational initiatives including ARKive, a Wildscreen charity initiative described as a 'Noah's Ark for the 21st Century'. ARKive's aim is to gather and conserve sounds and images (including profiles, photographs, movies and scientifically authenticated fact-files) for posterity before they - like the species they depict - are lost forever. There are also specific educational resources for teachers and pupils.

www.arkive.org

Another of At-Bristol's initiatives is Citizen Science. Focusing on topical issues relating to biomedical science that affect society, the project 'creates opportunities for students to engage in informed debate and give teachers support in using new debate formats in the classroom'. More than 30 events are staged nationwide each year.

www.at-bristol.org.uk

Sodarace

Sodarace is a remarkable online competition in which participants design two-dimensional geometric robots that race each other over a variety of terrains. Machines can resemble anything from pointy-legged crabs, to crazy, distorting Ferris wheels. The project, a joint enterprise between Queen Mary, University of London and the creative technology company Soda, has a strong educational element, providing a range of resources for schools and universities.

sodarace.net

FREE download to learn about engineering

Racing Academy is a massively multiplayer car racing and vehicle engineering simulation which allows students to engineer and race realistic virtual models of cars. Developed by Lateral Visions, with support from Futurelab, the prototype is aimed at older teenagers but there is scope for it to become a multi-generational learning environment. It is now available as a free download from the Futurelab website.



www.futurelab.org.uk/download/projects/racing_academy.php

“The speaker, and the schoolmaster, and the third grown person present, all backed a little, and swept with their eyes the inclined plane of little vessels then and there arranged in order, ready to have imperial gallons of facts poured into them until they were full to the brim.” Charles Dickens, *Hard Times*

Let's get personal

Most of us would like to think we've come a long way from the kinds of educational practices satirised by Dickens 150 years ago, which leave no scope at all for children's creativity, imagination or interests.

Yet the journey from an education system that views children as empty vessels waiting to be filled with facts to one that acknowledges children's individuality has been a bumpy one: progressive educational trends have often been followed by a resounding backlash. Today, however, the thinking of Government and leading educationalists is dominated by what may turn out to be a truly radical idea: personalised learning.

Ask six people what personalised learning means and you'll get six different answers. Despite its name, it is not about making greater use of individual learning - personalised learning often takes place in groups. Neither is it exclusively about adapting teaching methods to the learning styles of different pupils, though it can have an element of that. The Department for Education and Skills (DfES) describes it as “the drive to tailor education to individual need, interest and aptitude so as to fulfil every young person's potential.” In other words, it is about making education more learner-centred.

ASK SIX PEOPLE WHAT PERSONALISED LEARNING MEANS AND YOU'LL GET SIX DIFFERENT ANSWERS

From the Government's point of view, personalised education is part of a wider strategy to give people a greater say in public services, responding to what they want and need rather than what institutions think they should have. In education, that means acknowledging that everyone is different: that pupils and students have different aptitudes, interests and ambitions. As Matthew Horne, of the DfES's Strategy Unit, puts it: “Children have a variety of different starting points, and the one-size-fits-all approach to teaching doesn't work.”

According to Horne, the idea of personalised education owes much to academic research on metacognition, also known as ‘learning how to learn’. What teachers need to be able to do is help children understand how they learn so that they can have greater control over their own learning. “There is very good empirical evidence,” says Horne, “that if you improve the learning skills of individual children then they progress more effectively and successfully and their attainment will improve.”

“YOU'VE GOT TO MOTIVATE CHILDREN, AND IF YOU WANT THEM TO LEARN YOU'VE GOT TO ENGAGE WITH THEIR MINDS”

But why has the idea of personalised learning come to the forefront now? Professor Andrew Pollard, Director of the ESRC-funded Teaching and Learning Research Programme (TLRP), suggests that it can be seen as a continuation of a process by which central Government has taken greater control over what happens in the classroom: “Having introduced a National Curriculum inspection, assessment and teaching strategies over some years, standards have now stalled a bit, and so a new strategy had to be thought about.” Pollard welcomes the direction the Government is now taking: “You've got to motivate children, and if you want them to learn you've got to engage with their minds. In principle then, the direction is absolutely right.”

