The British Broadcasting Corporation has been involved with the production and delivery of educational services from close to the start of broadcasting in the United Kingdom. After a variety of experiments, broadcasting began in 1922 with the British Broadcasting Company as a consortium of radio equipment manufacturers with John Reith as general manager.

Around this time David Sarnoff, general manager of Radio Corporation of America, referred to the use of radio/wireless for education, information and entertainment. It is likely that John (later Lord) Reith, managing director of the BBC, picked up on this idea, because his book, *Broadcast over Britain*\(^1\) contains two chapters (“The Best of Everything” and “The King’s English”) on how broadcasting must move beyond the confines of pure entertainment and enter the world of education.

The BBC broadcast its first national education program on April 4, 1924. In May, the BBC appointed John S. Stobart as its first director of education. The *Radio Times* (the Official Organ of the BBC) on June 15, 1924 carried on its front page an article called “A Broadcasting University.”

So the stage was set very early on in its history for the BBC to be a significant player in the world of education in the United Kingdom; to this day the BBC claims to “inform, educate and entertain.” The British Broadcasting Corporation is constitutionally established under a royal charter, the first of which is dated December 20, 1926. This phrase, “Inform, Educate and Entertain” appears in the first royal charter and is repeated in the exact same form in the most recent royal charter that took effect on January 1, 2007.\(^2\)

It was not long before the members of the early BBC Education department

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George Auckland joined BBC Television after graduation from university in 1969. In 1995–1996, with a colleague, he created BBC Education Online as a pilot project. He is now Head of Learning Innovation for BBC Learning, and recently received a "Lifetime Achievement Award" from the Royal Television Society, Educational section.


\(^2\) See appendix, extract from BBC Charter, available at www.bbc.co.uk/info/policies/charter.
began discussing the dangers of one-way communication; it became clear that for real education and learning to happen some activity was needed beyond the broadcast. The solution at the time was to set up listener groups, so that members of the audience could discuss a program they had heard together and gain insights from the ensuing conversation.

This is the background of BBC Education or BBC Learning as we are now called.\(^\text{3}\) For producers and executives working in education in the BBC the “Beyond the Broadcast” activity has always been a significant part of their work.

Viewing and listening audience figures and the Audience Appreciation Index show how effective broadcasting can be in stimulating and engaging the audience. The guide section of the diagram is where the Beyond the Broadcast part of the operation starts in earnest. This activity can take many forms—telephone help lines, leaflets, books, CD Roms, DVDs, events, and so on, but it is the digital world that has created the biggest change, fundamentally altering the way the BBC delivers its educational remit to audiences and fulfils its royal charter commitments.

For BBC Education and Learning our involvement with the digital world goes back to the late 1970s. In 1978 the BBC transmitted a “Horizon” documentary program called *Now the Chips are Down*.\(^\text{4}\) Essentially the program

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\(^\text{3}\) Throughout this article BBC Education and BBC Learning are essentially interchangeable. As a department within the BBC they are the same, but we are now called BBC Learning, with a distinct emphasis on the learner. I will try to use the term that was current at the time. I hope this will not cause too much confusion.


BBC Education made several series “starring” the BBC Micro, which included: *The Computer Programme*, *Making the Most of The Micro*, *Computers in Control* (about robots and other hardware), *Micro Live* (weekly computer news magazine), and it also made the ground-breaking *Domesday Project* in 1986. Specifically,

- The BBC was often seen on BBC television programs such as *The Adventure Game*, *Tomorrow’s World*, *Beat the Teacher*, *Doctor Who* (where it provided many graphics and even special effects) and on countless educational programs during the 1980s.
- BBC Radio 4 had a program called *The Chip Shop* which broadcast some software for the BBC Micro that could be taped and then loaded.
- The BBC Micro was also used to provide little cartoons between children’s programs for a couple of years.
asked the question “why was the United Kingdom apparently so far behind the U.S.A., Japan, France and Germany in the use of computers and Information Technology in general?” So powerful was the message in the program that questions were asked in the U.K. Parliament as to how and why this situation had come about. Later, in 1979, ITV transmitted a series called *The Mighty Micro*, which predicted the rise of the microcomputer and home computers in particular. BBC Education department decided that computing and information technology were educational issues, and out of this sprung the BBC Computer Literacy project involving the development of a microcomputer for home and, as it turned out, educational use and also a series of television programs running through most of the 1980s. These included *The Computer Programme*, *Making the Most of the Micro*, *Computers in Control*, and *Micro Live*. In the mid-1980s I made the BBC Schools TV series *Micromindstretchers* to encourage the use of microcomputers in primary school classrooms.

