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on borderless higher education

Report

Web 2.0 for Learning and Teaching in Higher Education

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Abstract:

This report discusses the uses of Web 2.0 in higher education and examines the practices at five institutions currently implementing Web 2.0: the UK Universities of Warwick, Leeds, Brighton and Edinburgh, and the University of Klagenfurt in Austria. It then considers ways in which Web 2.0 impacts institutional policy and strategy, and in the final section analyses issues related to Web 2.0 in learning, teaching and assessment. This report may be used to help formulate policy and guidelines for Web 2.0 use in universities; although it identifies some of the risks associated with Web 2.0 implementation, including intellectual property and security issues, because the application of Web 2.0 in higher education is still in an early stage it concludes by recommending that institutions impose only minimal and necessary regulations in order to avoid constraining experimentation with Web 2.0 technologies and allied pedagogies.

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Web 2.0 for Learning and Teaching in Higher Education

1 Introduction

This report is the result of a study¹ into the use of Web 2.0 technologies for content creation for learning and teaching in higher education, initially funded by the Joint Information Systems Council (JISC)², and then, with JISC's kind permission, extended in a small study funded by the Observatory on Borderless Higher Education (OBHE)³. The JISC work was carried out between March and May 2007, and the OBHE work in July 2007. The report draws on existing studies, interviews with staff at universities who have implemented Web 2.0 technologies for learning and teaching, and a week-long web-based seminar (webinar) series with expert contributions both from invited speakers⁴ and from the audience. The report builds on the briefing documents that were written especially for the webinar and the results of the webinar discussions, many of which can be found on the Moodle site that was used to support the conference⁵.

Web 2.0 will affect how universities go about the business of education, from learning, teaching and assessment, through contact with school communities, widening participation, interfacing with industry and maintaining contact with alumni. However, it would be a mistake to consider Web 2.0 as the sole driver of these changes; in reality Web 2.0 is just one part of the higher education ecosystem. Other drivers include, for example, pressures towards greater efficiency, changes in student population, and ongoing emphasis on better learning and teaching methods. Nonetheless, Web 2.0 is, in our view, a technology with profound potential for inducing change in this sector. We expect that learning will be opened up by the catalytic effects of Web 2.0 technologies, allowing greater student independence and autonomy, greater collaboration and increased pedagogic efficiency.

Because Web 2.0 is a relatively young technology, there are many unresolved issues relating to its use in universities. These include intellectual property rights for material created and modified by university members and external contributors; appropriate pedagogies for use with Web 2.0 (and equally which pedagogic approaches are enhanced by the use of Web 2.0); how to assess material that may be collectively created and that is often open to ongoing change; the choice of types of systems for institutional use; how to roll out Web 2.0 services across a university; whether it is best to host the services within the university or make use of externally hosted services elsewhere; integration with institutional systems; accessibility, visibility and privacy; data ownership; control over content; longevity of data; data preservation; information literacy; and staff and student training. At this stage all that we have to go on are the results of experiments with Web 2.0, rather than a set of solutions that are ready for widespread adoption.

In the report, we provide a discussion of Web 2.0 together with a compilation that includes some of the more commonly-used systems for education. We then examine progress at five universities which have taken a strategic approach and implemented Web 2.0 services in different ways at the institutional level. We then turn to institutional policy and strategy and consider ways in which Web

¹ Franklin, T, and van Harmelen, M (2007), *Web 2.0 for Content Sharing for Learning and Teaching in Higher Education*, report, JISC. URL: http://www.jisc.ac.uk/media/documents/programmes/digital_repositories/web2-content-learning-and-teaching.pdf Last accessed 1 August 2007.

² Joint Information Systems Committee (JISC). URL: <http://www.jisc.ac.uk> Last accessed 1 August 2007.

³ Observatory on Borderless Higher Education. URL: <http://www.obhe.ac.uk> Last accessed 1 August 2007.

⁴ The speakers for the webinar series were: *Institutional Practice*: Stan Stanier, University of Brighton; Terry Wassall, University of Leeds. *Content Sharing*: Brian Kelly, UKOLN; Graham Attwell, Pontydysgu. *Learning and Teaching*: Mark van Harmelen, University of Manchester; Tom Franklin, Franklin Consulting. *Policy and Strategy*: David White, University of Oxford; Chris Adie, University of Edinburgh. Please see the bibliography under each author's name for the title and access details relating to their contribution.

⁵ van Harmelen, M, "Web 2.0 in Learning and Teaching", web site for the JISC Web 2.0 Webinar Series. URL: <http://moodle.cs.man.ac.uk/web2/> Last accessed 1 Aug 2007.

2.0 impacts them In the final section we consider ways in which Web 2.0 is being used in learning, teaching and assessment, and important issues associated with pedagogy and assessment. This report may be used to help formulate policy and guidelines for Web 2.0 use in universities. Because the use of Web 2.0 in various areas of application (learning, teaching, administration, management) is still in an early stage, we recommend that institutions impose only minimal and necessary regulations in order to avoid constraining experimentation with Web 2.0 technologies and allied pedagogies.

2 Background to Web 2.0

2.1 Terminology

The term “Web 2.0” distinguishes the modern and emerging nature of the world wide web (“web”) from its original uses (“Web 1.0”). Initially, with Web 1.0, a few content authors provided content for a wide audience of relatively passive readers. In Web 2.0, many more users generate, consume and transform material posted on the web, an innovation referred to as “shared content” or “read/write”. With Web 2.0, the web can also become a platform that enables groups of users to socialise, collaborate and work and play together. These social networking and shared content aspects of Web 2.0 have important ramifications for higher education⁶.