The DfES lists five areas where a student-centred approach can be taken: assessment, teaching and learning, curriculum choice, school organisation and out-of-school partnerships. Instead of summative assessment, which simply records how well or badly a student has done, assessment becomes formative, enabling students and their teachers to identify areas of strength and weakness in order to improve their learning.

ICT has a central role to play in delivering a more personalised approach. It enables greater





collaboration both in the classroom and outside it: for example, through the internet or video-conferencing, the student who has a specialised interest can more easily make contact with experts or other students with a similar interest. Children can, if they prefer, work in groups or in pairs, or use discussion boards to comment on each others' work. If they want to continue internet-based research at home, they can. At the same time, technology offers greater opportunities for formative assessment, making it easier, for example, for students to carry a personalised record of their achievement in the form of an e-portfolio.

One of the concerns Pollard has is that the DfES strategy may, despite the stated intentions, remain too focused on teaching and not enough on learning: "It seems to have more to do with how you organise the classroom, how you present a curriculum, how you assess and how you relate to the children. Whilst it's obviously appropriate for teachers to consider such things, that's not quite the same as encouraging them to focus on how children construct knowledge in their minds."

Pollard's observations point to a potential paradox at the heart of personalisation, which is whether you can centrally impose a more devolved and democratic approach to learning. It is at least arguable that a learner-centred approach is at odds with the requirements of National Curriculum Standard Attainment Tests (SATs).

SCHOOLS ARE "LEARNER-HOSTILE" INSTITUTIONS THAT ARTIFICIALLY GROUP CHILDREN INTO FIXED AGE GROUPS AND FORCE THEM INTO TAKING PART

Horne's response to this is that the National Curriculum represents a core body of knowledge to which all children are 'entitled', and that SATs remain an important form of public accountability rather than qualifications that children achieve. Pollard thinks otherwise: "A National Curriculum is certainly a form of entitlement, but there also need to be sufficient opportunities for teachers to be responsive to specific learner needs. There is plenty of

research which shows how SATs constrain such responsiveness and distort the curriculum. To promote personalisation and to persist with SATs is deeply contradictory." There are bound to be tensions, he says, in trying to square that particular circle.

The Government would argue that personalisation is less about a top-down imposition, and more about learning from the good work that many teachers already do. Its aim, it says, is to make "the best practices universal". Yet Roland Meighan, Director of the small publisher Educational Heretics Press, author of a recent radical book 'Comparing Learning Systems' and founder of the Personalised Education Now trust, argues that the Government's approach to personalisation is deeply conservative and based on an outdated view of how children learn. Meighan believes that schools are "learner-hostile" institutions that artificially group children into fixed age groups and force them into taking part in a curriculum they are not necessarily interested in.

Before attending school, he argues, children are naturally curious and questioning, but after a year at school, that questioning drops dramatically: "In that first year children understand that their interests and concerns are being hijacked and forced into a mould of the teacher-directed curriculum." He maintains that "the 'day prison' approach to learning of mass coercive schooling is, in a democracy, (a) obsolete in an information-rich society, (b) counter-productive by producing the dumbed-down kind of person, and (c) an abuse of human rights." Meighan believes that a truly learner-centred approach would give children the freedom to follow their own interests, guided by what he calls "learner travel agents".

It is unlikely that the Government will adopt such a radical approach, though the experience of William Booth School in Nottingham (see opposite) suggests that, even within the confines of an ordinary state school, a strong degree of personalisation is possible. Ultimately, however, the success or failure of the personalisation initiative will hinge on the goodwill of teachers. As Pollard says, "Implementation comes down to individual teachers working with learners. When it gets to the classroom you rely on the skill and judgement of the teacher."

