

New Technologies in Education Review



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INTRODUCTION

This review investigates, identifies and describes emerging technologies that can be applied to education services. It draws on literature and reports published by two professional expert bodies: Becta - the Government's lead agency for Information and Communications Technology (ICT) in education in the United Kingdom and researchers of New Media Consortium Horizon Project. Both research bodies publish annual reports that identify technologies which are likely to have a large impact on teaching & learning.

This review also recommends technologies for inclusion in the eTeach product, which is a programme for the continuous professional development of teachers. eTeach delivers a progression pathway for competent 'personal ICT' users and addresses the 'science of eLearning' and the adoption of emerging Web 2.0 technologies in education.

This publication is not intended to be a comprehensive review of new educational technologies, but presents some highlights of the broad spectrum of developments and trends. It does not contain an in-depth analysis of each technology, but provides a brief description and its reference to education. It should make readers aware of some of the possibilities that are developing and the potential that technology has of transforming our ways of working, learning and interacting. Some of the technologies and tools discussed in this publication are already being used; others are beginning to be explored.

EMERGING TECHNOLOGIES FOR LEARNING

Web 2.0 technologies / User-Created Content

Web 2.0 has been defined by Tim O'Reilly as:

[the]network as platform, spanning all connected devices; Web 2.0 applications are those that make the most of the intrinsic advantages of that platform: delivering software as a continually-updated service that gets better the more people use it, consuming and remixing data from multiple sources, including individual users, while providing their own data and services in a form that allows remixing by others, creating network effects through an 'architecture of participation,' and going beyond the page metaphor of Web 1.0 to deliver rich user experiences¹.

The OECD report on the participative web and user-created content from 2007, prepared by Sacha Wunsch-Vincent and Graham Vickery, defines user-created content (UCC) as: i) content made publicly available over the Internet, ii) which reflects a certain amount of creative effort., and iii) which is created outside of professional routines and practices.

UCC comprises various forms of media and creative works (written, audio, visual, and combined) created by Internet and technology users. Its main characteristics are:

Publication requirement: the work is published in some context, be it on a publicly accessible website or on a page on a social networking site only accessible to a select group of people (i.e. fellow university students). This excludes email, bilateral instant messages and the like.

Creative effort: a certain amount of creative effort was put into creating the work or adapting existing works to construct a new one; i.e. users must add their own value to the work. The creative effort behind UCC often also has a collaborative element to it, as is the case with websites which users can edit collaboratively.

Creation outside of professional routines and practises: User-created content is generally created outside of professional routines and practices. It often does not have an institutional or a commercial market context. Motivating factors include: connecting with peers, achieving a certain level of fame, notoriety, or prestige, and the desire to express oneself.

UCC most often takes form of texts, photos and images, music and audio files, video and film.

Most common UCC platforms are:

- blogs
- Wikis and Other Text-Based Collaboration Formats
- Group-Based Aggregation and social bookmarking
- Podcasting

¹ http://radar.oreilly.com/archives/2005/10/web_20_compact_definition.html

- Social Networking Sites
- RSS and syndication
- mapping mashups

Applications for Teaching and Learning

The relevance of user created content for teaching, learning and creative expression described in the 2007 Horizon Report lies in fostering collaborative work for teachers with colleagues, students and community members from around the world. Sites that allow for the easy upload of images, video, audio and other media, also provide students with low-cost, low-risk means to publish their work as they develop their skills. Comparing their own work to that of others can give students a valuable perspective on their own abilities and inspire them to try new ideas and techniques.

Another benefit of these tools in education may be in their ability to connect people and facilitate work without the need to consult central technology support centres. These tools also lend themselves to classroom applications, providing a space where work begun in the classroom can be easily done outside of class.

A social network type website is being used within the eTQF project, thus supporting the professional collaboration of project partners. www.etqfproject.ning.com

Blogs

The term blog comes from 'weblog' and, according to Wikipedia: *'A blog is a website for which an individual or a group generates text, photographs, audio files and/or links, typically but not always on a daily or otherwise regular basis. The term is a shortened form of weblog. Authoring a blog, maintaining a blog or adding an article to an existing blog is called "blogging". Individual articles on a blog are called "blog posts", "posts", or "entries".'*

There is a big variety of blogs according to their content. There are group blogs, family blogs, community blogs, and corporate blogs. LibLogs (library blogs), and EduBlogs (targeting education: <http://edublogs.org>) are just some of the emerging types of blogs. In educational settings, faculty are using blogs to express their opinions, to promote dialogue in the discipline, and as an instructional tool, and students are increasingly using blogs both as personal commentaries and as a required part of certain courses. Blogs continue to benefit from several years of experimentation and evolution, both within and outside of education. By carefully evaluating their strengths and weaknesses, educators are learning to set guidelines and expectations to maximize the benefits of blogs. Structured exercises and clear goals are further enhancing the value of blogs in education.

Blogs are an increasingly accepted instructional technology tool. Blogs can be used for reflection about classes, careers, or current events; they can also capture and disseminate student and faculty-generated content. RSS feeds make blog content accessible through newsreaders, allowing bloggers to increase the sharing of this information among interested individuals. Blogs offer students, faculty, staff, and others a high level of autonomy while creating a new opportunity for interaction with peers. Blogs provide a forum for discussion that goes beyond coursework to include culture, politics, and

other areas of personal exploration. Students often learn as much from each other as from instructors or textbooks, and blogs offer another mechanism for peer-to-peer knowledge sharing and acquisition².