**The Domesday Project**

An early example of encouraging the audience to join in was the Domesday Project, created by BBC Education to celebrate the 900th anniversary of the Domesday Book (created for William the Conqueror in 1086). The technology was based on a BBC Micro Computer and an analogue Laser Disk Player. The combined cost of the equipment was rather high, so not many versions were sold, which is a great pity because the project contained a jewel that shines bright today. One of the disks contains 24,000 photographs and many times more short articles. Much of this material was created by school children; some 10,000 schools took part in the project. It must be the largest collection of what we now call “user generated content” (UGC) up to that date. All this material was collected by conventional methods—letters, forms, 35 mm color slides and so on—although the articles could be sent on the floppy disks of the time. Only recent developments using the Web have enabled larger UGC projects to happen, we are now all familiar with photo collections such as Flickr and online encyclopaedias such as Wikipedia. Although the

• The BBC broadcast Telesoftware on Ceefax (its teletext service) that could be downloaded if you had a teletext adaptor connected to your computer until 1987.
• The BBC had a software arm “BBC Software” that supported the BBC Micro, and released several books through BBC Books.
• The BBC also branded a multi-purpose robot, called “The BBC Buggy,” which worked with a BBC Micro and was made by the Microelectronics in Education Programme (MEP).
• The Domesday Project.

5 For more about the Domesday Project, see www.atsf.co.uk/dottext/domesday.html.
Domesday Project has been dormant for some time, we have extracted the photos and the articles and are investigating ways in which we can create a twenty-first century project using mobile technology.

The BBC Networking Club
In 1989, shortly after the World Wide Web was created by Sir Tim Berners-Lee, BBC Education started to consider the educational possibilities of the Web and the Internet. The BBC Networking Club www.bbcnc.org.uk was launched in April 1994 and ran until November 1995. The idea was to help our audience make some sense of the emerging Web and get online themselves. On April 13, 1994 we started to transmit a TV program called The Net, made for us by Illuminations and little later a radio program called the Big Byte, made by our own staff. Each of these programs developed early websites.

Soon afterwards I produced the BBC Education series This Multimedia Business. It was the first U.K. TV program to use a virtual reality set. This program had two kinds of Beyond the Broadcast support: a series of five floppy disks which, when loaded up on the computer, created a miniature CD-Rom-style experience and a website. We did not produce a CD Rom at the time because very few personal computers had CD-Rom drives (unless you had the latest Mac). The idea behind the floppy disk set was to give the audience a taste of hypertext, audio, and even video running on their office computer. We created an extensive, somewhat multicolored website and included the rather spooky URL http://www.bbcnc.org.uk/tv/multimedia_biz in the closing credits of the programs. It was from such activities that BBC Education Online started, as a pilot project with the blessing of John Birt (now Lord Birt) director general at the time.

From the beginning BBC Education Online has produced material for school age and adult learners. Some early examples and successes are GCSE Bitesize and WebWise.

Bitesize
Bitesize (see www.bbc.co.uk/schools/bitesize) started out as online support

See http://en.wikipedia.org/wiki/The_Net_
The Net was a TV series made by the BBC and shown in the early 1990s. It ran for four series, the first of which began on April 13, 1994. The focus of the program was primarily the Internet explosion of the time, though it also dealt with other emerging technologies and series one had a computer games review section. When it started, it was one of the first TV programs to solicit viewer input via e-mail. Produced for BBC Education by Illuminations. BBC2, 8:00 pm, April 13–June 20, 1994.
for an exam revision service that included TV broadcasts, books, CD Roms and DVDs. Some of this material is public service and free at the point of use and some is commercially available. You can see in this range of activity a concept that nowadays is called 360-degree commissioning and which the BBC is applying to a much wider range of its output.

Across the whole of the United Kingdom (four nations) Bitesize covers the age range from 14- to 16-year olds, with variations in content for each nation. Also there is a wide range of Bitesize material available for children 5 years old and upwards for England, Wales, and Northern Ireland. BBC Scotland has some content for post-16-year olds (Scottish Highers).

Curriculum review/recap/revise is a core element of BBC Learning strategy. Bitesize Primary supports core learning while Bitesize Secondary (11-year olds and upwards) helps students prepare for SATs (Standard Assessment Tasks) and GCSEs (General Certificate in Secondary Education). It is available to all, in school and at home, and on other platforms to which students have access.

The section of the site for 14-to-16-year olds (GCSE and Standard Grade in Scotland) includes more than 20 academic subjects, everything from Art to Spanish. It is used by the vast majority of young people in that age range; peaking at 845,000 Unique Users per week in the 2006–2007 exam period. On average, each year-group in the U.K. is about 750,000 persons, so GCSE Bitesize is reaching a very high proportion of the available audience.