Personalisation: New report and charter

A report on personalised learning which draws upon a seminar series 'Beyond the Broadband Blackboard: Digital Technologies and Learner Voice' held by Futurelab, Demos, Becta and Toshiba between December 2004 and February 2005, has recently been published. It argues that the logic of education systems should be reversed so that it is the system that conforms to the learner, rather than the other way round. The essence of personalisation demands a system capable of offering bespoke support for each individual that recognises and builds upon their diverse strengths, interests, abilities and needs, in order to foster engaged and independent learners able to reach their full potential.



The report, which advocates the use of digital technologies in order to achieve this goal, contains a new 'Learner's Charter' which sets out a range of potential entitlements for young people in a personalised learning environment. Presented as a list of expectations to which learners should reasonably be entitled, this charter is intended as a stimulus for debate and a checklist for educators intending to develop a personalised learning environment.

The report, with the charter, is available to download free from the Futurelab website.

www.futurelab.org.uk/research/personalisation.htm

References

- DfES (2004). A National Conversation about Personalised Learning: www.standards.dfes.gov.uk/innovation-unit/personalisation
- TLRP (2005). Personalised Learning: www.tlrp.org/documents/personalised_learning.pdf

Talk into action

Room 13

Room 13, which arose from a residency by the artist Rob Fairley at Caol Primary School in Lochaber in the early 1990s, is an artists' studio, funded by the National Endowment for Science, Technology and the Arts (NESTA), and managed entirely by the children. Pupils drop into the studio whenever they feel like it; if they want, they can spend all day there, on condition that they also finish their classwork.

The children produce all kinds of art, including oil paintings, sculpture and photographs. "The visual artist is taking the individual child at the beginning of their own learning journey, instead of trying to get a whole class to move down one particular line or one particular objective," says Claire Gibb, artist-in-residence at Lochyside, another Lochaber school that has adopted the Room 13 idea.

Sometimes the children are commissioned to produce work, such as taking the school photograph or producing Christmas cards for businesses. These help them develop both their technical skills and their business skills. Gibb says that pupils have responded well to the freedom: "It's about trust really. They have to take responsibility for getting their work done - it's giving them the sort of freedom they'd have if they were a university student."



NESTA

William Booth Infants School, Nottingham

Andy Mattison, Head of William Booth, has thrown away much of the rule book as far as current educational orthodoxy goes. Literacy and numeracy hours have been abolished; attendance at assemblies is voluntary; there are no fixed playtimes and opportunities for outdoor learning are available every day.

The school carries Foundation Stage principles of learning through play into Key Stage 1. "The notion now," says Mattison, "is that after the summer holiday at the end of the Foundation Stage a magical thing happens - children stop being these imaginative, creative, physical learners and they're ready to sit down and do what the teacher tells them for six hours a day. Of course it doesn't work like that."

Mattison, who likes to be known as Andy to everyone at school, describes a typical morning: "Some children are in the hall at a voluntary assembly. Others will be in their rooms or in the corridor or outside doing a whole range of stuff - home corner, woodwork, construction, writing, maths. A few will be working with the teacher on a focused activity."



Children are encouraged to learn in ways that suit them: "One child will respond to the challenge, 'I've got these word cards here. You knew 10 last week, how many can you do this week?' Another child needs to learn just by immersing themselves in the whole world of books. If another child wants to lie on the floor to do their writing, because that's more comfortable, that's fine."

Mattison says that not only do the children learn more effectively, they're happier - which, he says, "is the most fundamental aim of all".

Personalisation: Making it real

Launched in the summer of 2005, Enquiring Minds is a three-year research and development programme to investigate how children can be effective in shaping their own learning. Funded by Microsoft and undertaken by Futurelab, the research aims to enable young people to take personal responsibility for their own learning by changing the emphasis from what they learn to how they learn. In practical terms, Enquiring Minds will develop activities and resources for both children and teachers to enable young people to act not simply as the recipients of knowledge, but as its creators.

For further information about this research project, go to www.futurelab.org.uk/research/enquiring_minds.htm.