Wiki

A wiki is a website that allows users to add, remove, or edit and change content collectively. Other sites allow users to log in and cooperate on the editing of particular documents, so it is usually a joint collaboration on the part of several authors. Wikis permit asynchronous communication and group collaboration across the Internet. Various described as a composition system, a discussion medium, a repository, a mail system, and a tool for collaboration, wikis provide users with both author and editor privileges; the overall organization of contributions can be edited as well as the content itself. Wikis are able to incorporate sounds, movies, and pictures; they may prove to be a simple tool to create multimedia presentations and simple digital stories.

Wikis offer a powerful yet flexible collaborative communication tool for developing content-specific Web sites. Because wikis grow and evolve as a direct result of people adding material to the site, they can address a variety of pedagogical needs—student involvement, group activities, and so on. Since wikis reside on the Internet, students can access and participate from any location, provided they have Internet access. From an instructional technology perspective, wikis allow faculty and students to engage in collaborative activities that might not be possible in a classroom. Their flexibility will encourage broader adoption—by both students and faculty.³

Wikis might be the easiest and most effective Web-based collaboration tool in any instructional portfolio. Their inherent simplicity provides students with direct (and immediate) access to a site's content, which is crucial in group editing or other collaborative project activities. A wiki's versioning capability can show the evolution of thought processes as students interact with the site and its contents. These collaborative projects help promote "pride of authorship" and ownership in the team's activities. In addition, wikis are being used as e-portfolios, illustrating their utility as a tool for collection and reflection⁴.

Collaboration using a wiki is not limited to students. College, School, Faculty can use wikis to collaborate on projects, whether editing a textbook, preparing a journal article, or assembling a syllabus or reading list. Wikis might also prove to be an ideal vehicle for soliciting ongoing input for research or projects where community input can help inform and direct subsequent investigation. The possibilities for using wikis as the platform for collaborative projects are limited only by one's imagination and time. Wiki enabled projects can provide various levels of site access and control to team members, offering a fine-tuning element that enhances the teaching and learning experience⁵.



One well known example, Wikipedia, is an online encyclopaedia that anyone who has registered can contribute to. However, many of the contributors are also moderators: unfinished or part articles are called 'stubs' and need to be moderated, worked up and polished before they are accepted into the main body of the work. A wiki web environment differs from traditional online learning in that it encourages both teacher and student to learn together: knowledge is no longer transmitted

² Becta: 7 things you should know about blogs, pg.

³ Becta: 7 things you should know about Wikis. www.educause.edu/eli

⁴ Ibid

⁵ Ibid

from one to the other, but each person shares a part of what they know to construct a whole – in effect another form of peer-to-peer constructivist learning⁶.

Other examples of sites providing wikis such as PBWiki, JotSpot, SocialText; Writing collaboration sites such as Writely.

Tagging and Social bookmarking

Social bookmarking is the practice of saving bookmarks to a public Web site and “tagging” them with keywords. Bookmarking, on the other hand, is the practice of saving the address of a Web site you wish to visit in the future on your computer. To create a collection of social bookmarks, you register with a social bookmarking site, which lets you store bookmarks, add tags of your choice, and designate individual bookmarks as public or private. Some sites periodically verify that bookmarks still work, notifying users when a URL no longer functions. Visitors to social bookmarking sites can search for resources by keyword, person, or popularity and see the public bookmarks, tags, and classification schemes that registered users have created and saved.

Social bookmarking dates back just a couple of years, when sites like Furl, Simpy, and del.icio.us began operating. Other social bookmarking sites include de.lirio.us, an open source version of del.icio.us, and citeulike, a social bookmarking site for academic papers. Social bookmarking is particularly useful when collecting a set of resources that are to be shared with others. Anyone can participate in social bookmarking.



Activities like social bookmarking give users the opportunity to express differing perspectives on information and resources through informal organizational structures. This process allows like-minded individuals to find one another and create new communities of users that continue to influence the ongoing evolution of folksonomies and common tags for resources. Using a folksonomy-based tool for research lets you take advantage of the insights of other users to find information related to the topic you are researching, even in areas that aren't obviously connected to the primary topic. These kinds of tools also encourage users to keep coming back because the folksonomy and the collections of resources are constantly changing. It's easy to imagine assigning a value for individual resources, resulting in a ranking system that functions as a collaborative filter.

Tagging information resources with keywords has the potential to change how we store and find information. It may become less important to know and remember where information was found and more important to know how to retrieve it using a framework created by and shared with peers and colleagues. Social bookmarking simplifies the distribution of reference lists, bibliographies, papers, and other resources among peers or students.

Podcasting

Podcasting is a term inspired by the Apple Computer Corporation's iPod—a portable digital audio player that allows users to download music from their computer directly to the device for later listening. The term is no longer specifically related to the iPod but refers to any software and hardware combination that permits automatic downloading of audio files (most commonly in MP3 format) for listening at the user's convenience. Unlike traditional radio or other Web-based streaming media, podcasts give listeners control over when they hear the recording. Podcasting makes use of the

⁶ Becta: Emerging technologies for learning 2006. pg.35

Internet's Real Simple Syndication (RSS) standard. It differs from broadcasting and Webcasting in the way that content is published and transmitted via the Web. Instead of a central audio stream, podcasting sends audio content directly to an iPod or other MP3 player⁷.