Bitesize now includes streaming video clips and also mp3 audio downloads that the audience can use on their preferred portable device. Over the next few years Bitesize will start to offer:

**Personalized learning**
- Customization: Key Stage 4 (14-to-16 year old) students can construct their own Bitesize homepage containing just the subjects and courses they are taking.
- Aggregation: students can select feeds of Bitesize modules/objects and aggregate them (with other content) in a personal Learning Homepage
- Intelligent search: students can quickly interrogate all Bitesize content and be taken to relevant answers

**Web-pervasive**
- Windowing: users can embed Bitesize learning objects in whichever piece of webspace they inhabit.
- Syndication: RSS means students can access Bitesize content from wherever they are: “Bitesize-To-Go”
• Partnerships: agreements with commercial partners—around syndication of podcasts and audio downloads—help make Bitesize part of students’ weblife.

**Multi-platform**
• Mobile: users can download Bitesize objects and bespoke content (e.g. Mobile Revision Notes and Quizzes) to phones and other mobile devices
• Mobile: users can interact with Bitesize in new ways—e.g., posting to subject message boards or signing up to have revision schedules sent to their phone
• Other platforms: Bitesize has always innovated for emerging new platforms (interactive TV, SMS, mobile Java).

We will continue to do this as other new platforms are adopted by our audience.

**WebWise**
We conceived WebWise (www.bbc.co.uk/webwise) as a beginner’s introduction to the Web. Over a number of years the production team has introduced a number of fresh ideas. The first was a 10-part online course, “Becoming Web Wise.” This course can lead to a certificate provided by local Further Education Colleges. More recently the team has produced a section called “Computer Tutor” using a combination of video and Flash to provide a guided or hosted tour on how to use a computer and another section the “WebWise Guide to Broadband.” What is emerging is a new genre existing somewhere between broadcasting and conventional online. Whereas in the 1980s and 1990s we would have made a TV series such as the *Computer Programme* or *The Net* to introduce our viewers to the complexities of a topic, now we can use the best of both worlds, the video for stimulation and engagement and the interactive content for the actual learning.

**Languages**
Language learning materials for adults has been part of our portfolio from the start of BBC Education Online (see www.bbc.co.uk/languages). Even our earliest website included some audio and video, although the technical quality in those days was fairly basic. Broadband has transformed our offering, as shown by our latest addition “Ma France.” Here, for the first time, we commissioned and produced the video material with Broadband as the principle use. All the copyright and contractual issues were sorted out at the beginning of the process so that the videos can be used online, be broadcast, and used on mobile devices.
“Ma France” is designed as a short course with 24 interactive videos in French. The user can choose to view with or without subtitles in French and in English. The videos and the interactive features emphasize fun, participation, and the playful side of language and language learning. The interactivity includes these features: follow the interview with the help of captions; test your comprehension of the interview through a drag ‘n drop activity; meet a challenge set by the interviewee which will involve choosing one route or another through branching video streams (“sliding doors”); there will also be vocabulary and grammar points, a printable role play and links to related web material. Extra cultural insights come via an interactive game.

Those who want to take the course a little more seriously can register with the BBC, which then allows them to track their progress through the material. Production is well under way for an innovative interactive Spanish learning game for adult beginners. “Shot,” using the “point of view” technique set in different Spanish locations, puts the learner at the center of a thriller involving a campaigning journalist and a corrupt property developer.

We have also been part of a Podcasting trial conducted by the BBC. The Languages team re-cut the “Ma France” videos into smaller chunks and added a presenter to make 12 Video Podcasts (approximately 6 minutes in duration), which we delivered to users of MP3 players and PCs as part of a BBC trial in the first half of 2007. During the 3 months that “Ma France” was active on the trial there were over 500,000 downloads, clearly demonstrating an appetite for this kind of approach to learning from this particular section of the audience.

**Internet Protocol Television Trial**

From 2001 until recently we have been involved in IPTV trials in Kingston upon Hull, a small city on the northeast coast of England. Uniquely, the telephone system in Hull is run by a local company, Kingston Communications, rather than British Telecom. As a result of investment in the technical infrastructure in the city it was possible to run television signals over the telephone lines long before it was possible anywhere else in the U.K. The video pictures appeared on the user’s television sets via a specially designed set top box. This was Internet Protocol TV in its purest sense. We were invited to put some content onto the Kingston Interactive TV Video on Demand platform. In addition to BBC Learning videos we ran two other experiments that created considerable interest.