Technology update

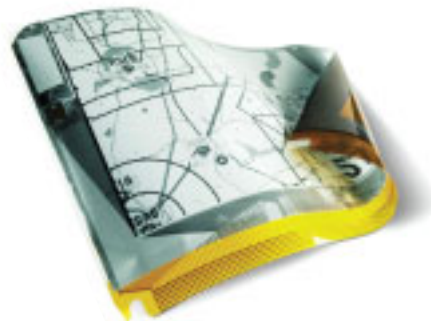
This section offers a 'round-up' of some of the exciting technologies that could make the leap from innovative novelties for pioneers to cornerstones of modern life for the masses. Could these technologies revolutionise our everyday lives? You decide...

First 'rollable display' PDA

Philips Polymer Vision has revealed a new kind of PDA with a 'rollable' screen, known as READIUS™. It is the world's first prototype of a functional electronic-document reader that can unroll its display to a scale larger than the device itself, providing paper-like viewing functionality. Not intended as ready-for-market product, the prototype is being used to demonstrate the 'fitness' of its rollable displays for use in the mobile devices of tomorrow.

READIUS is a trademark belonging to Koninklijke Philips Electronics.

www.polymervision.com



POLYMER VISION



NINTENDO

A 'Revolution'-ary controller

Nintendo is set to abandon the traditional two-handed controller and introduce a new freehand-style unit that is held with one hand for their up-and-coming console system, Revolution. The intuitive, pioneering interface

allows players to run, jump, spin, slide, shoot, steer, accelerate, bank, dive, kick, throw and score in a way not experienced before. When picked up and pointed at the screen, the controller gives lightning-quick interaction, sensing motion, depth, positioning and targeting dictated by movement of the controller itself. The controller also allows for a variety of expansions, including a 'nunchuk'-style unit offering the enhanced game-play control hardcore gamers demand.

www.nintendo.com



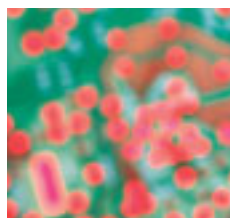
STEVE WARSCHNER

Look out - it's behind you

Researchers from Stanford and Cornell Universities have developed a camera that can see the reverse of objects, by analysing the ways projected patterns of light bounce off them. The system consists of a digital camera and digital projector. The projector beams

a series of black and white pixels at a scene and the camera captures the way the light bounces off objects in the scene. It works because the properties of a ray of light are unchanged when the ray is reversed, a characteristic known as Helmholtz reciprocity. The most immediate application for the camera is in relighting movie scenes, although it could eventually find use in medical imaging as well.

www.graphics.stanford.edu/papers/dual_photography/



Quantum leap in computers

Scientists at the University of Manchester have made a major breakthrough which could pave the way for a new type of high-speed, or quantum, computer. If built, they would be the most powerful computers ever made - with speeds, for some calculations, millions of times faster than the average PC. The research team has for the first time demonstrated how 'qubit rings', pieces of quantum information, can be linked together which opens up the possibility of being able to create 'quantum gates' - a more advanced version of the processors found in modern computers.

www.manchester.ac.uk/aboutus/news/pressreleases/quantumcomputers/



FOGSCREEN

Mist-erious new projection system

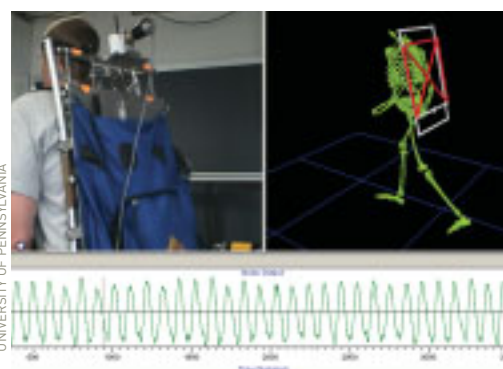
The FogScreen is an invention from Fogscreen Inc in Finland which allows projection of high quality images in the air by a walk-through projection screen. With an interactive add-on you can also use the air as an interface to operate computers by touching only the air with your bare hands. The screen is created by using a suspended fog-generating device, so no frame is required and the viewer can walk through the screen directly into the images. The fog used is dry, so it doesn't make you wet even if you stay under the device for a long time, and it is made of ordinary water with no chemicals whatsoever.