2.2 A brief history

What is now generally accepted as the “shared content” or “read/write” nature of Web 2.0, as defined above, already appeared in 1980 in Tim Berners-Lee’s prototype web software. (In Berners-Lee’s view there is, therefore, nothing new about Web 2.0⁷.) However, the content-sharing aspects of the web were abandoned in the original rollout, and did not reappear until Ward Cunningham wrote the first wiki (see 2.6.2) in 1994-1995. Blogs (see 2.6.1), another early manifestation of the read/write phenomenon, were sufficiently prevalent by 1997 to gain the name weblogs that year. It was not until the summer of 2004 that the term “Web 2.0” appeared with its current meaning⁸. A year later, Tim O’Reilly led a conference session to explore the meaning of the term and subsequently wrote about the phenomenon in September 2005⁹.

2.3 Web 2.0 and media and technology convergence

The full implications of Web 2.0 for learning and teaching will need to be viewed in the light of media and technology convergence, particularly with respect to the following:

- The growth of Web 2.0 occurs at the same time that broadband communications, telephony and broadcast media are converging; broadcast television and radio are now available via the Internet, and television is available on a limited number of mobile phones.

⁶ Readers may also be interested in definitions offered in UKOLN / ahds, *What is Web 2.0*, Briefing note 92, URL: <http://www.ukoln.ac.uk/qa-focus/documents/briefings/briefing-92/briefing-92-A4.doc> Last accessed 1 Aug 2007 and Anderson, P., *What is Web 2.0? Ideas, technologies and implications for education*, JISC TechWatch Report. URL: <http://www.jisc.ac.uk/media/documents/techwatch/tsw0701b.pdf> Last accessed 1 August 2007.

⁷ Langingham, S (2006), "Tim Berners-Lee Originator of the Web and director of the World Wide Web Consortium talks about where we've come, and about the challenges and opportunities ahead", Interview, IBM DeveloperWorks Interviews, 28 July 2006. URL: <http://www-128.ibm.com/developerworks/podcast/dwi/cm-int082206.txt> Last accessed 1 August 2007.

⁸ O'Reilly and MediaLive International (2004) *Web 2.0 Conference – Oct 5-7, 2004*. URL: <http://web.archive.org/web/20040602111547/http://web2con.com> Last accessed 1 Aug 2007; Graham, P. (Nov 2005), *Web 2.0*, URL: <http://www.paulgraham.com/web20.html>

⁹ O'Reilly, T (2005), "What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software". URL: <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html> Last accessed 1 August 2007.

- While professional production and editing in broadcast media are likely to persist, we will see this sector increasingly adopting Web 2.0 technologies, with greater audience participation and audience-created content. In parallel we will also see an increasing number of channels funded in diverse ways e.g. subscription, general advertising, personalised advertising, and via the sale of personal information collected via these channels.
- The increased bandwidth offered by 3G telephony will encourage a move from the desktop computer using a desktop browser to mobile devices and browsers. Content will be created, shared and consumed on mobile devices.
- Ubiquitous computing, computing that is always around us, and always on, will change our everyday digital and media environments, mediating the world in new ways.
- Indication of presence within social spaces will increase, so that users can see who is connected and who is active, and gain a feel for, or knowledge of, what other users are doing. This helps mediate between people in different ways.

To illustrate just some of the potential of this convergence, it is interesting to consider the following example: Recently Will Richardson wrote in his blog¹⁰ about taking an iPhone on a hike and using it and Wikipedia to research, together with his children, what they saw on the hike. This is a highly evocative blog post, especially when extended to consider what mobile learning can be: Web 2.0 software and mobile technologies can be used for independent learning that is motivational, relevant, and applicable where and when it is needed. Translated to a university setting, perhaps with a group of biology or zoology students on a field trip, the same tools could allow students to research using web-based materials, add new information to those materials based on their discoveries in the field, blog as they make these discoveries, add to a class wiki, or twitter to each other about their findings. Further in the future, technologies will permit these students to use mobile devices from the field to participate in a live Internet TV discussion with classmates, teaching and research staff, and (potentially) the public, showing video clips of the day's findings¹¹.

2.4 Convergence between Web 2.0 and open courseware

Web 2.0 is a natural platform for open learning materials (also known as open courseware). One large-scale example, the OpenCourseWare Consortium¹², has 108 universities and 15 affiliate organisations listed as members including two discussed in this report: the University of Klagenfurt, in Austria (discussed in section 3.5), and the University of the Western Cape, in South Africa (in section 5.6). Members develop and share free, digital educational content with a stated objective to "advance education and empower people worldwide." Other particularly interesting examples of open courseware include MIT's Open Courseware¹³ and the Open University's OpenLearn¹⁴. OpenLearn is associated with the Open University's LearningSpace¹⁵, which, while not a Web 2.0 system, provides communication and discussion facilities for learners. An interesting part of LearningSpace is that learners can construct, reuse and change learning plans using downloadable desktop software. In this respect, LearningSpace is moving towards Web 2.0. We predict a growing convergence between open learning materials and the use of Web 2.0 facilities for learning. In part this may lead to some interesting changes in universities, discussed in the context of "Education 3.0" in section 5.6.

¹⁰ Richardson, W (23 July 2007) "iHiking", Weblogg-ed. URL: <http://weblogg-ed.com/2007/ihiking> Last accessed 1 August 2007.