Podcasting allows education to become more portable than ever before. Podcasting cannot replace the classroom, but it provides educators one more way to meet today's students where they "live"—on the Internet and on audio players. Barriers to adoption and costs are minimal. The tools to implement podcasts are simple and affordable. Podcasting is predicted to soon become a mainstream application, much like video-on demand recorders.

Podcasting enthusiasts see no limit to the potential uses of this technology, particularly in education, and the number of podcast aggregators (sites that collect, categorize, and then make available podcasts for subscribers) is growing. Interlacing podcasts with video applications—listening to a podcast while viewing related material on the Web—is another area of experimentation in education.

Podcasting is evolving at a rapid rate. New features—categorizing, navigating, and indexing—are being demanded by users. Consequently, designers and producers of podcasts are seeking new ways to add layers of richness to simple audio files—creating audio experiences that are both entertaining and instructive.

Regarding teaching and learning implications, podcasting allows students to use their technology-based entertainment systems (iPods, MP3 players) for educational experiences. Because students are already familiar with the underlying technology, podcasting broadens educational options in a nonthreatening and easily accessible manner. For example, podcasting allows lectures or other course content to be made available to students if they miss class. Beyond missed lectures, podcasting can provide access to experts through interviews. Podcasting is not limited to content delivered to the student, however; students can create their own podcasts—as a record of activities, a way to collect notes, or a reflection on what they have learned.

Social Networking

Social networking is considered as the most pervasive aspect of Web 2.0 with its ability of making connections and bringing people together. Conversations that take place in social networking contexts are inherently social, and often revolve around shared activities and interests. The heart of social networking is fostering the kinds of deep connections that occur when common pursuits are shared and discussed.

Because of students' tremendous interest in social networking, colleges and universities are increasingly going to be seeking ways to employ the same strategies that make social networking sites so effective. The 2007 Horizon report suggests that social networking sites are the next step after portals and will result in rich, interactive and robust learning communities.

A sampling of social networking applications across disciplines includes the following:

- *Encourage community and self-expression.*

Campus-based social networking sites offer a safe, convenient space for students to build ties with community members and experiment with developing a public self.

⁷ Becta: 7 things you should know about...podcasting

- *Offer immersion in a foreign language environment.*

Students learning another language can join a community in that language, where they will be exposed to conversational and colloquial reading and writing, learn about daily life, and establish friendships with native speakers.

- *Extend the impact and life span of conferences and workshops.*

Topical social networking sites can be used before, during, and long after an in-person conference. Attendees can begin to network before they even get to the hallways, and the group's wisdom can be collected and preserved, increasing the effect of the conference and prolonging its usefulness.

RSS and syndication

RSS is a protocol that lets users subscribe to online content using an RSS "reader" or "aggregator," which checks subscribed Web pages and automatically downloads new content. The aggregators display a list of subscriptions, with highlighting or another indicator of RSS feeds that have added content since the user last logged in. Without having to go to all of the individual Web sites, users can quickly and easily access new material from sites that interest them. For many, RSS has become the pipe through which content flows from providers to consumers. What makes RSS important is that users decide exactly what content is allowed through that pipe.

Since its introduction in the late 1990s, RSS has become almost ubiquitous. An excellent mechanism for distributing regularly updated content, RSS is a natural complement to blogs, news sites, photo-sharing applications, and podcasts. The popularity of podcasting results on some level from RSS technology. When new podcasts are available, the aggregator (or, in this case, podcatcher) automatically downloads the new file to your computer or portable music player⁸.

In many cases the process of creating RSS is being automated and, used in tandem with learning platforms, presents a possible future scenario for disseminating highly specialised and personalised learning content. Educational resources can be indexed and distributed in a learning object network.

RSS is likely to come to the fore in education for three reasons:

- 1) As teachers' expertise with multimedia learning objects grows, they will be looking for a cheap, useful distribution network to populate their lessons and courses. RSS could provide this and the means to find people and services allied to these resources and also provide a 'push mechanism' for people to disseminate their resources on a just-in-time and archived basis for others.
- 2) Syndicated educational content could be one future of resourcing, for being able to syndicate images, videos and weblogs easily and freely across systems and networks, and to update and archive them in real time as well as aggregate them and attach relevant tags, could be a very powerful way forward for online learning. This is especially true if the process is linked to peer-to-peer communication systems whereby the learners themselves produce content, tags and resources, and aggregate or reflect on the accumulation of knowledge around these. This has serious implications for staff resourcing, training, professional development and a host of other applications – especially in tandem with CMS (content management systems) or learning platforms.

⁸ Becta: 7 things you should know about...RSS

- 3) Many educationalists working on similar projects in different institutions would find it useful to pull all those feeds together to get an overview of what resources and activities are present in the educational arena. RSS enables you to do this.

There are tools such as [superglu](http://www.superglu.com) [http://www.superglu.com] that allow you to bring multiple RSS feeds onto the same web page. This could be used to:

- aggregate all of a student's production in one page
- bring a range of different search feeds together for easy viewing
- create a class site that aggregates whatever content feeds you are providing for students
- create a collaborative project site
- bring teacher lesson plans or ideas together on one page⁹.