www.fogscreen.com

The new power generation

Scientists at the University of Pennsylvania have invented a backpack that converts the motion of walking into power that could be used to run mobile phones and other devices without having to carry replacement batteries. The Suspended-load Backpack converts mechanical energy into electricity. It is based on a rigid frame pack but, rather than being rigidly attached to the frame, the sack carrying the load is suspended from the frame by vertically oriented springs. It is the vertical movement of the backpack contents that provides the mechanical energy to drive a small generator mounted on the frame. Contrary to what might be expected, wearing the backpack does not use up much more metabolic energy than walking while wearing a conventional backpack of the same weight.

www.upenn.edu/pennnews/article.php?id=841



UNIVERSITY OF PENNSYLVANIA

Can ICT really help children in the pre-school environment? It's so often a given that computers are 'good' and 'educational' that it's sometimes worth standing back to challenge this assumption.



Tots, toddlers and technology



There's at least some evidence that, in the semi-formal educational environment of the nursery or reception class, ICT is failing to deliver. Dr Lydia Plowman from the Institute of Education at Stirling University, who studies young children's use of technology and its impact in the pre-school environment, agrees: "The focus on computers is misplaced to the extent that the classic desktop is poorly designed for the nursery or reception class environment - it's designed for adults, for individual use and for use in a work context. It's also designed for static use. And while there's been great improvement in the software and how it's designed, generally using it is not a stimulating enough experience for the child - it can be boring, even. Young children should be able to learn through play, with technology as well as without it.

"It's a challenge to see how this could be more fun than the sandpit or water play unless there's greater encouragement for helpers and nursery nurses to be more active guides and participants in the experience."

"THE CLASSIC DESKTOP IS POORLY DESIGNED FOR THE NURSERY OR RECEPTION CLASS ENVIRONMENT"

Part of the problem is that adults in nurseries sometimes suffer from a lack of training and motivation to fully exploit the ICT available. The result: by sticking to a rigid concept of what technology is, its tangible and haptic (tactile) appeal never gets invoked. Plowman adds: "Pre-school practitioners tend to assume that 'ICT equals computers' and don't tend to question that assumption. This is understandable as they still do not receive sufficient professional development opportunities in the area of ICT. This focus on computers can be limiting, and our research suggests that a better way to bring ICT to the

pre-school environment is to broaden the definition to include a range of not just everyday electronic devices such as mobile phones and digital cameras, but smart toys, DVD players, toy mobiles and scanners. This could help to make it less 'alien' for practitioners and so boost their confidence."

However there are examples where practitioners are using ICT in new ways. Donnington St Matthew's Church of England Aided Primary School and Nursery Centre in Telford, Shropshire recently won the Naace quality 'kitemark' for its ICT work. There is a separate nursery facility on campus that caters for both family learning and pre-schoolers (3 and 4 year-olds), where staff encourage use of a range of digital tools and devices including an electronic microscope, and digital, still and video cameras as well as PCs. The nursery also uses interactive whiteboard technology and has broadband access to the internet.

For head teacher Glenn Calcutt, technology is a real help in enhancing and extending the nursery learning experience at the site. "The sooner children get exposed to ICT the better as it not only familiarises them with computers and other technologies, but also helps to spot a natural aptitude or interest in working with ICT. This goes beyond the basic benefit of familiarisation; we do want children from an early age to be comfortable with ICT, but we also want to integrate and embed technology into the educational experience."

Another nursery that seems to have avoided the 'PC in the corner' issue and integrated digital technology into the learning experience is St Saviour's Nursery and Infant School in Bath, a 60-place facility that offers a staff-led, child-initiated learning mixture.