¹¹ Potential for this is indicated by operator11, see Catone, J (1 August 2007), "Operator11: Live Netcasting Gets Social", *Read/WriteWeb*. URL: http://www.readwriteweb.com/archives/operator11_live_social_netcasting.php Last accessed 5 August 2007.

¹² OpenCourseWare Consortium. URL: <http://ocwconsortium.org> Last accessed 1 August 2007.

¹³ MIT, OpenCourseWare. URL: <http://ocw.mit.edu> Last accessed 1 August 2007.

¹⁴ Open University, OpenLearn. URL: <http://www.open.ac.uk/openlearn> Last accessed 1 August 2007.

¹⁵ Open University, LearningSpace. URL: <http://openlearn.open.ac.uk/> Last accessed 1 August 2007.

2.5 Who is doing what with Web 2.0

A widely quoted rule of thumb¹⁶ is that 1% of Web 2.0 users create content, 10% comment or in some way add to the content (e.g. adding a tag), and the remaining 89% consume content without adding to it. On the basis of survey data, Forrester Research has refined this broad distinction into categories of creators, critics, collectors, joiners, spectators and inactives. This survey provides data¹⁷ across different age groups and thus the percentages in the table below are for the proportion of a particular age group performing a particular kind of activity:

ROLE	AGE	12 – 17	18 – 21	22 – 26	27 – 40	41 – 50	51 – 61	62+
Creators		34 %	37 %	30 %	19 %	12 %	7 %	5 %
Critics – comment and add ratings etc		24 %	37 %	34 %	29 %	18 %	19 %	11 %
Collectors – RSS aggregator users, bookmarkers		11 %	16 %	18 %	19 %	19 %	16 %	11 %
Joiners – join social media sites		51 %	70 %	57 %	29 %	19 %	8 %	6 %
Spectators – watch and read		49 %	59 %	54 %	41 %	31 %	26 %	19 %
Inactives – online but no social media, e.g. only e-mail		34 %	17 %	21 %	42 %	54 %	61 %	70 %

The data cited in the table above show that participation rates are higher than the rule of thumb usually cited, particularly, as might be expected, among younger users. Statistics on content creation compiled by hitwise, a survey-based research company¹⁸, show a rise in Web 2.0 traffic from 2% of all web traffic in April 2005 to 12% in April 2007%. Interestingly, the survey reveals

¹⁶ E.g. Arthur, C (20 July 2006), "What is the 1% rule?", Technology Section, *Guardian Unlimited*. URL: <http://www.guardian.co.uk/technology/2006/jul/20/guardianweeklytechnologysection2> Last accessed July 2006. Last accessed June 2007; URL: <http://64.233.183.104/search?q=cache:rcJbHy8GlsYJ:www.guardian.co.uk/technology/2006/jul/20/guardianweeklytechnologysection2+http://www.guardian.co.uk/technology/2006/jul/20/guardianweeklytechnologysection2&hl=en&ct=clnk&cd=1&gl=uk> Last accessed 1 August 2007.

¹⁷ Table categories and percentages from Forrester Research, via Business week. See also Li, C, with Bernoff, J, Fiorentino, R, and Glass, S (19 April 2007), "Social Technographics®", *Forrester*. URL: <http://www.forrester.com/Research/Document/Excerpt/0,7211,42057,00.html> Last accessed 1 August 2007. Li, C (22 April 2007), "Forrester's new Social Technographics report", *The Groundswell*. URL: http://blogs.forrester.com/charleneli/2007/04/forresters_new_.html Last accessed 1 August 2007. Cheng, J (2 May 2007), "The Social Technography of Web 2.0", *ars technica*. URL: <http://arstechnica.com/news.ars/post/20070502-the-social-technography-of-web-2-0.html> Last accessed 1 August 2007.

¹⁸ Data from hitwise, a survey-based research company owned by Experian, that gathers survey data from Internet Service Providers.

Trancer, B (2007), "Measuring the Participatory Web", Web 2.0 Expo 2007. URL: http://www.businessweek.com/the_thread/blogspotting/archives/pdf/Tancer%20Web2expo1.pdf Last accessed 1 Aug 2007.

particularly low creation statistics for some of the sites commonly associated with Web 2.0 including YouTube (where 0.16% of site visits are to add video content) and Flickr (where 0.2% of visits are to upload photos). The figure is higher for Wikipedia (where 4.59% of visits are to edit entries). This suggests that much of the activity on YouTube and Flickr, especially, remains the old Web 1.0 activity of viewing content. Combined with the Forrester Research data, however, hitwise's statistics have some important implications relating to the use of Web 2.0 in higher education: many students will already use Web 2.0 technologies and are accustomed to socio-technical architectures of participation.

2.6 Web 2.0 Software

One way to approach Web 2.0 is to look at the software that is commonly thought of as Web 2.0. Individual systems are hosted on servers and accessed across the web via a browser. These may interchangeably be called "Web 2.0 systems", "Web 2.0 services", or "Web 2.0 applications". There is a large range of Web 2.0 systems; here we discuss some of the most important for higher education. (For readers interested in a more comprehensive list of Web 2.0 systems for education, we recommend the excellent "Back to school with Web 2.0" series¹⁹. Those interested in the wider range of contemporary Web 2.0 systems should consult the "2007 Web 2.0 Awards" at Seomoz.org²⁰. To keep abreast of this rapidly changing field, we recommend setting up an RSS or e-mail subscription to the Read/WriteWeb's Weekly Wrapups²¹.)