Mapping mashups

Mashups combine separate, stand-alone technologies into a novel application. Mapping mashups, in particular, overlay data on maps with clickable markers showing specific points of interest. Data interoperates with an online mapping service, putting information into a geographical context. In a wide range of academic disciplines, understanding the geographical context of places and events is central to a deep comprehension of the subject matter. Mapping mashups do this by combining a mapping tool with other applications and online resources to create interactive learning experiences¹⁰.

Some mashups provide details for specific locations. Others bring together different data sources, such as combining crime data with location information (ChicagoCrime.org for example). A music mashup mixes tracks from two different source songs. Tools (for example, Google's Mashup Editor, Intel's mashup maker, or MIT's Piggy Bank [http://simile.mit.edu/wiki/Piggy_Bank]) allow non-technical individuals to mix up data, find new meaning, and present it in interesting ways. Educationally, mashups can be extremely valuable (helping students integrate previously disparate types of information), but they are not without their cautions (such as use of others' intellectual property)¹¹.

In many fields of study, an understanding of the geographical context of places and events is central to a deep comprehension of the subject matter. This applies to areas ranging from the sciences, such as geology or meteorology, to the humanities, such as history or political science. Joining subject matter to a mapping tool provides an educational experience unlike simply reading about a place and then finding it on a map. Applications can show groups of locations on a map, representing how proximity among the sites, topographical features, or other elements of the physical world have an effect on the subject at hand. Mapping mashups provide a means for placing data and class lessons into a physical context.

For some students, this step moves an otherwise abstract concept into the real world, helping them see patterns and movements that explain ideas and their significance. By their nature, many mapping mashups are particularly well suited to research. To the extent that such tools accurately model the practices of researchers—manipulating data, thinking critically about patterns and relationships—

⁹ Becta: Emerging technologies for learning 2006

¹⁰ Becta: Emerging technologies for learning. Volume 3. 2008. pg. 23

¹¹ Becta: Emerging Technologies for Learning, 2008, pg. 16

mapping mashups can bring research closer to teaching and provide authentic experiences for students¹².

Mobile technologies

Widespread adoption of mobile phones for education and learning was first highlighted in the 2006 Horizon Report, and has continued on into the following 2007 and 2008 reports in the mid-term horizon as the likeliest timeframe. Already, there are many examples of campus-wide programs, individual courses, and creative opportunities that exploit the potential of mobile phones; more are emerging all the time. It is predicted that mobile phones will be accepted tools on campus, as desirable and common as personal computers. Mobile phones are becoming the storehouses of people's digital lives, containing a growing share of our personal and professional resources and data.

Over the last few years, mobile phones have become increasingly powerful and adapted to multiple uses; virtually every phone now sold includes some form of multimedia, if not several, as well as instant messaging, web browsing, and email. QWERTY keypads are common, and geolocation and the capability to record video and audio is quickly becoming a standard feature as well. At the same time, more and more kinds of content are available for phones. Many websites and blogs can automatically detect if the browser is housed on a phone and format content accordingly. Video is a click away on almost all new phones, whether you want it streamed to you via the network or played off your SD card, or want to capture it via your phone's internal video camera—and it is hard to find a phone anymore that does not include a still camera. New genres of filmmaking and photography are developing as artists and students experiment with equipment that fits in their pockets. The mass amateurisation of video production is resulting in a new kind of video where the message is much more important than the form. Photos, email, music, and other personal files already accompany many of us wherever we take our laptops. The newest form of this trend no longer requires the laptop—your phone is your personal digital repository. High speed broadband, combined with the multifunctionality of new phones and increased storage capacity via removable memory, is making rich media and live content the next big application for phones¹³.

The increasing capability of phones, plus the fact that virtually everyone has one, is already making these devices an attractive delivery platform. Applications for communication, scheduling, training, entertainment, study, and creativity suggest themselves; task of educators is to select and develop those that are meaningful for education. For example, the ability of phones to record data has tremendous applications in fieldwork for many disciplines. In the UK, students in a grade-school geography class use cell phones to record data (text and pictures) in the field and submit it to the teacher, who remains in the classroom. Students can create mini-documentaries easily and cheaply with their phones; online tutorials for phone-based moviemaking offer tips and techniques. The ability of almost all phones to access email, instant messaging, the web, and calendaring increases the ways in which students and instructors can communicate—and is eroding the digital divide. Some campuses are turning to mobile phones as a replacement for landlines, which are being used less. It seems that even students who cannot afford to own a computer are still very likely to own a mobile phone; it simply makes sense to provide services and information they can access with those devices¹⁴.

¹² 7 things you should know about...Mapping Mashups. www.educause.edu/eli

¹³ The Horizon Report 2007, pg.15

¹⁴ Ibid

Education gaming

The perception of the use of games in education is changing drastically. Games, as well as 3D immersive environments such as the popular online 3D world/platform, Second Life (adult and teen version), perhaps offer more innovative ways to understand how participation may shape what and how young people learn, communicate, and feel inspired to explore. Recent research suggests that digital games are important to the education and development of the next generation of digital citizens and the way they develop practices around networked communication and collaboration¹⁵.