Citizenship is now part of the curriculum in the U.K. so we decided that, rather than include lots of BBC material, we would work with the audience, teachers, school children, and community groups and encourage them to
make short videos around such citizenship topics as homelessness, debt, body image, conflict, and so on.

Some of the schools in Hull are particularly well equipped with AV resources, video cameras, microphones, editing facilities and even small TV studios. Other schools and groups had access to city learning centers, usually on school grounds but in separate buildings. These CLCs are also well equipped. So we created a project we called CITZN-H and employed, part time, a local project manager who also worked as a disk jockey at our local radio station, Radio Humberside. This project manager has considerable street credibility and had been homeless for a short time himself. Over about a year we received more than 80 videos, 650 young people were involved, 22 schools and 24 independent groups. We made the videos available on the Interactive TV system.

We have found the project acted as a catalyst for teacher professional development in areas such as digital video; teachers perceive an improvement in motivation of some of the children and teachers began to re-purpose content for their own use. Projects like this can help develop many other soft skills in the students; organisational skills, communication skills through having to contact other people to arrange for filming etc, story telling and understanding narrative drive, presentation skills, and an early understanding of intellectual property rights and moral rights.

In 2003–2004 Hull University carried out a piece of research entitled “Teaching and Learning with Digital Video Assets” and noted a number of important points:

- Digital video and digital video editing suits many learning styles.
- Evidence to show that learning gains are transferred into other subject areas, e.g., improvement in writing and speaking skills.
- Students become more critical and discriminatory in their selection of assets.
- Self assessment can enable students to dramatically improve their performance.

(See www.becta.org.uk/page_documents/research/evaluation_dv_assets03.pdf.)

One of the criticisms about user-created videos is that they are rarely as good as the professional product. Hull University made the fascinating observation that paradoxically, the basic quality of many school-produced assets seems to be their strength:

Part of the brilliance of [the children’s own work] is that it is rough, unlike professionally produced work, and you can say [to pupils] how could we improve that? So they are evaluating the film, which they don’t tend to do
with a BBC film because it’s too ‘posh.’ So the poor quality of the work is part of its strength in a way.

The other experiment we produced around the time of the national schools exams for 16 year olds (called GCSE in England). The idea was to provide last minute help and advice via television. Even though our trials were on a Video on Demand platform, it was also possible to run live TV on the system. For the two weeks before the exams we employed local schoolteachers to sit in our studio and answer questions sent in by phone, text, e-mail or even the basic messaging system offered by the set top box. Although we started off very basically, by the final year we were transmitting the program via the set top box, on local radio, streamed on the Web and on the local big screen in the city center, so what started off a simple idea, finished as a multiplatform experience.

User Generated Content for Learning
Trials such as CITZ-H are leading us to the idea of user generated content for learning. It is widely accepted in education that when you teach you also learn at the same time. This was recognized by the ancient Greek Seneca several thousand years ago. So the question we are now trying to answer is how we make this idea of learning by teaching more commonly used and recognized? If teaching is such a powerful way to learn, what does it take for everyone to become teachers? Obviously we are not talking about everyone becoming “qualified” teachers in the academic sense but more at the simple level of explaining things to each other successfully. It is the “The Art and Craft of Explaining Things.” User generated content is a very popular idea at the moment. If some of that UGC is not just about entertainment or even pure indulgence, but instead addresses the idea of explaining things then we have the possibility of user generated learning. There are some particularly good examples of how this can work well in the “Notes and Queries” type columns in newspapers and magazines. When a reader has a query or question, it gets answered, not by an expert employed by the newspaper, but by another reader. Often the standard of answers is very high, the readers being considerable experts themselves, or they may have experienced a particular situation that gives them special insights. Not everyone, however, feels confident expressing themselves in written language. This is where modern media, audio, still photography, and especially video can be very helpful. An audience that becomes sufficiently confident in making simple explanatory videos, for example, also becomes an audience of potential teachers, as well as learners. Obviously it is important that the videos are sufficiently well made that some-
one else can learn from them. The qualities we need are both editorial and technical, we need to see and hear well enough what is being explained in the video, but it is particularly important that the explanation, the story, if you like, is well thought through. It is these processes that I refer to in the phrase “The Art and Craft of Explaining Things.” Anyone who has made factual television or radio will be well aware of these processes, and if you make your programs well and with suitable dedication, you, the producer will become quite an expert on any given topic. I have experienced this myself as a TV producer. But few people are lucky enough to produce TV programs, so we need to make these “explaining” skills more readily available. Our user generated learning research will investigate these ideas.