All of the systems that follow can be grouped under the convenient label of **social software**, i.e. software that exists to facilitate group processes. If anything, the importance of Web 2.0 is that it is inextricably intertwined with the growth of social software. **Social media** is a term that is increasingly being used instead of social software.

2.6.1 Blogs

A blog is a system that allows a single author (or sometimes, but less often, a group of authors) to write and publicly display chronologically-ordered articles (called posts). Readers can add comment to these posts.

Examples of educational uses:

- A group of bloggers using their individual blogs can build up a corpus of interrelated knowledge via posts and comments. This might be a group of learners in a class, encouraged and facilitated by a teacher, or a group of dedicated life-long learners sharing similar interests and learning goals.
- Teachers can use a blog for course announcements, news and feedback to students.
- Blogs can be used with syndication technologies (discussed in 2.6.8) to enable groups of learners and teachers to easily keep track of new posts.

2.6.2 Wikis

A wiki is a system that allows one or more people to build up a corpus of knowledge in a set of interlinked web pages, using a process of creating and editing pages. The most famous wiki is Wikipedia²².

¹⁹ Benzinger, B, "Back to School with the Class of Web 2.0", Parts 1-3, SolutionWatch, URLs: <http://www.solutionwatch.com/512/back-to-school-with-the-class-of-web-20-part-1> <http://www.solutionwatch.com/515/back-to-school-with-the-class-of-web-20-part-2> <http://www.solutionwatch.com/519/back-to-school-with-the-class-of-web-20-part-3> All last accessed 1 August 2007.

²⁰ Seomoz.org (9 May 2007), "2007 Web 2.0 Awards". URL: <http://www.seomoz.org/web2.0> Last accessed 1 August 2007.

²¹ Read/WriteWeb, "Weekly Wrapups". URL: http://www.readriteweb.com/archives/cat_weekly_wrapups.php Last accessed 5 August 2007.

²² Wikipedia. URL: <http://en.wikipedia.org> Last accessed 1 Aug 2007.

Examples of educational uses:

- Wikis can be used for the creation of annotated reading lists by one or more teachers. (See also social bookmarking in 2.6.3 for an alternative method for doing this.)
- Wikis can be used in class projects, and are particularly suited to the incremental accretion of knowledge by a group, or the production of collaboratively edited material, including material documenting group projects.
- Wikis can be used by teachers to supply scaffolding for writing activities: in a group project a teacher can supply page structure and hints as to desirable content, then provide feedback on student-generated content.
- Students can flag areas of the wiki that need attention and provide feedback on each other's writing.

2.6.3 Social bookmarking

A social bookmarking service provides users with the ability to record ("bookmark") web pages and attach short descriptive labels (tags) that describe the pages. Examples of such services include del.icio.us²³, Bibsonomy²⁴, and Furl²⁵. Furl not only bookmarks but also makes a copy of pages that are bookmarked. Over time, users build up collections of records that relate to their interests and can search for bookmarked items using likely tags. Users can also find other users who are likely to be interested in the same topic(s). Since items have been deemed worthy of being bookmarked by users who share interests, social bookmarking services can sometimes be more effective than search engines for finding relevant Internet resources, particularly for specialist subjects. Syndication (discussed in 2.6.8) can be used to monitor tagging activity by selected users, by selected tags, or both.

Examples of educational uses:

- Teachers and learners can build up collections of resources, and with a little ingenuity can also use social bookmarking systems to bookmark resources that are not on the web.
- In this way it is easy to build up reading lists and resource lists. These may, with the use of multiple tags, be structured into sub-categories.
- Groups of users with a common interest can team together to use the same bookmarking service to bookmark items of common interest. If they have individual bookmarking accounts, they all need to use the same tag to identify their resources²⁶.

2.6.4 Media-sharing services

These services store user-contributed media and allow users to search for and display content. Besides being a showcase for creative endeavour, these services can form valuable educational resources. Compelling examples include YouTube²⁷ (video), iTunes²⁸ (podcasts and vidcasts), Flickr²⁹ (photos), Slideshare³⁰ (presentations), DeviantArt³¹ and 5oup³² (art work) and Scribd³³ (documents). The latter is particularly interesting as it provides the ability to upload documents in

²³ Del.icio.us. URL: <http://del.icio.us> Last accessed 1 August 2007

²⁴ Bibsonomy. URL: <http://www.bibsonomy.org> Last accessed 1 August 2007

²⁵ Furl. URL: <http://www.furl.net> Last accessed 1 August 2007.

²⁶ Eg. members of the JISC Users and Innovation community (Emerge) are using the del.icio.us tag `jisc_emerge` URL: http://del.icio.us/jisc_emerge to tag resources of common interest.

²⁷ YouTube. URL: <http://www.youtube.com> Last accessed 1 Aug 2007

²⁸ Apple, iTunes. URL: <http://www.apple.com/itunes> Last accessed 1 August 2007

²⁹ Flickr. URL: <http://www.flickr.com> Last accessed 1 August 2007.

³⁰ Slideshare. URL: <http://www.slideshare.net> Last accessed 1 Aug 2007.

³¹ DeviantART. URL: <http://www.deviantart.com> Last accessed 1 August 2007.

³² 5oup (pronounced "soup") is social networking site for art students, set up in early 2006 by James Chambers and Tom Judd, at that time both were students themselves. URL: <http://www.5oup.net> Last accessed 1 August 2007.