The kind of worlds people interact in through games, online games in particular can be shared places of learning, contexts for thinking through complex problems, hierarchies, economics, and even science. They offer a sense of ‘physical’ proximity to others which few other online spaces give.

There are two aspects of educational games highlighted in the latest Horizon reports – virtual worlds and massive multiplayer games. Because of the more rapid acceptance and use of virtual worlds in academia as opposed to gaming in general, this phenomenon remains in the mid-term horizon—moving ever closer, while the latter remain a bit farther out.

Virtual worlds are richly immersive and highly scalable 3D environments. People enter these worlds via an avatar which is their representation in that space, moving their avatar through the space as if they were physically walking—or in some cases, flying. The most popular virtual worlds are multi-user spaces, meaning that many people can be in the same virtual space and interact with one another in real time. While many popular games take place in virtual worlds, virtual worlds are not themselves games. Pure virtual worlds like Second Life, Active Worlds, or There can be applied to any context, as opposed to game worlds, which generally have a fixed, goal-oriented purpose.

Virtual worlds offer an opportunity for people to interact in a way that conveys a sense of presence lacking in other media. These spaces can be huge, in terms of the number of people that use them, and they are growing in popularity because they combine many of the elements that make Web 2.0 really exciting: social networking; the ability to share rich media seamlessly; the ability to connect with friends; a feeling of presence; and a connection to a community.



Virtual worlds can be used to create very effective learning spaces. Since they are generalized rather than contextual, they are applicable to almost all disciplines. Settings can be created to pertain to any subject or area of study; locations and artifacts can be as realistic and detailed, or as generic and undefined as desired. 3D construction tools allow easy visualization of physical objects and materials, even those normally occurring at cosmic or nano scales.

The social aspects of virtual worlds are also useful for educational purposes. These worlds lend themselves to role playing and scenario building, allowing learners to temporarily assume the responsibilities of an astronomer, chemist, or engineer without incurring real-world consequences. Researchers and ethnographers have ventured into worlds like Second Life to interview and study the inhabitants¹⁶.

¹⁵ Elspa, 2006

¹⁶ The Horizon Report 2007

Intelligent Agents

Intelligent Agents (IAs) are autonomous, graphically embodied agents in an interactive, 2D or 3D virtual environment. They are able to interact intelligently with the environment, other IAs, and especially with human users.

The definition of an intelligent agent is still subject of controversy. However, it is generally accepted that an agent can be viewed as “an encapsulated computer system that is situated in some environment and is capable of flexible and autonomous actions in that environment in order to meet its design objectives”. Wooldridge and Jennings argue that the term agent can be used to denote a hardware or (more usually) software based computer system that has the following properties:

- **Autonomy:** Agents can operate without the direct intervention of humans or other agents, and have control over their individual actions and internal state.
- **Social Ability:** Agents are able to interact with other agents (and possibly humans) via an agent communication language.
- **Reactivity:** Agents perceive their environment, and should respond in a timely fashion to changes that occur in it.
- **Pro-activeness:** Agents do not simply act in response to their environment; rather they are able to exhibit goal-directed behaviour by taking the initiative.

For educators, more important than the technical features is the functionality and applicability for teaching and learning purposes.

Intelligent Agents technology and its use in education has been tested within a Leonardo da Vinci project – PARMENIDE - Promoting Advanced Resources and MEthodologies for New Teaching and Learning Solutions In Digital Education, promoted by the Open University “Guglielmo Marconi” in partnership with other six European universities. The project has developed, tested and assessed an innovative integrated learning system which aimed at combining e-learning modalities with an advanced and interactive knowledge acquisition system based on Intelligent Agents (IA). The target group were technical professionals employed in railways and airports’ environments. A pilot integrated training system was designed and developed based on a blended methodology able to provide both e-learning solutions (e-courses) and Intelligent Agents Systems (Pilot Applications). The core aim of the initiative was to realise a “Fire Prevention, Fire-Fighting and Emergencies Management” online course through an experimental e-platform based on a blended methodology. Therefore, PARMENIDE pilot application aimed at building a novel form of education and training environment for fire prevention based on an Intelligent Agent.



The trainees were involved in a critical approach toward their training path and performance. The Intelligent Agent allows the trainees how to collaborate to the re-definition of the contents and to the growth of their expertise. The IA allows the learning initiative to balance theoretical and practical

elements and test virtual *learning by doing*. In fact, adult learners acquire practical skills through an educational use of devices, systems and equipment.

Compared to the traditional static multimedia learning systems, content delivery becomes highly interactive and personalized considering the natural inclinations of students and their differing attitudes. Virtual tutors use Artificial Intelligence methods to evaluate in depth the student's performance and reaction, and adapt teaching to the individual needs and requirements. They show the student how to accomplish a complex task, such as controlling an assembling process, using a mechanical circuit, repairing a system or specific machines; the IAs communicate the feedback of the students' performance taking advantages from verbal and non verbal behaviour in order to attract the student's attention on crucial moments of learning.

With this particular project the Intelligent Agent took the form of a pedagogical agent as a virtual human taking advantage of verbal and non-verbal behaviours. It captures the attention of the trainee during the key phases of the learning process. IA is based on an autonomous software system, operates in the training environment as tutor assessing users' performance during their training tasks.



