Introduction

I want to thank Rachel Jones from Steljes for delivering the first BCSE annual lecture on 30th November 2007.

Rachel’s input and the response from Steve Moss, Partnerships for Schools was truly illuminating. This pamphlet is a record of this first BCSE lecture.

Learning technologies are changing as I write and it is individuals and organisations in our membership who are helping to make sense of a fast changing world. We can embrace change or reject it. Young people seem to embrace technology immediately and often without a manual. The role of educators has never been more significant; helping young people make the right choices.

Old certainties and old borders are dissolving fast and it is the work of companies like Steljes, Northgate Information Systems, RM and local education authorities like Wolverhampton that show us the power (to enthuse) for learning that technology really has.

Rachel Jones, Head of Education & Building Schools for the Future, Steljes

In her role as Head of Building Schools for the Future, Rachel is responsible for Steljes’ involvement in BSF projects, including developing strategies for how the company can anticipate and take the lead in designing the future classroom. She also manages the nationwide team of Educational Development Consultants.

Prior to working at Steljes Rachel was a secondary head teacher where she was responsible for leading her school out of special measures in only two terms. Rachel is passionate about transforming schools into strong learning centres in the heart of the community. She has a clear vision about how to use technology to support information sharing across children’s services and to make a real difference to young people’s engagement and achievement.

Her previous roles include working as an Inspector for Secondary School Effectiveness, providing management support to senior staff and focusing on school improvement. In her LA role she managed a team of consultants and advisers who provided targeted training and coaching to staff in schools. Rachel’s enthusiasm for new technologies and learning also saw her contributing extensively to the development of ICT within her LA as well as for new set-up primary schools. The pinnacle of this work was in the development of the Ingenium project, which was one of the ‘classroom of the future’ pilots for BSF.

We hope this discussion helps you in your work.

Ty Goddard
Director, BCSE
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Learning Technologies and Schools of the Future

Learning is changing – isn’t it?

In 2004, a US based market research corporation1 dubbed a newly identified group ‘Masters of the Youniverse’. The same young people are also variously referred to as Generation Y or the Net Generation. However described, these ‘digital natives’ are not only our current school population, they are the parents and teachers of the future. So what are the implications for the 21st century schools that we are designing today?

So far, much of the debate surrounding the Building Schools for the Future programme has focused on whether new schools are ‘fit for purpose’, a judgement largely made in terms of design and build quality. The title itself proposes that this is a major ‘Build’ programme, of which it is, though in fact only about half of England’s secondary schools may actually be rebuilt, with some 35% anticipating significant refurbishment and 15% minor works. The consistent change element within every BSF project is however the investment in teaching and learning technologies. No matter what level of service. BSF offers a robust delivery framework, including support through management and integration of public services. BSF offers a robust delivery framework, including support through professional managed service, which has the capacity to deliver this ambitious level of service.

Why are we spending so much on technologies?

Social changes

ICT is increasingly described as the fifth utility, the point being that we pretty much cannot live, work or learn efficiently or comfortably without an ICT infrastructure. National expectations of the social role of schools are also changing; hot-housed in climate of concern about youth disaffection and family breakdown. In response, the government publication Harnessing Technology sets out a sophisticated model of how technologies can fundamentally shift the process of state education, not just in terms of learning but in terms of locality management and integration of public services. BSF offers a robust delivery framework, including support through a professional managed service, which has the capacity to deliver this ambitious level of service.

Economic shift

The Teaching and Learning in 2020 Review Group’s report emphasises the need for schools to ‘personalise’ pupils’ learning to meet the demands of ‘a knowledge-based economy where it will be possible to compete with developing and global markets’. The OECD2 defines such a knowledge economy simply as ‘Know-what, Know-why, Know-how, Know-who’. This extends considerably beyond the dominance of ‘facts’ and ‘content’ to which we remain deeply culturally bound in the UK. How can schools possibly engage with such a wide-ranging portfolio of knowledge? The ‘empty vessel’ model is no longer sustainable, and adjustments to the National Curriculum are starting to take account of this. Developing young people’s capacity to ‘learn to learn’ and their skills in critical analysis are rapidly gaining priority status, and developing ICT capability is key to this.