³³ Scribd. URL: <http://www.scribd.com> Last accessed 1 August 2007.

different formats and then, for accessibility, to choose different download formats, including computer-generated speech.

2.6.7 Podcasting

Podcasting allows listeners to keep up-to-date with recent audio or video content. For the user, a podcast is like a radio broadcast delivered via a digital file using the Internet, where the user is in control of when and where the broadcast is listened to. Behind the scenes, podcasting is a combination of audio or video content, RSS (discussed in 2.6.8) and a program that deals with (a) RSS notifications of new content and (b) playback or download of that new content to a personal audio/video player. Vidcasts are the video equivalent of podcasts.

Examples of educational uses:

- Podcasts can be used to provide introductory material before lectures, or, more commonly, to record lectures for students who miss a class or want to listen again for reinforcement. Podcasts can also be used to entirely replace face-to-face lectures.
- Vidcasts can be used to supply videos of experimental procedures in advance of lab sessions.
- Podcasts can be used to supply audio tutorial material such as recordings of native speakers for use in language courses.
- Distribution and sharing of educational media and resources. For example, an art history class could have access to a set of artworks via a photo sharing system.
- Students can respond to each other's work.
- Flickr users can add annotations and comments, facilitating teacher explanations, class discussion and collaborative comment.
- FlickrCC³⁴ allows Flickr users to locate Creative Commons licensed images that are freely reusable as educational resources.
- Instructional videos and seminar records can be hosted on video sharing systems. Google Video allows for longer, higher-quality videos than YouTube, and contains a specific genre of educational videos³⁵.

2.6.5 Social networking systems

Social networking systems allow people to collaborate for various purposes. Examples include Facebook³⁶ and MySpace³⁷ (for social networking / socialising), LinkedIn³⁸ (for professional networking), Second Life³⁹ (a virtual world) and Elgg⁴⁰ (for knowledge accretion and learning). These systems allow users to describe themselves and their interests in order to forge online communities. A common feature is the ability to make links to a user's friends, so that finding one person with shared interests can lead through links to more users. The ranking of user contributions by community members, another common feature, allows for reputations to be built and for individuals to become members of good standing; this can be an important motivator for the individual contributions that make for a thriving community. The ability to create sub-communities allows for nurturing and growth of smaller areas of interest.

³⁴ Flickrcc, *Bluemountains.net*. URL: <http://flickrcc.bluemountains.net> Last accessed 1 August 2007

³⁵ Google Video BETA, Educational Genre. URL: <http://video.google.com/videosearch?q=genre%3Aeducational> Last accessed 1 August 2007. Some of this genre has been hijacked to promote particular political points of view.

³⁶ Facebook. URL: <http://www.facebook.com> Last accessed 1 August 2007.

³⁷ MySpace. URL: <http://www.myspace.com> Last accessed 1 August 2007.

³⁸ LinkedIn. URL: <http://www.linkedin.com> Last accessed 1 August 2007.

³⁹ SecondLife. URL: <http://secondlife.com> Last accessed 1 August 2007. There is some debate as to whether Second Life is a Web 2.0 technology.

⁴⁰ Elgg. URL: <http://elgg.net> Last accessed 1 August 2007.

Examples of educational uses:

- The use of Elgg at the University of Brighton is discussed in section 3.3.
- LinkedIn acts, at a professional level, as a model of educational use by allowing users to disseminate questions across the entire community.
- The virtual environment of Second Life allows for a wide variety of educational experiments from the construction of virtual campuses for student recruitment and orientation to the recreation of ancient monuments or geographically distant environments for exploration.
- Students at Goldsmith's college have created their end-of-year show in Second Life.
- Other varieties of social networking systems are used at a professional level for community learning and act as potential models for educational use. Confluence⁴¹, a corporate wiki system with a social network focus, is currently being used in a pilot project by Manchester Business School to promote the spread of knowledge in Local Government communities.

2.6.6 Social presence systems

These systems provide users with the ability to post short messages from different media/channels (e.g. web and mobile phone) and for users to subscribe to other users' messages in different ways. By posting multiple short messages users maintain a social presence on the web without the burden of posting longer blog posts. Examples are Twitter⁴², Jaiku⁴³ and Pownce⁴⁴, where the emphasis is on establishing social presence and connecting with others that use these services.

As far as we can tell educational uses of microblogging are not yet well-established, but potential educational uses could include:

- Students on a field trip alert each other to field discoveries as they work in a geographically dispersed fashion.
- Teachers distribute short lesson plans to students⁴⁵.
- Adapting existing educational mobile phone usage, language students receive daily vocabulary sets to memorise.
- One use we have seen Twitter, used to provide a feed of subject-related URLs⁴⁶.

2.6.7 Collaborative writing and editing tools

These allow users in different locations to collaboratively write and/or edit a document all working at the same time, preventing the problems associated with collaboration when a document must be passed from contributor to contributor. As yet most of these services do not allow for synchronous voice or video communication, so third-party synchronous communication systems are often needed to co-ordinate editing activity. Examples are Google Docs & Spreadsheets⁴⁷ (for text documents and spreadsheets) and Gliffy⁴⁸ (for diagrams), but there are over 600 such applications⁴⁹.

⁴¹ Atlassian, "Confluence – The enterprise wiki". URL: <http://www.atlassian.com/software/confluence> Last accessed 1 August 2007.

⁴² Twitter. URL: <http://twitter.com> Last accessed 1 Aug 2007.

⁴³ Jaiku. URL: <http://www.jaiku.com> Last accessed 1 August 2007.