The Creative Archive
The idea behind the Creative Archive (http://creativearchive.bbc.co.uk) relates to all the above and may provide some answers. Rather than just watching our output, the audience is invited to download some it, re-edit it into their own videos and share it with others, including sending the new video back to the BBC. Creative Archive was set up as a licensing arrangement or agreement that has some similarities to Creative Commons (www.creativecommons.org). However, in our case we have a single license that takes into account the origins of the downloaded material and where it may not be used. In the U.K. various organizations, some not for profit, some commercial, have agreed to offer their versions of Creative Archive; but all of us are using the same single licence. BBC Learning’s own version of the Creative Archive contained video and audio downloads specifically tailored for use in the classroom, because it has been clear to us for some years that there is a strong desire among teachers to have this kind of material in downloadable form. (Figure 1)

Increasingly in the U.K., teachers and children are making their own videos and podcasts as part of the teaching and learning process, as we saw with Project Hull. The BBC Trial ran for 18 months and now awaits the outcome of the Public Value Test.7

We are putting the creativity of the audience at the heart of what we do. This is not the normal role for a broadcaster, but it is part of our new learning strategy. Younger audiences are becoming increasingly difficult to reach in a multi-channel, multimedia world, and yet these are the very people who in a few years time we will be asking to pay the licence fee on which the BBC depends. With applications such as GCSE Bitesize, we are very successful at

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7 www.bbc.co.uk/bbctrust/framework/public_value_test/index.html
“A Public Value Test is a mechanism for weighing public value against market impact.”
reaching the mid-teenage audience but, outside the area that is focused on school examinations, it becomes much more difficult to reach this audience. Informal learning is one approach we are using to keep our connections with this vital part of the audience. One very exciting informal learning project that we have been running for the last four years is BBC Blast.

**BBC Blast**

The aim of Blast (www.bbc.co.uk/blast) is to encourage 13–19 year-olds to become creative in a range of areas—music, writing, dance, video, art, animation and so on. These passions can be powerful motivators to attract young people to informal learning. Blast started small and experimental in 2003, and we launched it more widely in 2006 across several platforms: online, on BBC Two, on mobiles, and on tour around the United Kingdom.

This audience seems to move freely between platforms and communication devices, so Blast offers a variety of ways to make contact. The website provides safe message forums where users can find other people who share the same creative goals, discuss ideas, and make new contacts. They can upload their work to galleries as well as check out, comment on, and rate videos, photos and mp3 audios created by other young people. In addition to this, the site hosts great video tutorials (“Blastcasts”) by creative experts in areas as
diverse as beatboxing, film-making, breakdancing and eco-fashion. We have competitions with creativity-based “money can’t buy” prizes; and practical hints and tips. Both user-generated and BBC made content can be found via your mobile phone’s WAP browser or by going to bbc.co.uk/mobile/blast. “Mobsters” is a recent addition to the mobile and web sites. It is an animated series designed to show, in bitesize episodes, how people can be creative with their mobiles. Some of the best work uploaded to the website or created as part of the Blast on Tour workshops is featured as part of Blast TV on BBC Two.

Whether online, on TV, or as part of Blast on Tour, we provide a forum to showcase user generated content in a supportive way. The VJ Masher online tool allows users to manipulate video and images to music, all created by users of the site, and save the resulting VJ “mix.” By taking the use of user generated content to this next level, Blast is able to find new ways of reaching and engaging with its audience.

The BBC, in common with the rest of the broadcasting industry, has to adapt to the new ways that the public consumes media, especially the 13–19s age group. Blast integrates the standard broadcast model but also allows and encourages people to create, share, and review their own content, whether they’re in front of a computer, holding a mobile, or in their town center. It provides the space and resources needed to be creative, as well as relatively small amounts of editorial content (such as the Blastcasts, interviews, and hints and tips) and allows the users ideas to drive the project.

The Blast Truck
Blast has had a good track record of successful live events and, in 2005 we decided that a new approach to events and partnership working could be used. In June 2006, Blast on Tour hit the road for the first time and toured for 15 weeks, taking in 15 locations and directly involving 45,000 young people. The Blast truck is a unique, mobile e-learning studio that includes a digital workspace, TV/audio studio and control room and a separate performance and showcase space. The truck itself can host up to 35 young people on board at any one time with a further 120 audience members in the showcase area.

The workshops, taster sessions, and master classes offered cover an incredible range of subjects and draw upon local talent and facilitators wherever possible. Typical workshops can be in DJing, street dance, mobile phone filmmaking, writing, slam poetry, and more.