Learner Expectations

Give a school pupil a new mobile phone and she won’t ask you for the manual to find out how it works. The Net Generation is habituated to a technologically rich, problem solving and lateral environment; many find the flat, linear environment of traditional ‘chalk and talk’ pedagogies stifling. While this does not advocate a free for all, permitting completely self-directed learning, it does beg a serious question as to how teaching and learning will be structured in the future.

Know-what, Know-why, Know-how, Know-who
Similarly Dan Buckley’s illuminating manual ‘Personalisation by Pieces’ presents two models, the P(upil) Route and the T(eacher) Route. The T route presents a model of conventional educational practice, made more efficient through the use of technologies. Buckley outlines how the core pedagogical model can either remain quite unchanged (T) or can be radically transformed (P) depending on how the educator / school chooses to use technologies.

Here a university student in the USA newly catches the mismatch experienced through mere transfer of existing practice (denuded of its in-class direct social interaction) to an online environment. The combined views of the international agency, a national educationalist and an individual learner tell us that introducing ICT without a clear rationale and agenda for change is likely to provide a poor return on investment at best and may even prove demoralising for educators and create frustration amongst learners.

The professor had assumed… that putting philosophy on the Web would give his students more flexibility to shape their own learning experience… Instead, my online course had turned learning into exactly what I despaired – a one-dimensional exercise in learning and regurgitating facts.

We web how many?

Web 2.0 has become a buzzword, with Web 3.0 hot on its heels. These second and third generations of internet capability are perhaps the most significant change agents impacting on the ‘Masters of the Youniverse’. Our first experience of the web was for most an encyclopaedia, whereas web 2.0 has transformed it from what was essentially a ‘read only’ medium to one where anyone can publish and post his own material and share content. This opens up a considerable challenge to the conventional educational model. Technology enables learners effectively to bypass the transmission mode of pedagogy which has often dominated practice in schools. Learners are instead able not just to find out information for themselves, but to join communities and discussions where facts, information and knowledge are challenged and tested.

Definitions of web 3.0 are still contested, but might include ‘read-write-do’. In 2001 Tim Berners-Lee and others were already defining the ‘Semantic Web’[8] in terms of metatagging content properties so that ‘semantic web agents’ can interpret relationships between our inputs, requests and actions. Tagged[8] ‘smart’ objects are within reach and rapidly coming on-stream. In the short term this means tailoring the functionality of a website or forum so it adapts to the community it supports. The pattern of user activity influences the interface or might generate an (automated) shift in content. Already we can expect user recognition responses to permeate everyday activity. For example on arrival at the airport, the ticket recognition system might not simply direct you to the correct gate, but prompt you via an instant message to purchase your favourite perfume. It may even point you to a particular store whose loyalty scheme you are in, and trigger walking directions using your mobile’s GPS. In such a context control over access to our personal data becomes highly significant. In an education context the ‘intelligent’ school becomes super-responsive to the individuals within it through position tracking and instant messaging as well as more familiar climate control and security management. In a learning context these developments present the opportunity to create responsive learner profiles within a Virtual Learning Environment. As a learner completes work at a particular standard satisfactorily, new tasks are automatically pushed towards her. When a learner defines a particular study interest for a specific time period, each day new content e.g. podcasts, weblinks or text files will pop up in her intray to stimulate thinking. She may be invited to join a community working on similar material or to join in an online interview with an expert in the field. The level of her activity will be logged and contribute to her grade in her e-portfolio.

Changing Pastimes, Changing Minds

Our fear of isolated young people, alone in front of their computers is far from the reality of this online environment which provides a gateway to communities and collaborators far and wide. For the first time in a generation a recent US study[9] has found that teenagers now typically watch less television than their parents. The authors venture, ‘teens embrace new content at a much faster pace than their parents, so we will naturally see a widening gap in the amount of television viewing time between the two groups.’

New technology is by its nature subjective. Most teenagers aren’t especially interested in technology per se, but have a voracious appetite for the activities that technology enables, for example the internet as an access tool, instant messaging as ‘talking’, multi-user games to compete and play and forums[10] as places where they can find ‘chum’ and tricks to enhance their playing skills. They have internalised what their parents may see as ‘new technologies, just as that generation had internalised the ‘new’ technologies of the touch-pad telephone, personal computers and CD’s. The key
difference is that the internalised ‘Yourniverse’ is virtual, much less focused on hardware, much more focused on the kinds of activities which digital technology and the internet can support. This internalisation is not simply social but, argues Susan Greenfield, induces a physical impact on synaptic connections, ‘brain-cell circuits configure in extent and power according to the particular modes of input they have...this forging of new connections, which has a direct basis in the connections between neurons, is surely the essence of learning’.