Ed Harker, one of its nursery practitioners, says he finds ICT invaluable, primarily as a means to track and record the children's

learning path: "We have found great success with using digital stills photography as a way to observe and record observations on children's progress in the form of individual digital learning diaries, which are all stored centrally on our main computer. Using this technology is a very efficient way for me, as the practitioner, to keep track of the child's progress as I can record what they're doing and keep engaged instead of breaking off to write paper notes. Also, the children love the immediacy of seeing themselves on the screen of the digital camera. It is much easier than describing it all in a report or transcribing their speech. We are now experimenting with MPEG4 files as a simple, portable solution as more information can be stored this way."

"WE NEED TO BROADEN THE DEFINITION OF ICT TO INCLUDE A RANGE OF NOT JUST EVERYDAY ELECTRONIC DEVICES SUCH AS MOBILE PHONES AND DIGITAL CAMERAS, BUT SMART TOYS, DVD PLAYERS, TOY MOBILES AND SCANNERS"

Broadening the definition of what ICT is and what it can do away from the stand-alone, albeit broadband-connected, PC seems to be a fruitful way forward, then. Certainly some of the work Harker is doing echoes the ideas of Penny Hay, an artist and educator now running the new Learning Centre in Bath who has extensively researched the topics of educational development and the use of ICT.

For her, "The best approach to children in the pre-school context using ICT has to be where it can act as documentation to make visible their progress. This is where the concept of the digital learning log could be very useful, with a concentration on mapping the child's learning journey. The more that the pedagogic and learning experience can be made visible and its impact made explicit, the better technology's benefit could be. We want computers to support children's curiosity, not compare their performance."

So research into ways to support child learning around many sorts of electronic devices seems to promise success. But have we answered our question? Does ICT in the pre-school context add value?

"ICT SHOULD BE SEEN AS JUST ANOTHER TOOL IN THE PEDAGOGICAL TOOLBOX"

"There is unquestionably a place for ICT in the pre-school environment; a very minimal motivation is that the child benefits from being exposed to something that is also likely to be at home and will definitely be in later school and workplace settings. But what we seek to teach children can't be limited to mechanical expertise - how to use a mouse etc - but something much richer. This is a fruitful area



for research and innovation to develop new technology teaching aids," says Plowman.

And in Harker's view, "Some children find computer games entrancing while others aren't that hooked. The point is flexibility - find what suits the individual child. ICT should be seen as just another tool in the pedagogical toolbox, surely and, in the same way that I couldn't manage without my pencils and clipboards these days, I don't want to give up my electronic devices."

For Dan Sutch, Learning Researcher at Futurelab, "We need to further develop devices that are appropriate to pre-school children: allowing them to access digital resources through movement, touch and speech; whilst walking outside or playing with friends. The resources we develop should prompt and provoke young children, let them gather and capture their experiences and stories, and enable them to share their experiences and understanding with adults and other children."

The answer to our question seems to be that pre-school ICT exposure can be beneficial, but that we need to be more creative in our use of it. Teaching staff can be helped by more support and encouragement to avoid the 'PC stuck in the corner' issue. Meanwhile, genuinely exciting research - like an innovative idea for a 'Magic Carpet' being developed at MIT where users launch and modify complex musical sounds and sequences as they wander about the carpet - suggests that we may have much more to teach ourselves and our children at this stage.



SIMON GREENWOLD



SIMON GREENWOLD

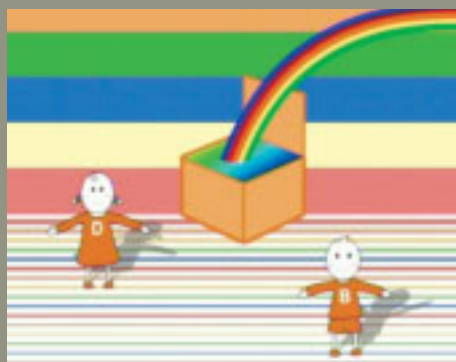
What parents want

"In my view as both a technology user and as a parent, giving children the opportunity to use computers at an early age is a good thing. Technology is part of our everyday lives at home, at work and at school - I want my children to be comfortable with it and proficient in its use as they are with other aspects of day-to-day life such as the telephone or even writing with a pencil."