As with other areas of Blast, the tour offers the best in informal learning while being based on formal learning concepts. The lead events producer and
lead facilitators ensure that the workshops have valuable learning outcomes and are regularly monitored and reviewed to ensure that learning remains at the heart of what we do. As well as gaining technical and creative skills, visitors to the truck also increase in confidence, problem solving and team working ability.

By the end of the 2007 tour the Blast truck (Figure 2) will have visited 30 locations throughout the U.K. At the time of writing this article (October 2007), we have directly engaged 107,000 people and reached 1.7 million. This is possible through our partnership working. We have worked with a wide range of key national, regional, and local partners, including the Arts Council, BFI, Royal Albert Hall, Arts Award, Youth Justice Board, Connexions, Arts Council, Scottish National Ballet, and many, many more—over 400 across the U.K. so far this year.

The Learning Zone and Learning Zone Broadband Clips Library.
For many years the BBC has been offering much of its formal learning output on the Learning Zone (www.bbc.co.uk/learningzone/clips) transmitted on BBC2 from 2:00 A.M. until 6:00 A.M. The programs are designed to be recorded off air under a license arrangement operated by the Educational Recording Agency Ltd. (www.era.org.uk). Now we are moving some of these programs into an online broadband application. Through this project we provide a full searchable set of audio-visual resources for use in the classroom. The programs are clipped up into sections that run typically 1–4 minutes. Each clip is
mapped initially to the curriculum and can be searched for by subject, topic, age range (of children) keywords, curriculum reference and so on. The whole project is maintained within a database that provided a variety of functions. From the business point of view we can record all the information we need to know about a clip, now and in the future, for example its origin, copyright details, length and so on. Another section contains metadata supplied to us by subject specialist teachers, clip descriptions, classroom uses and keywords. Within this section we can assign more than one metadata set to any given clip. This allows for a clip to have multiple uses, for example a clip about volcanoes, originally produced to fit Geography-Tectonics, could be used by an English teacher to inspire creative writing, the awesome power of the earth’s physical properties being clearly visible in the video clip. Or a video clip of say physics-electricity, made for 11–14 year olds (Key Stage 3 in England), could be used by an upper primary school teacher to introduce the children to the concept of electrical circuits. Clearly in each example the clip description might vary to reflect different emphasis, and obviously the classroom usage would be different, especially where a clip is used in a very different subject. Teachers will be able to create alternative metadata sets (user generated metadata) and in effect reassign a clip so that it appears in other search results. It’s possible to imagine some clips acquiring many uses and metadata sets; this would, in itself, represent a significant increase in value for money for the license fee payer and a much greater range of material for the audience.

21CC
An exciting space within the BBC where we can bring school children and their teachers to try out new technologies and develop creativity is 21CC (www.bbc.co.uk/21cc). Here we cater to a younger age group than Blast and have a slightly more formal learning agenda; if children are being taken out of school their teachers need the assurance that learning is still happening, even if the surroundings and techniques are different from normal school. So our learning program is about developing teacher confidence in the classroom and extending learning opportunities for pupils. All the workshops are hands-on and subject driven.

Each year, 7,500 teachers and pupils from London and beyond come through 21CC and enjoy a rich variety of creative opportunities. All are inspired to Imagine, Explore, Create and Learn. During a day at 21CC the children can be learning about stop-motion animation, Flash animation, how to make a one-minute video, podcasting, digital music composition, use of photo manipulation software, chromakey, and even augmented reality (AR).
AR is a concept that allows users to interact with virtual 3D objects in real time, using their own hands rather than a mouse or a keyboard. AR works by mixing the live video from a digital camera with animated 3D models, which are made to appear in the hands of the user. This is achieved by special software which tracks patterns, printed on paper, in each video image. AR technology allows learners to literally pick objects off the page and explore them in a highly rewarding way.

We are experimenting to try to find out whether technologies such as AR are especially useful for traditionally “hard-to-teach topics” such as the earth-sun-moon system, why seasons happen and so on. One surprising observation we have made is that it seems to stimulate conversation and encourage storytelling.

We also work in partnership with external organisations. A spectacular professional production of Madam Butterfly at the Royal Albert Hall in London has been the inspiration for two events in the spring and summer of 2007. At the Madam Butterfly Fashion Show, Royal Albert Hall, March 2007, for the first time ever, over 300 students from 16 schools and colleges in London and the South East of England came together to showcase their creations in a live fashion event as part of Royal Albert Hall’s Education Programme. The show took place in the beautiful, specially constructed Japanese water garden that was used as the set for the production of Madam Butterfly. In partnership with Royal Albert Hall, BBC 21CC worked with musicians from the Royal Philharmonic Orchestra, contemporary digital composer Duncan Chapman, and students from two of the 16 schools to produce an original music soundtrack based around the themes and music of Madam Butterfly that was performed live at the show. Meanwhile students from another two of the schools worked with a professional VJ (video jockey) to produce footage to be mixed and shown live at the show.