So during their formative years, young people are often engaging in a dynamic, interactive and reflective on-line environment, with rapid feedback and multiple interfaces. Within the virtual environment, the users are engaged in social activities and are often multitasking, encouraged by extensive resources, which in turn they ‘mash’ i.e. repurpose and redesign in ways not necessarily anticipated by the original programmers. They are attuned to an evolving infrastructure supporting collaboration, asynchronous threaded discussions, videoconferencing, and mobile devices with embedded GPS capabilities. Precksz’s echoes Baroness Greenfield’s opinion and maintains that, ‘as a result of the ubiquitous environment and the sheer volume of their interaction with it, many of today’s students think and process information fundamentally differently from their predecessors.’

They may be more visually literate, better able to express themselves through images than text. They may have very quick response times, having practised this extensively in gaming environments, but then may find extended concentration on a single task more challenging. Rapid responses in messaging and texting may also lead to the prioritisation of speed over accuracy. They may be able to shift their attention rapidly from one task to another, but their attention may wander quickly from things that interest them less. Gaming environments together with developments in internet usage during their lifetimes may also encourage an exploratory learning style, one which is predisposed to learning by doing. Embedding learning which is found out for oneself, rather than using the discrete tool, is less easy. However, networking and instant messaging might promote social interaction and teamwork rather than individual activity. Peer evaluation and moderation is also a very powerful part of the experience – young people may value the appreciation and validation of their peers over (external) educators.

As the list continues, the potential impacts on classroom management as well as on current pedagogical practice become illuminating. In a more fragmented and less deferential society, the bug question for state educators may not be whether models of teaching ought to adapt to the changing demands of modern learners. Rather it may be how long schools can continue to be manageable if learning, teaching and assessment models do not adapt to this rearing of young people’s minds.

Discussions on the digital divide tend to be concerned with the access to broadband connectivity. However, if scientists are right and cognitive processes are influenced by regular creative engagement in the online environment, our schools need to address the quality of online provision they make. An aspect of tackling the digital divide will be to ensure that all young people gain access to and guidance on the use of more sophisticated tools.

The Office for National Statistics reports that 98% of young people in the UK used the internet in 2003/4, but this study dissects an uneven pattern of access and use. We need to be specifically interested in how young people are making use of the internet and related technologies. Digital exclusion is highly correlated with social exclusion which in turn is highly correlated with educational underperformance. Access is clearly the baseline issue, but regularity and particularly the quality of use is an increasing focus, and it’s not as simple as defining the ‘have / have nots.’

Socio-economic factors, age and gender influence the quality of internet use with the predictable picture emerging that better off children and those with more attentive and educated parents are more likely to be creatively engaged.

Developing highly interactive and creative media in virtual learning environments (VLEs) must therefore be high priority, as must avoidance of the trap of developing an attractive looking virtual teaching environment, which may be little more than a portal to an online repository for task-based linear exercises and random ‘objects’. Personalisation means much more than applying a choice of ‘skin’ from a menu, which is really only the equivalent of covering your exercise book in your choice of wrapping paper.

Conventionally, VLEs / learning management systems / platforms have tried to mimic the classroom experience in an online space, with students able to access and submit tasks. In a web 2.0 enhanced environment the student becomes the ringmaster, is the centre of attention, selecting his own tools, managing his own performance, which is shared with a select audience, who provide feedback and, if all goes well, applause. In this scenario, we move closer to a Personalised Learning Environment, which Lubensky summarizes as ‘a facility for an individual to access, aggregate, configure and manipulate digital artifacts of their ongoing learning experiences’.

What does this mean for schools?

Virtual Learning Environments and Web 2.0

BECTA: ‘an intermediate target for 2008 is that all learners should have access to a personalised online learning space with the potential to support e-portfolios’

BECTA’s learning platforms framework lists 10 suppliers.