⁴⁴ Pownce. URL: <http://www.pownce.com> Last accessed 1 August 2007.

⁴⁵ Oehlert, M (25 October 2006), "A Short Experiment: Six Word Lesson Plans", *The Learning Circuits Blog*, URL: <http://learningcircuits.blogspot.com/2006/10/short-experiment-six-word-lesson-plans.html> Last accessed 1 August 2007.

⁴⁶ education (a user name), "education". URL: <http://twitter.com/education> Last accessed 1 August 2007.

⁴⁷ Google Docs & Spreadsheets. URL: <http://docs.google.com> Last accessed 1 August 2007.

⁴⁸ Gliffy. URL: <http://www.gliffy.com> Last accessed 1 August 2007.

⁴⁹ IT Redux, "Office 2.0 Database". URL: <http://itredux.com/office-20/database> Last accessed 1 August 2007.

Examples of educational uses:

- For collaborative work over the web, either contributed simultaneously or simply to share work contributed by different individuals at different times; e.g. researchers from several countries writing a jointly-authored paper.
- Creation of works of art or design across disciplines; e.g. architecture and interior design students from different universities working together to complete a commercial brief.

2.6.8 Syndication and notification technologies

In a world of constantly-updated shared content, it is useful to be able to *easily* keep up to date with changes, particularly if one is interested in multiple sources of information on multiple web sites. A feed reader (sometimes called an aggregator) can be used to centralise all the recent changes in the sources of interest, and a user can easily use the reader/aggregator to view recent additions and changes. Behind the scenes this relies on protocols called RSS (Really Simple Syndication) and Atom to list changes. (These lists of changes are called feeds, giving rise to the name feed reader.) A feed reader regularly polls nominated sites for their feeds, displays changes in summary form and allows the user to see the complete changes.

Examples of educational uses:

- In a group project where a wiki or blog is being developed collaboratively, RSS feeds can be used to notify all members of changes as they are made.
- Feed Readers can also be used to track tags in social bookmarking systems, to keep track of new shared media, and to keep up to date with current news, e.g. from the BBC or CNN website.

2.6.9 Start pages

Start pages (sometimes called web start pages or webtops) include Netvibes⁵⁰, iGoogle⁵¹, and Pageflakes⁵². Start pages aggregate information sources (often based on notification technologies) and use small web-based applications called widgets to provide information to users.

Typically a user customises a start page's content and layout, and then chooses the start page as his/her browser home page. Then the user will see the start page when s/he starts-up the browser, or when s/he clicks on the browser's home icon. Alternately the user may bookmark the start page for easy retrieval. Once the start page is displayed, the user can then initiate various kinds of web related activity, e.g. following up on news displayed on that page.

Examples of educational uses:

- Displaying course-related news via a dedicated blog.
- Displaying a feed of URLs tagged by a class using a social bookmarking system.
- Displaying course events via a course calendar.
- Displaying news items for a current affairs class.

2.6.10 Bricolage and mashups

Inherent in Web 2.0 software is some ability for users to join together, personalise and configure systems according to their own needs. Thus, for example, bloggers can change the contents of the margins surrounding their posts to allow themselves and others access to further learning-related

⁵⁰ NetVibes. URL: <http://www.netvibes.com> Last accessed 1 August 2007.

⁵¹ iGoogle. URL: <http://www.google.com/ig> Last accessed 1 August 2007.

⁵² Pageflakes. URL: <http://www.pageflakes.com> Last accessed 1 August 2007.

information (e.g. their recent del.icio.us bookmarks, their wiki, a class calendar, URLs to open learning material) and communication facilities (e.g. enabling other users to contact them via Skype⁵³ using "Skype Me" buttons)⁵⁴. Similar use can be made of browser toolbars⁵⁵. The act of experimentally building new artefacts in this way is known as **bricolage**⁵⁶. Increasingly, bricolage facilities are built into application configuration facilities, but most bricolage still relies on some HTML knowledge and is thus beyond the competence of most users.

Web 2.0 also adds the notion of **mashups**⁵⁷, where users can mix and repurpose data for their own needs. The current state of the art is represented by Yahoo Pipes⁵⁸, a web-based facility that allows users to mix and process web-based data without needing to learn a programming language.

3 Institutional practice

Web 2.0 has created new ways of working, including opening up new opportunities in learning and teaching that have not been possible on a large scale before. This is similar to the way in which virtual learning environments (VLEs) such as Blackboard and WebCT created new opportunities during the 1990s. Before VLEs, learning technology was only suited to enthusiasts and experts due the difficulties involved in setting it up, developing and loading material, and registering students. While many people are beginning to make use of Web 2.0 technologies in learning and teaching, much of this is still experimental work carried out by enthusiastic lecturers who are willing to devote the time to make the technologies work for their teaching. There are some examples of universities grappling with these issues at an institutional level and using a variety of different approaches to do so. In this section, we illustrate the variety with five case studies.

3.1 University of Warwick⁵⁹

The University of Warwick, founded in 1965, is a medium sized, campus-based university with a high research rating. It has over 30,000 students and nearly 5,000 staff. Warwick was one of the first universities to offer Web 2.0 services at the institutional level, and has been offering all of its students personal blogs since October 2004. This was undertaken partly in the spirit of academic investigation, simply to see what would happen, and partly to foster a community, with educational goals secondary. The university decided to develop its own blogging system as, at that time, there were no commercial systems that met its needs. In particular, they wanted to have the ability to integrate the blogs with other university systems.