This year another version of 21CC will be opening at our brand new BBC Scotland headquarters in Glasgow.

Mobile Activities
As well as running well-established services and projects, we also conduct a variety of trials and experiments to test emerging technologies and try to discover what values they may have for education and learning. Handheld or mobile learning is an area attracting much attention at the moment and it certainly fits one of our models by offering “Just in Time” content as well as many UGC opportunities. The combination of content and context can be very powerful. We are involved in a variety of experiments to try to determine what
Mobile Learning from the BBC could really mean. Mobile phones and mobile devices in general are offering more and more facilities, for instance the built in camera has been available for some years now, and increasingly phones have GPS location and Wireless LAN capabilities. In our experiments we have to provide some location information, but we are not equipment manufacturers, so our main concern has been about the audience or user experience, in other words, editorial issues.

The Millennium Bridge Trial
Our earliest work started around the time of the millennium and unofficially we called the project BBC Open Air, investigating what the experience of BBC Learning is when you are away from your normal TV or computer and outside in the open air. This was a completely internal trial not involving members of the public.

We mapped an area in London, around the center of the Millennium Bridge over the River Thames and investigated what content we had readily available that related to places a few minutes walk away from the bridge. This is a very busy part of London and it soon became apparent, in searching the BBC website, that we had a vast amount of material at our fingertips. Conventional web pages, however, are far from ideal for use on small screen devices. Rather than a conventional mobile phone, for this experiment we chose to use a PDA (portable digital assistant) with a mobile phone card installed. This gave us a reasonable screen size to work with. We obtained the location from the mobile phone cell; although this is far less accurate than GPS, it was adequate for this experiment. Much of our effort was really about reworking the existing web content to be appropriate for the new circumstances—a small screen device, in the open air. We experimented with text and images, audio and short videos and came to a number of conclusions, some fairly obvious.

For a live location-based service to work we must consider the following urgently:
• All new content BBC web content should be tagged with location metadata
• Short form versions of BBC web pages should be written at the time of creation
• Most BBC web pages should be written in the inverted pyramid style (e.g., conclusion first)
• Many BBC sites other than News Online, are still written in the traditional pyramid style common to academic publications
• The inverted pyramid style is more appropriate for websites aimed at interested adults and casual browsers.
Battlefield Britain: Stories from Our Tumultuous Past

From the earliest days BBC Education-Learning has organized real world events to support our programs and extend the learning experience. Recently we have been looking at what digital and interactive enhancements we could provide for some of these events. The Battlefield Britain series offered us an ideal opportunity to try out some of our ideas and technology. The series concerned itself with significant battles fought around the British Isles over the last 2000 years. Some of these battles, for example, the Battle of Hastings in 1066, are extensively celebrated at the battlefield site with regular reenactments and lots of other activities for visitor to see and do. We were looking, however, for a battlefield that was much less “busy.” After many conversations we were invited to consider the Battle of Culloden, 1746, which was the last battle fought on the British mainland. The battlefield is situated near Inverness in the Scottish Highlands. It is a wild, romantic, and sacred place; many of those killed in the battle having been buried on the site, it is low key and respectful. In many ways it is an ideal location to try out modern but discrete mobile devices in the hands of visitors. The TV program contains a detailed description of the preparations and the battle itself, including high-quality computer generated graphics of events on the battlefield. The National Trust for Scotland, which looks after the site, agreed to allow us to conduct a trial; they also are very interested in how mobile technology can be used to enhance the visitor’s experience.

We decided to try to determine location by a Wireless Local Area Network (Wireless LAN) rather than GPS because it was a less-explored technology at the time and also, in an ultimate system, the Wireless LAN is capable of delivering content as well as the location information (Figure 3).

Wireless location is a good deal harder to achieve than location using GPS, which is a well-developed system with off-the-shelf technology, but it has one significant advantage: it will work indoors as well as in the open air. This is the task we set ourselves and we were only partially successful, but we learned a lot of useful information. We had three interconnected propositions; to deliver location information, to deliver content and to make the content as closely linked to the actual location as possible. During the short period of the trial we were more successful with content than with the location information; subsequently we have made the location software work satisfactorily. We did learn, however, a huge amount about the close mapping of video to location and the extraordinary feeling the viewer gets when the two work well together. The mobile device then becomes like a window in time, where you can view events from our tumultuous past on the very spot where they happened.
Video is experiential, it is the next best thing to being there, but when you have the video and you are there on the spot, then it is really rather special.