October 2007, googling produces 32 million results for VLEs

Web 2.0 tools
- podcasts
- animations
- RSS feeds
- videos
- photos
- wikis
- mashups
- tagging
- blogs
- social networks
- wikis
- tagging
- social networks

Use of web 2.0 tools in education is still at an early adoption phase, not least because many tools are not entirely robust, there are legitimate concerns over e-safety and few teachers can use them confidently yet. However, future-proofing requires consideration of how web 2.0 tools might be incorporated into a V/PLE over time.

What does this mean for schools
The new reality is that the public-education system is no longer the only, or the paramount, place where we go to learn.’ (Daly) Within the state education system in the UK, this is an increasingly accepted reality, particularly in the 14-19 age range where students may be registered at a school, but attend a local college or workplace (or both) for part of the week. The range of learning involved in the new specialised diplomas to be launched in September 2008 will present even greater demands for multi-located learning. Put this alongside the requirement for all secondary pupils to have access to a VLE by 2008, and the shifting pattern of learning becomes clearer. The VLE and ultra portable devices will provide much of the adhesion in multi-located learning.

MOBILE LEARNING When Three is Not A Crowd

As their handheld computer screens simultaneously flash up “correct,” Josh, Aaron and Jack let out a cheer. They have just worked out why Tenby in South Wales has a wall around it. Shortly afterwards, Gevin Hawkins, assistant head at Stowheath junior school in Wolverhampton, clicks on his own personal digital assistant (PDA) and brings everyone to a halt, despite their protests. “On my PDA I’m getting all the answers,” he says. “Every group is getting question five wrong at least once.”

As the class lift their heads to focus on the board - remarkably, there has been no reaction to the boys’ cheers as they are all too engrossed in their own learning - the screen from Jordan’s machine comes up for all to see. At the top is the question, “Tenby is famous for being a medieval walled town. Why do you think it was important to build a wall around the town?” and then the five possible answers.

The Eduinnova software (which originated at the Catholic University of Chile, Santiago) they are using has been designed to promote discussion, so the answers are in a different order on each device in their working groups of three. Pupils can’t simply say “The top one” or “B” but have to quote the whole text.

What next, Immersive Learning?

Not yet readily available, this could be one of the next steps. Think of multi-user games environments. Think of the augmented reality that can already be experienced through prompts on the mobile device, combined with some of the psycho-sensory stimulation experienced in an IMAX cinematic environment. Think Second Life. The potential of virtual simulations to augment and stimulate learning and response is significant. At one level it could enable learners to influence the design of content, pedagogy, and assessment based on their individual preferences and needs. At another level it could lead to the development of ‘Cave Automated Virtual Environments. A CAVE is a 3D visual computing environment that recreates space and allows the educator or researcher to interact and visualize complex shapes in an interactive 3D environment. It is a multi-person, room-sized, high-resolution 3D video and audio environment’. Currently used in research on genomics, the potential of this type of combined physical / virtual space to provide multi-sensory immersed learning experiences opens the door to types of learning and content which stretch our current imagination.

Learning is changing, isn’t it?