IA is a virtual facilitator with great reactive, intuitive and interpretative skills, able to provide verbal and non verbal behaviours (human like expressions).

Display screen technologies

Until fairly recently, the limitations of display and interface technologies have restricted the potential for human interaction and collaboration with computers. The emergence of interactive whiteboards has pointed to new possibilities for using display technology for interaction and collaboration. A range of emerging technologies and applications could enable more natural and human centred interfaces so that interacting with computers and content becomes more intuitive. This will be important as computing moves from the desktop to be embedded in objects, devices and locations around us and as our 'desktop' and data are no longer device dependent but follow us across multiple platforms and locations. These technologies comprise of interactive surfaces, interactive tables, multi-touch devices, digital pens and even interactive paper.

In education, intuitive interfaces lower the barriers to using IT, allow for a better understanding of complex content and enhance opportunities for collaboration. Multi-touch and interactive surfaces are becoming more interesting, because they allow a natural and intuitive interaction with the computer system. These more intuitive and natural interfaces could help students to be more actively involved in working together with content and could also help improve whole-class teaching activities. As these technologies develop the barrier of having to learn and work with traditional computer interfaces may diminish. It is still unclear how fast these interfaces will become part of our daily life and how long it will take for them to be used in every classroom. However, we strongly believe that the more intuitive the interface is, the faster it will be accepted and used. There is a huge potential in

these devices, because they allow us to use digital technologies in a more human way. We are just at the beginning of a new decade, where books can be displayed on e-paper devices such as the Sony Reader.

Collaboration webs

Collaboration no longer calls for expensive equipment and specialized expertise. The newest tools for collaborative work are small, flexible, and free, and require no special installation or setup, are designed to be used within a web browser, produce materials that can be easily shared, and offer a convenience and flexibility that can make virtual collaborations both simple and highly productive.

The first area of development has been an explosion of straightforward tools that allow people to break work into small easy-to-accomplish pieces that a team of people can work on together or in parallel. Examples are tasks like writing a document, building a budget, assembling a presentation, or creating a digital story. Webware suites like Zoho Office (www.zoho.com) and Google Docs (docs.google.com) offer the most common features that off-the-shelf packages provide, including word processing, spreadsheets, presentation tools, and more, without the need to buy or install any software. Significantly, the ability to share documents and collaborate on content creation is built into the core functionalities of these toolsets. A wide variety of webware applications exist to manage the creation and workflow of rich media projects as well (see www.splashup.com for photos and www.jumpcut.com for videos, to name just two examples); capture a sketch with audio narration (www.sketchcast.com); or publish presentations and slideshows (www.slideshare.net; www.slide.com). The second area of development has been in online collaborative workspaces that serve as a hub where a group of people can easily work, share resources, capture ideas, and even socialize. In contrast to productivity applications, which enable users to perform a specific task or create a particular product, collaborative workspaces are “places” where groups of people gather resources or information related to their personal or professional lives. The most popular of these tools are highly flexible and can be adapted to almost any project. At the same time, these spaces conveniently lend themselves to almost seamless integration of content from other online resources, often quite transparently. Examples include do-it-yourself social networks like Ning (www.ning.com); sharable personalized start pages that are “pagecast”—shared, in other words—from services like Netvibes (www.netvibes.com) or Pageflakes (www.pageflakes.com); and social networks like Facebook (www.facebook.com).

The essential attribute of the technologies for education and learning is that they make it easy for people to share interests and ideas, work on joint projects, and easily monitor collective progress. All of these are needs common to student work, research, collaborative teaching, writing and authoring, development of grant proposals, and more. Using them, groups can collaborate on projects online, anywhere there is Internet access; interim results of research can be shared among a team, supporting illustrations and tables created, and all changes and iterations tracked, documented, and archived. In class situations, faculty can evaluate student work as it progresses, leaving detailed comments right in the documents if desired in almost real time. Students can work with other students in distant locations or with faculty as they engage in fieldwork. The bar for widespread participation is very low, since the software to support virtual collaboration is low cost or free, and available via a web browser. Students can access the same materials from any computer, whether it is theirs or one in a computer lab. Support needs are greatly reduced as nothing needs to be installed or upgraded. A virtual

collaborative workspace for a course or study group can be assembled quickly using tools, or widgets, that can pull information from a variety of sources, including Flickr, Twitter, MySpace or Facebook, news and weather feeds, Del.icio.us, blog feeds and more. For example, a custom course workspace could include a calendar widget populated with data from the school's online calendaring system, an RSS feed that displays students' and professors' recent blog posts or Twitter updates, a course-created tag cloud on Del.icio.us, a Flickr badge featuring related photos, and a whiteboard widget where course members can leave messages for one another. All the information the group needs can be accessed and contributed to by any of them in a virtual space accessible from any computer. The same tools can be used to set up a personal



portfolio where a student can display his or her work in any form—photos, blog posts, shared videos, and more can be pulled to the page by widgets that grab the student's contributions on other sites. Complementary webware tools make it possible for students to easily incorporate multimedia into their work. Videos, audio clips, and images can all be edited online using free tools like those mentioned above, then easily published and shared using any of a number of online services. As new work is blogged, podcast, or posted, a portfolio page created with these tools will automatically update with the most current content. Using similar approaches, online conferences and symposia can offer session archives that persist over time; simply request that participants use a particular tag when they post related content, and the widgets will continue to update the conference page as new content appears¹⁷.