These blogs are widely used. Current statistics (from April 2007) give an indication of the take-up⁶⁰:

- 4,540 blogs
- 88,619 entries

⁵³ Skype. URL: <http://www.skype.com> Last accessed 1 August 2007.

⁵⁴ An example of setting up a blog's title bar and sidebar to facilitate personal learning is provided by Jo Kay in Kay, J (31 July 2006), "Cleaning up my PLE for CLC", *Stuff:ED*. URL: <http://jstuffed.blogspot.com/2006/07/cleaning-up-my-ple-for-clc.html> Last accessed 1 August 2007.

⁵⁵ van Harmelen, M (forthcoming, December 2007), "Design trajectories across four Personal Learning Environment implementations", special issue on PLEs, Taylor and Francis, *Interactive Learning Environments*.

⁵⁶ Turkle, S, and Papert, S (1991), "Epistemological Pluralism and the Revaluation of the Concrete" in Papert, S and Harel, I (eds), *Constructionism*, Ablex Publishing Corporation.

URL: <http://www.papert.org/articles/EpistemologicalPluralism.html> Last accessed 1 August 2007.

⁵⁷ For a thorough treatment of mashups in education, see Lamb, B (July/August 2007), "Dr. Mashup or Why Educators Should Learn to Stop Worrying and Love the Remix", Vol 42, No 4, *EDUCASE Review*.

URL: <http://www.educause.edu/apps/er/erm07/erm0740.asp> Last accessed 5 August 2007.

⁵⁸ Yahoo Pipes. URL: <http://pipes.yahoo.com> Last accessed 1 August 2007.

⁵⁹ Thanks to Graham Lewis for discussing work at the University of Warwick; see also McClellan, J (5 May 2005), "Just do it ... blog it", Technology Section, *Guardian Unlimited*. URL:

<http://technology.guardian.co.uk/online/story/0,3605,1476175,00.html> Last accessed 1 August 2007

⁶⁰ Warwick University, *warwickblogs*. URL: <http://blogs.warwick.ac.uk> Last accessed 1 August 2007.

- 13,255 tags
- 190,859 comments
- 111,803 images

When students leave the institution they can opt to have the blog deleted or suspended, or they can export the data to take with them. The blogging system has changed the social context for students by increasing their social contacts and ways of interacting with other people, but teaching staff have been slow to incorporate blogging into their teaching. While there are some inappropriate and offensive posts on the system, often these lead to comments from other bloggers which render the posting more positive or initiate a useful debate. This has meant that moderating has been less burdensome than expected. In theory students (and staff) are bound by Warwick's acceptable usage policy, but staff do not routinely monitor the blogs and only deal with cases that are reported to them. A greater challenge may be copyright, and there is considerable evidence that students can be less than diligent when re-using material from other sources⁶¹.

The University also has a podcasting service, and the Centre for Academic and Professional Development will lend out recording equipment to staff. The German Department is using podcasts to support vocabulary development and to record plays. There is also the intention to develop a wiki to accompany the blogging service.

3.2 University of Leeds⁶²

The University of Leeds is a large civic university, with over 32,000 students and a strong research base. The University of Leeds was one of the earliest to introduce a virtual learning environment (VLE), building their own system called Bodington (later made open source). About two years ago it was decided that Bodington no longer met the needs of the university and that a new VLE should be selected. A long and thorough consultation was undertaken on the choice of a replacement system. During this period academic staff were asked which tools they would find useful for learning and teaching, and some requested blogs and wikis. In October 2005 the university selected and installed MediaWiki as a wiki and Elgg for blogging as stand alone systems for staff experimentation.

This initiative is in line with the University of Leeds Learning and Teaching Strategy which emphasises the use of technology to enhance learning and teaching, "increasing the innovative ways in which technology is used" and "championing the use of technology through innovative pilot projects". The initiative also furthers the university's capacity for high-quality blended learning. Additionally it provides tools which can be used by staff and students as part of campus life to communicate information, work as groups, share research findings and take part in communities of practice in line with the university's stated values of community and academic excellence. Support for staff in using these tools has been offered since the start of the project by the Staff and Departmental Development Unit. Training sessions and workshops identifying good practice in using Web 2.0 tools in learning and teaching have been very popular. In contrast to the Warwick model, the blogging tools were not promoted directly to students. By promoting the tools primarily to staff, subsequent use has been focussed on delivering new ways of teaching and disseminating information within the institution. Students who are active on the Leeds blogs are doing so as part of a module or programme of study and have found the blogs via recommendation from their teachers. As of April 2007 there were 2,000 student accounts on the system. Student and staff are governed by an acceptable use policy, and there have not, so far, been any reported problems. It has been suggested that providing services via staff means that students see the services as part of learning and teaching rather than recreation and are therefore less likely to abuse the services.

⁶¹ Dale, J (24 March 2005), "Blogs at Warwick University", Blogger Me.
URL: http://www.bloggerme.co.uk/the_uk_web_log_forum/2005/03/john_dale_.html Last accessed 1 August 2007.
This post contains usage statistics from 2005, after approximately a year of use.

⁶² Thanks to Melissa Highton for discussing work at the University of Leeds.

The experience of the University of Leeds has been that offering the services first to staff has encouraged take-up beyond learning and teaching, to support research and management as well. In addition to use in learning and teaching there are many examples of University of Leeds staff making use of the blogging tools to support staff groups, to share information across campus and to reflect or record progress in their own work. Promoting blogs, wikis and other RSS-enabled applications such as podcasting and news feeds has been part of the Staff and Departmental Development Unit's support for the ongoing development of staff information literacy skills.