Frances Fawcett, former Microsoft UK Marketing Manager

"I believe computers can be useful for both teaching and reinforcing a range of skills and concepts across a wide curriculum. It's also an advantage for the children to develop their keyboard and mouse skills etc at an early age so that they are able to quickly access the ICT curriculum when they move on to primary school. However, having said all this, I also think it's important that children have plenty of opportunities for hands-on experiences and more active play - which of course they do within the nursery. Interestingly, children like variety and it's rare that you have to encourage them to move from the computer to another activity. In my experience, it's something they do quite naturally at pre-school."

Susan Morgan, IT PR and Analyst Freelancer



Further reading

The team at the University of Stirling have produced a number of interesting articles on this topic. See 'Children, play and computers in pre-school education' (British Journal of Educational Technology 36) and 'A benign addition' - research on ICT and pre-school children (the Journal of Computer-Assisted Learning No 19), both by Dr Lydia Plowman and Dr Christine Stephen. Also relevant is 'Already at a disadvantage? ICT in the home and children's preparation for primary school', published by the British Educational Communications and Technology Agency (Becta), Coventry.

The Futurelab Literature Review in Learning with Tangible Technologies (O'Malley and Danae 2004) gives a comprehensive overview of new and emerging haptic technologies, appropriate projects and literature that is relevant to pre-school/early years learning. Go to www.futurelab.org.uk/research/lit_reviews.htm to order a hard copy, or to view or download the document for FREE.



Projects exploring innovative use of pre-school ICT

Two ESRC- (Economic and Social Research Council) funded projects at the University of Stirling looking into this area are 'Interplay' (www.ioe.stir.ac.uk/Interplay/index.htm), which identifies ways of enhancing young children's experiences with ICT through guided interaction with practitioners, and 'Entering E-Society' (www.ioe.stir.ac.uk/Research/e-Society/index.htm) which looks at exposure to ICT in the home context for the under-5s.

Futurelab is supporting three academic studentships to research the area of early years learning and digital technologies. Running from October 2005 to September 2008, these studentships are investigating the digital play ecology of young children (University of Stirling), the design and evaluation of tangible technologies (University of Nottingham) and screen-based technologies in family settings (University of Bristol). For further information, go to www.futurelab.org.uk/research/studentships.htm

NESTA (National Endowment for Science, Technology and the Arts), which works to improve the climate of creativity in the UK, supports an initiative known as 5x5x5 which enables artists, educators and cultural centres to work with children aged 3 to 6 to stimulate their creativity and innovation - see www.nesta.org.uk/ourawardees/profiles/3281

Other unique resources include the Futurelab-supported prototypes Moovl, which allows young children to create drawings that move and interact with each other, and the Skybluepink Interactive Box, which uses colours and shapes to bring foreign languages to life for children using an interactive magic box with animated characters. For further information on these and other innovative prototypes for learners of all ages, go to see www.futurelab.org.uk/showcase/show.htm

FREE posters

Futurelab has produced a set of four posters which demonstrate the ideas that came from their Innovations Workshops on:

- Pre-school learners
- Interactive TV
- Third generation phones (3G)
- Music learning, performance and appreciation

These posters are freely available to the education, ICT/technology and creative communities. If you would like copies, call Futurelab on 0117 915 8200 or e-mail innovations.workshops@futurelab.org.uk

Events

Association for Science Education (ASE) Annual Conference

5-7 January 2006

University of Reading, UK

www.ase.org.uk/htm/conferences/annual_conference_2006

Hands up if you think science education should be inspiring, stimulating, exciting... Hands up if you want to celebrate what you do in the classroom... At the ASE Annual Conference you can explore, debate and discover what is important to you with regards to science education.

BETT 2006

11-14 January 2006

Olympia, London, UK

www.bettshow.co.uk

BETT is widely accepted as the world's leading educational ICT event, with over 600 leading educational suppliers and over 27,000 visitors. Embedding ICT is at the heart of the Government's new five-year strategy for children and learning, and BETT 2006 is a must for those wishing to keep abreast of the issues and the products relating to ICT in education.