Semantic web/Web 3.0

Web 3.0 is a term used to describe the future of the World Wide Web. Following the introduction of the phrase "Web 2.0" as a description of the recent evolution of the Web, many technologists, journalists, and industry leaders have used the term "Web 3.0" to hypothesize about a future wave of Internet innovation. However, there is considerable debate as to what the term Web 3.0 means, and what a suitable definition might be.

Web 3.0 is also very often associated with the term semantic web which can be described as the extension of the World Wide Web that enables people to share content beyond the boundaries of applications and websites. The semantic web is a vision of information that is understandable by computers, so that they can perform more of the tedious work involved in finding, sharing and combining information on the web. It is being developed to allow devices, information services and applications to interact directly with each other dynamically over the web.

The future of VLEs

A virtual learning environment (VLE) is a software system designed to support teaching and learning in an educational setting, as distinct from a Managed Learning Environment (MLE) where the focus is on management. A VLE will normally work over the Internet and provide a collection of tools such as those for assessment (particularly of types that can be marked automatically, such as multiple choice),

¹⁷ The Horizon Report 2008

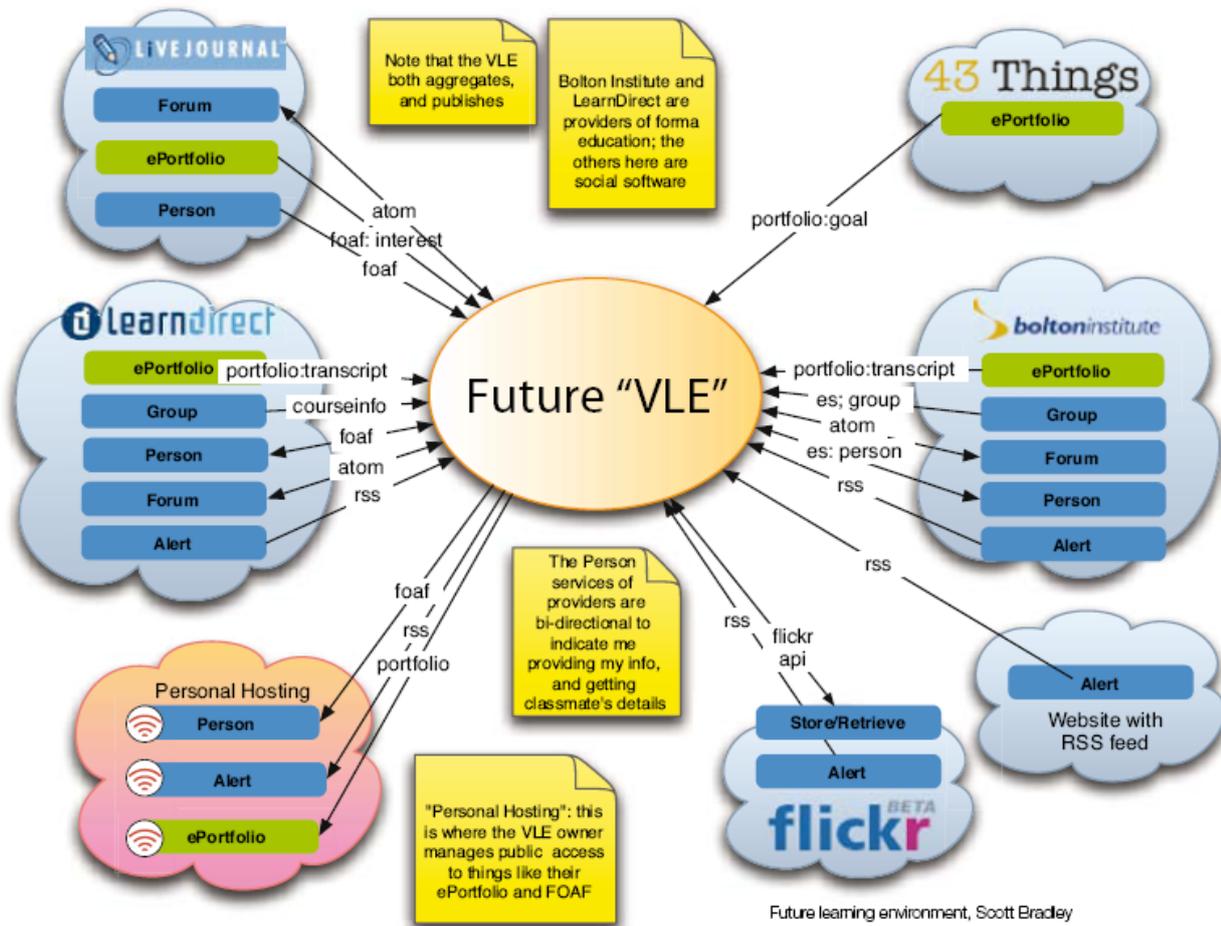
communication, uploading of content, return of students work, peer assessment, administration of student groups, collecting and organising student grades, questionnaires, tracking tools, and similar. New features in these systems include wikis, blogs and RSS.

While originally created for distance education, VLEs are now most often used to supplement the face-2-face classroom, commonly known as Blended Learning.