The million dollar question is of course the impact all of this might have on learning and standards. Will the nation see a good return on its investment? Has an overemphasis on hardware and content at times obscured the need to develop a deeper understanding of the pedagogical shifts implied by technologies? BECTA comments that a ‘key concern is the extent to which teachers fail to appreciate that learning and teaching through technology requires a new approach to pedagogy, to planning and preparation, and to how the curriculum is perceived’.” The challenge within this, is that there is no ‘quick fix’ for our schools or teachers. The table opposite indicates the extent of change that teachers and learners may find themselves grappling with.
<table>
<thead>
<tr>
<th>20th Century Pedagogy</th>
<th>21st Century ICT-enhanced Pedagogy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Schemes of work are supplied by the Head of Department. Hard copy lesson plans are prepared by individual teachers.</td>
<td>Schemes and lesson plans are maintained online; iterative practice permits these to be collectively improved. Teachers work collaboratively to share resources, locally and at a distance.</td>
</tr>
<tr>
<td>The teacher chooses and provides sources and resources.</td>
<td>The teacher recommends good quality resources for students to investigate and encourages critical analysis of additional resources provided by students.</td>
</tr>
<tr>
<td>Examples are taken from textbooks, fixed at date of publication.</td>
<td>Live real-world examples are watched, listened to or read.</td>
</tr>
<tr>
<td>The teacher defines and controls the learning environment.</td>
<td>The teacher enables students to access various learning environments, physical and online, both in and out of school. Learners personalise their user spaces.</td>
</tr>
<tr>
<td>Teacher-created and supervised work dominates.</td>
<td>Teacher-guided and pupil initiated work is balanced. Autonomous group work features strongly and is self-regulating, though guided by the teacher.</td>
</tr>
<tr>
<td>Individual work at a single desk dominates.</td>
<td>Collaborative work dominates. Students use handheld devices to work in small groups, with thumbnail images on the Smartboard providing an overview. The teacher can pause the lesson and devices to discuss learners’ work.</td>
</tr>
<tr>
<td>Linear, textual and verbal approaches dominate learning.</td>
<td>Hyperlinked, interactive, visual and aural approaches dominate learning.</td>
</tr>
<tr>
<td>The classroom and the teacher are the prime focus of learning.</td>
<td>The real world, peers, teachers and other adults are the prime focus of learning. Collaboration takes place locally, nationally and globally.</td>
</tr>
<tr>
<td>A ‘chalk and talk’ delivery model is often used.</td>
<td>Teaching is predominantly interactive, involving the learners actively and creatively, with both learners and teachers using a range of presentation tools. Presentations [and commentary] on the Smartboard are recorded and uploaded to the VLE for revision purposes or for access by absent learners.</td>
</tr>
<tr>
<td>Classroom time is mainly used for individual quiet work rather than discussion and dialogue.</td>
<td>Classroom time is usually used for discussion and dialogue. Individual quiet work is done in a quiet zone, which may be outside the main classroom.</td>
</tr>
</tbody>
</table>

Teachers are expected to know answers to pupils’ questions → Pupils do not necessarily expect teachers to know the answers to their questions. They expect help to frame the right questions, help to develop skills to find answers and help to judge the reliability of content themselves.

Learners record their work in exercise books. These are usually private. Work may occasionally be shared with a neighbour. → Learners select the medium which most effectively conveys the content and analysis they are working on. They create text, presentation, audio and video files with embedded objects and hyperlinks. They present their work on the Smartboard and critique each.

Exercise books are dispersed between the learner’s bag, home and school, even the teacher’s home! → Learners maintain a personal work space in the virtual learning environment (VLE) which can be accessed by the learner, teachers and parents. Attendance, assessment and performance data is accessible via the VLE.

Learners are issued text books at the start of the year. In some subjects there is a class set which can only be used in school. → Learners access content via handheld or desktop computers. They use e-books which they can annotate. They access international archives. New tasks and information are pushed into their VLE workspace via RSS feeds according to their progress and areas of study.

Homework tasks are individual. They are mainly written and recorded in exercise books. → Learners can collaborate over homework tasks. They use Skype, webcams or shared online user space to discuss and adapt their work. They use visualisers to show handwritten or practical tasks online. The VLE is accessible from home, school, the youth centre and the local library.

Work is marked and commented on some time after it is done. Feedback and formative assessment are available immediately as part of the work process. Handheld assessment devices enable the teacher to adapt the lesson according to pupils’ feedback while the class progresses. → Much work can be marked electronically. Teacher-marking is focused on moderating self-assessment and peer assessment. The teacher spends more time providing personal feedback and guidance to the learner.

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Teachers increasingly expect ‘hands-on’ practice and may well be as resistant to be lectured as many students. Practice or work based learning models supported by visiting consultants, e-school champions, peer mentors, online communities and forums offer an updated and embedded approach to teacher professional development. Such models offer staff continuing support while also providing a ready resource in a ‘next steps’ approach to changing practice. To make the most of our technologies we need to have fantastic teachers who really understand their capabilities and have the creativity and imagination to inspire young minds. If we are looking for transformation we need to invest in those who will be leading it.