3G Mobile World Forum 2006

23-26 January 2006

Royal Park Hotel, Tokyo, Japan

www.3gmobileforum.com

This conference will gather together the world's leading 3G pioneers, strategists and regulators to showcase the future of third generation technologies and services. The latest developments in mobile technology will be discussed and future opportunities in 3.5G and 4G will be explored.

Learning Technologies 2006

25-26 January 2006

Olympia 2, London, UK

www.learningtechnologies.co.uk

Learning Technologies is a learning and skills exhibition and conference that covers every aspect of organisational learning and the technologies needed to successfully implement it. With over 100 exhibitors, the exhibition has become the focal point for workforce development and the supporting conference will once again feature over 30 of the industry's leading expert speakers.

Naace Annual Strategic Conference

28 February - 3 March 2006

The Riviera Centre, Torquay, UK

www.naace.org

For those involved in advancing education through the use of ICT, this event brings together colleagues from all over the UK and beyond, together with key players from the Government and industry, to provide a forum to share best practice and exchange ideas. You need to be a member or a sponsoring partner to qualify for a place.

Education Show

9-11 March 2006

NEC, Birmingham, UK

www.education-show.co.uk

The show will be addressing key issues in education across all subject areas, with a particular focus on core curriculum areas. It has been designed to provide all levels of teachers from all specialisms with a unique opportunity to review the widest selection of resources required to deliver better education, from pre-school through to 19.

CeBIT

9-15 March 2006

The Convention Center, Hannover, Germany

www.cebit.de

CeBIT is among the world's leading IT and telecoms trade fairs. In just one and a half decades, CeBIT has grown from its origins as part of HANNOVER MESSE to become the world's leading event for information technology, telecommunications, software and services.

Society for Information Technology and Teacher Education (SITE)

20-24 March 2006

The DoubleTree Hotel, Florida, USA

www.aace.org/conf/site

This conference covers a wide range of topics in various formats, allowing interaction among presenters and attendees and promoting the sharing of information technologies and teacher education expertise.

2006 Serious Games Summit (SGS)

20-21 March 2006

San Jose, USA

www.seriousgamessummit.com

Join the world's Serious Game developers to exchange ideas and advance the state of the art of games. The 2006 SGS will have tracks devoted to Serious Game Design, Assessment and Results, Business and Deals, Learning and Instructional Theory, Products Within Projects, and Behind the Game.

Lifelong Learning Conference 2006

13-16 June 2006

Rydges Capricorn International Resort, Queensland, Australia

lifelonglearning.cqu.edu.au/2006

Hosted by Central Queensland University, this conference brings together delegates from around the world to discuss, debate and progress the issues associated with lifelong learning. Several themes and issues have been identified - the relevance of generic skills, information literacy, social justice, and equity and access, to name a few.

The International Conference on e-Learning

22 June 2006

University of Quebec, Montreal, Canada

academic-conferences.org/icel/icel2006/icel06-home.htm

This conference brings together academic research and practical applications of e-learning from all areas. It provides a varied mix of participants and a unique focus, with real-life applications alongside academic research in e-learning related areas. At ICEL, an international group of academic, corporate, public sector, and educational communities will join together to exchange ideas and examples of best practice.

ED-MEDIA 2006

26-30 June 2006

Renaissance Orlando Resort at SeaWorld, Florida, USA

www.aace.org/conf/edmedia

The World Conference on Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA) is becoming a key event for those who play a role in learning communities, learning organisations and educational institutions, by bridging the worlds of practitioners, research, industry and leadership.

Wireless Networks and Emerging Technologies (WNET) 2006

3-5 July 2006

Banff, Canada

www.iasted.com/conferences/2006/Banff/wnet.htm

This conference aims to be a forum for international researchers and professionals to present their latest research, results and ideas in all areas of telecommunications systems, with emphasis on wireless and optical communications. Its aim is to strengthen relations between the telecommunications industry, research laboratories and universities.

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