Becta, have coined the term learning platform to cover both MLE and VLE as used in the schools sector. 'The term learning platform describes a broad range of ICT systems used to deliver and support learning. Through a learning platform, hardware, software and supporting services are brought together to enable more effective ways of working within and outside the classroom. At the heart of any learning platform is the concept of a personalized online learning space for the pupil. This space should offer teachers and pupils access to stored work, e-learning resources, communication and collaboration with peers, and the facility to track progress.'

¹⁸While the learning management system succeeded in emulating the classroom online, a second wave of applications and approaches, drawing on what has come to be described as Web 2.0, is redefining the concept of online learning. This second wave is characterised by the 'personal learning environment' (PLE). The values that underlie the PLE and Web 2.0 are the same: the fostering of social networks and communities, the emphasis on creation rather than consumption, and the decentralisation of content and control. Through 2005 and 2006, the concept of the Personal Learning Environment (PLE) slowly began to take form in the educational technology community, coalescing with a 'Future VLE' diagram (see below) released by CETIS's Scott Wilson. The idea behind the personal learning environment is that the management of learning migrates from the institution to the learner. The PLE connects to a number of remote services, some that specialise in learning and some that do not. Access to learning becomes access to the resources and services offered by these remote services. The PLE allows the learner to not only consume learning resources, but to produce them as well. Learning therefore evolves from being a transfer of content and knowledge to the production of content and knowledge.

¹⁸ DfES Making IT Personal leaflet, March 2006.



Future learning environment, Scott Bradley Wilson. Source: <http://community.uaf.edu/~cde/wiki/SSW/VirtualLearningEnvironments>

RECOMMENDATIONS FOR INCLUSION IN THE ETEACH PRODUCT.

The eTeach Community of Practice product is one of the products of the eTQF project and is intended to be a creation that will support the continuous professional development of teachers in the use of ICT. It has been described as a progression option for teachers who already possess basic skills in the use of ICT in teaching. It could be offered as a next step for teachers who have completed the eTeach Programme.

The first recommendation is that a delivery platform for the eTeach Community of Practice is one of the technologies described in this document e.g. wikis, blogs or social networking sites. For the pilot version of eTeach Community of Practice, we recommend using a free website for creating your own social networks – www.ning.com. The advantage of this platform is that it has good variety of features and good functionality. Depending on the purpose, it can be used as a public or private website. For piloting purposes it is recommended to use it as a private website where it can be accessed by invitation only.

Although the purpose of eTeach Community of Practice is to introduce the teacher to the world of modern technologies in education, the ultimate objective is its successful application in the classroom. Knowledge about the technical aspects of each technology is therefore not perceived as a prerequisite in its adaptation. For that reason, it is recommended that eTeach Community of Practice does not present the technology behind particular tools, but rather refers mostly to its applicability and its connection to education settings. Furthermore, looking at existing examples, ideally from the local working environment, they seem to be a good motivational tool for those who might not see the links between technology and education. Demonstrations of how other teachers use ICT in their subjects could change negative attitudes towards technology.

Conclusions:

- eTeach Community of Practice should not be a paper based programme, should be accessible and deliverable through modern online tools or platforms e.g. wiki, blog or a social network website.
- eTeach Community of Practice introduces teachers to a variety of emerging technologies with big emphasis on its applicability to education.
- eTeach Community of Practice content is not perceived as comprehensive, might include a short description of the most commonly used technologies in education and indicate further sources of information on other emerging technologies.
- eTeach Community of Practice will demonstrate the practical use of emerging technologies in education, preferably using local examples.

GLOSSARY

Bluetooth

A short-range wireless technology. It is mainly used to connect devices and peripherals such as mobile phones, headsets, printers and cameras. The most common Bluetooth standard has maximum data rates of 721Kbps, but the newer Bluetooth 2 (Enhanced Data Rate) allows for speeds up to 2.1Mbps.

E-portfolio

An e-portfolio is a digitised collection of documents and resources that represent an individual's achievements. The user can manage the contents and usually grant access to appropriate people. There is currently a variety of different types of e-portfolio with varied functionality. E-portfolios are increasingly being used for coursework and other assessment purposes.

Folksonomy

Derived from folk + taxonomy, a Folksonomy is a way of categorising data on the web using tags generated by users. Folksonomies are used on collaborative, 'social' websites for photo sharing, blogs and social bookmarking. Social bookmarking websites are services that allow users to store their favourite websites online and access them from any internet-connected computer. Users tag their favourite websites with keywords. These are then shared with other users and build into folksonomies of the most popular sites arranged under different categories.

Learning Platform

'Learning platform' is a generic term to describe a broad range of ICT systems which are used to deliver and support learning. A learning platform usually combines several functions, such as organising, mapping and delivering curriculum activities and the facility for learners and teachers to have a dialogue about the activity, all via ICT. So, the term learning platform can be applied to a virtual learning environment (VLE) or to the components of a managed learning environment (MLE). A VLE is a software tool which brings together resources for curriculum mapping, delivery, assessment, tutor support, communication and tracking. A managed learning environment (MLE) refers to the whole range of information systems and processes that support learning and the management of learning within an institution. It includes VLEs or other learning platforms, administrative and other support systems.

SD

Secure digital: a removable Flash memory card format primarily used with digital cameras and handheld computers.

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