Changing learning, Changing Schools

So within the Youniverse learners are busy learning independently and collaboratively. They are developing user-led structures and communities to support this learning, which provide the ‘master’ to whom they apprentice themselves. The divergence of experience between social learning contexts and traditional ‘schooling’ is stark and is reawakening debates from the 1970s about the role of school in society and the value of learning outside formal school ‘institutions’. At the same time a national commitment to lifelong learning and expectations of community provision are raising expectations of the role of schools within the community. This pressure exerts itself in many ways, not only in how we see the role of the school building in supporting learning, but also in how schools redefine their pedagogies to take account of these 21st century challenges. To date much of the research on ICT impact in schools has focused on hardware and software utilization, and attempts to gauge how much effect this may have on pupil progress. What has been examined far less is the extent to which making use of these technologies impacts on the whole pedagogical process. BECTA found, there was much less systematic enquiry into the impact on the day-to-day teaching practice of teachers, the impact on the teacher-pupil relationship, or on the teacher-teacher relationship. The evidence is that these relationships cannot and will not remain as they have been. If learners have as much trust in external sources as the opinions of their teacher, that relationship starts to change. If learning means increasingly interacting with a range of media, and selecting one’s own tools and forms of expression, conventions of ‘instruction’ are challenged.

The convergence of thinking about the process and relationships of learning alongside technological advances and personal use prompts the concept of C-learning® which starts to summarise some of the opportunities that building 21st Century, ICT-enabled schools presents. A national commitment to lifelong learning places schools as a critical resource to the community, and new designs will need to accommodate this. So does this mean schools will need to be (even) bigger? With ‘anywhere’ learning a reality, does it not rather place the school as the hub of learning within a community? Given multi-located learning, and many-aged learners using school sites, will the notion of an intelligent school ‘knowing’ who is in it, rapidly become reality? Will learning become a continuum between locations, as the personalised learning environment travels alongside learners, linking their communities at home, at school and internationally?

The choice that we are starting to face is our level of commitment to making transformational changes through our adoption of these technologies. Once we grasp what we are technologically capable of providing educationally, we start to grapple with attitudes to the role of school. As we roll out BSF over the next decade we will undoubtedly explore big questions about how transforming education fits with broader social values.

C-Learning?

Community
The school is extended and shared with the community; learning is on and off-site, online and potentially global

Content
Leavers select and repurpose resources to support and extend their learning

Creativity
Learners and educators select media and tools appropriate to the task. They select visual and audio images to amplify points.

Collaboration
Learners access, share, develop, display and demonstrate their work within the school and into the community

Critique
Critical analysis of one’s own and others’ work is a key learning strategy. Critical analysis of online content is a core skill.

Connectivity
Mobile technologies are used in school and at home 3G / WiFi / GPS enable resources and media to be accessed within and beyond the school

Construction
The building is designed to provide flexible spaces for learner, group, class and community use. The intelligent building responds to the learner. ICT infrastructure is a core design component

Weblinks and Blogs
Teacher Resource Exchange
Http://terry.freedman.org.uk/
http://www.nextgenelectronics.com/
Shambles (SE Asia but used worldwide)
http://www.shambles.net/
Calpt – tips on tools
http://edu.blogs.com/
Doug Balshaw’s blog
http://www.c4lpt.co.uk/index.html
http://www.nextgenelectronics.com/
Doug Balshaw’s blog
http://teaching.mikebalshaw.co.uk/
1. www.trendwatching.com/trends/MASTERSoftheYOUNIVERSE.htm
3. Harnessing Technology, Transforming Learning and Children’s Services, DfES 2005
7. OECD ibid
8. Buckley D, Personalisation by Pieces Framework (PbP), Cambridge Education, 2006 (T&P route developed in association with Microsoft)
15. e.g. http://radaration.gamesradar.com/forum
16. Greenfield S, Tomorrow’s People, How 21st Century technology is changing the way we think and feel, Penguin 2004
17. See also www.futuremind.ox.ac.uk
18. Prensky M, op cit
26. Vygotsky
28. adapted from Wayne Hodgins CEdMA Europe Workshop C-ing the Future the coming convergence of: Content, Competencies and Context, January 2007
About the BCSE

The British Council for School Environments (BCSE) is a membership organisation made up of local authorities, schools, construction companies, architects and others involved in, and concerned about, the design and build process in the education sector.

It acts as a forum for exchange, dialogue and advocacy for anyone interested in learning environments, from educators to policy makers; users to designers; managers to constructors.

To join the BCSE

Visit our website - www.bcse.uk.net or contact Beth Gladstone on beth@bcse.uk.net, 020 7785 6286

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