**Coast Mobile**

We are an island nation and the coast and coastline plays a major part in your history, geography, politics and trade. Several BBC series have explored these ideas and encouraged the audience to take coastal walks and explore for themselves. The Coasts Mobile project developed a robust way to deliver content to mobile phones using the now familiar Semacode system.\(^8\)

Alongside the normal TV programs were Interactive TV, a website, a WAP site, and BBC local news output encouraging viewers to take part. We put up signs in the participating towns and cities, and if the visitor had installed the correct software on their phones, they could just photograph the Semacode sign with their phone cameras. This code then became a URL, which the phone used to locate the appropriate information. If you did not have the software we supplied a phone number. The information was a mixture of images, maps, and audio-guided tours.

This is an area of activity that is bound to become increasingly commercialized, so what role, if any, remains for public service providers? The BBC has vast amounts of material that is location specific or can easily be made so, but how do we exploit this archive in a sensible and acceptable way?

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\(^8\) See [http://semacode.org](http://semacode.org)
Participate

Participate (www.participateschools.co.uk) is a large-scale research project involving a number of commercial and not-for-profit partners. We aim to explore at how we can use new and emerging technologies to encourage people to engage in environmental issues. It brings together a variety of schools in a series of multi-study technology supported science activities.

The students collect data, such as carbon monoxide and dioxide levels, “electro smog,” noise and light levels, via portable devices and from static sensors embedded in the environment. This can be augmented with audio, still images, and video in a shared online environment to give some context to the data.

We will develop tools to enable the upload and sharing of scientific environmental data between schools. So far the activities we have designed for schools include:

• Collecting environmental data in their local area using data logging and GPS equipment as well as digital cameras. Data collected can then be visualised in the 3D animated Google Earth.
• Participating in the production of a 60 second film about science based issues.
• Participating in the production of an exciting digital online science poster.

This is a long-term project and we are planning to investigate what happens when children are involved in real scientific endeavour, for example:

• Motivation: “fun” science activities that tap into current public, media and political debate.
• “Child as scientist”; authentic experiences of data collection, analysis, and interpretation.
• Share and compare findings with those of others; other school pupils, official sources, professional scientists.
• Provide opportunities for reflection upon what has been learned, thus deepening understanding.

Conclusion: Bitesize, On Demand, and Just in Time

The world of broadcasting is very much “one size fits all”; the viewers of any given program all watch the same version of the program. It is also intensely asymmetrical. We, the broadcasters do it, you the audience watch it or listen to it. As the people involved at the start of educational broadcasting soon realized, these concepts of one size fits all and asymmetry do not serve education and learning at all well. So, wherever we have been able, we have adopted the

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9 Participate Partners are Blast Theory, BBC Research and Innovation, Microsoft Research, BT, The University of Bath, the University of Nottingham, and Science Scope.
model that is Bitesize, On Demand, and Just in Time. Broadcasting, even interactive broadcasting, cannot deliver this, but the World Wide Web can and broadband makes more things possible. The development of mobile technologies, especially mobile broadband is more advanced in Japan than in Europe, but already we can see that mobile learning is well placed to deliver the Just in Time element.

Recently we have set up a Research and Development team within BBC Learning to investigate just what Mobile Learning from the BBC and User Generated Learning from the BBC could really mean. The relationship we have with our audience is changing more rapidly than at any time in the history of broadcasting, in part because they have ready access to the creative technologies that were once the province of the broadcaster. We need to nurture that creative potential in the audience and use it to develop richer learning experiences.

Appendix 1
Extract from BBC Charter

4. The Public Purposes

The Public Purposes of the BBC are as follows—

(a) sustaining citizenship and civil society;
(b) promoting education and learning;
(c) stimulating creativity and cultural excellence;
(d) representing the UK, its nations, regions and communities;
(e) bringing the UK to the world and the world to the UK;
(f) in promoting its other purposes, helping to deliver to the public the benefit of emerging communications technologies and services and, in addition, taking a leading role in the switchover to digital television.

5. How the BBC promotes its Public Purposes: the BBC’s mission to inform, educate and entertain

(1) The BBC’s main activities should be the promotion of its Public Purposes through the provision of output which consists of information, education and entertainment, supplied by means of

(a) television, radio and online services;
(b) similar or related services which make output generally available and which may be in forms or by means of technologies which either have not previously been used by the BBC or which have yet to be developed.