There were several reasons for creating locally managed systems:

- The webmaster preferred that institutional content be hosted locally rather than externally.
- Informal learning opportunities are seen as being as important as formal ones, and therefore infrastructure to support such opportunities was needed.
- It would be possible to attach the University of Leeds branding to locally-hosted solutions.
- Staff who want to use the systems in their teaching can enrol their students into the wiki or blog (or both).
- The roll out has been manageable: hosting and technical support has been provided by the central web team including the webmaster.

Reasons for not incorporating these tools into the institutional VLE are that:

- The institution is in a period of transition between VLEs and integration work will likely begin when a new VLE is in place.
- Blogs and wikis are promoted to staff as flexible tools for openness, creativity and community to be used as and when appropriate beyond application in learning and teaching.

Future plans include making the current system a fully-supported service run by Information Systems and Services and supported by their help desk.

3.3 University of Brighton⁶³

The University of Brighton is a new university, with 19,000 students and 2,100 staff spread over four campuses in and around Brighton. In September 2006, Brighton implemented Elgg⁶⁴ across the university⁶⁵, integrating it with their existing systems. According to Stan Stanier, Learning Technologies Director at Brighton:

We have Elgg running campus-wide with 36,000 users registered. The flexibility of the Elgg model made it easy to integrate with our institutional VLE and MIS⁶⁶ systems so we can use the same automated procedures to register students and course communities for all our systems. Our students took to using Elgg immediately and within two weeks we had a thriving and interesting blogging community. What's more rewarding is the manner of use rather than simply the scale of use – students and staff are using it both as an online social community and for shared academic interest. Elgg is now being used formally within courses and modules and less formally to bring together people with similar interests – enabling people to share information, reflections and comment across course boundaries and develop something very different to anything we've had before. I firmly believe we're taking the first steps from a Virtual Learning Environment to a Shared Learning Environment.⁶⁷

⁶³ Thanks to Stan Stanier for discussing the work at the University of Brighton.

⁶⁴ Elgg. URL: <http://elgg.net> Last accessed 1 August 2007.

⁶⁵ Community@Brighton. URL: <http://community.brighton.ac.uk> Last accessed 1 August 2007.

⁶⁶ Management Information System.

⁶⁷ Stanier, S (undated), quote in "An example user – University of Brighton", Elgg. URL: <http://elgg.org/features.php> Last accessed 1 August 2007.

Stanier describes the use of Elgg as "a glorious experiment" with the evolution of the system being driven by its users. The university sees Elgg as particularly helpful at fostering a sense of community across the split campus. As suggested above, take-up has been good, and some courses are being moved from Blackboard, their current VLE, to Elgg, because Blackboard does not allow student participation to the same degree. Students are also beginning to use the system for their personal development planning and for the creation of e-portfolios. Students are also able to incorporate material from elsewhere, such as MySpace (about 25% of students have MySpace accounts).

There is some take-up of the system in learning, and all course cohorts are automatically added to Elgg as communities, though students and staff are free to create their own communities too. Many of the student societies have done so. Examples of use in learning include media students who upload videos that they have created and then use the system to critique each other's work. Elgg is also providing new forms of student support. There have been cases of students who blogged about wanting to withdraw from their studies, for example, who as a result have been offered support from student services or other students.

While all staff and students have accounts, only a small proportion of these are active. This has increased from around 0.2% of all accounts by the end of November 2006 (soon after implementation) to about 4.5% in May 2007. There are currently approximately 13,700 posts with about 3,500 comments, and about 1,500 files uploaded into the system. This is lower than the University of Warwick's post and comment figures, but it is still a promising start considering that the Warwick system has been in longer use. Disappointing aspects have been the slow take-up of Elgg by members of the university, and the difficulties of enabling access by external experts / professionals who could contribute to learning and teaching programmes. Initially there was some inappropriate use, but such postings usually disappear within minutes due to peer pressure. The system has also been used for inappropriate sales activity on one occasion.

Overall, the University of Brighton has found that having an institutional system can be extremely helpful in building a community. Integrating the services into the environment raises their visibility and makes them easier to use. The greater communication and community-building possible in Elgg means that some courses are being moved from Blackboard.

3.4 University of Edinburgh⁶⁸

The University of Edinburgh was founded in 1588 and is a large civic university. It is one of the top ten universities in Europe⁶⁹, with over 23,000 students and almost 7,000 staff.

The University of Edinburgh is, as far as we are aware, the only university in the UK to have a formal Web 2.0 strategy⁷⁰. This strategy is also supported by an action plan towards the establishment of appropriate infrastructure to facilitate greater use of Web 2.0 tools and to foster their take-up through "leading by example". The strategy maps its proposed actions onto the university's overall strategic plan to demonstrate how Web 2.0 relates to the university's overall objectives. Strategies include:

- Use blogs and RSS feeds instead of newsletters – e.g. the internal Information Services staff newsletter, the Main Library Redevelopment Project updates, the Edinburgh University Complete Lifecycle Integrated Development Project (EUCLID) newsletter, the proposed University Web Development Project newsletter.

⁶⁸ Thanks to Chris Adie and Jean Ritchie for discussing work at the University of Edinburgh.

⁶⁹ According to the Times Higher Educational Supplement's *International comparison: Europe's top 50 universities*. URL: http://www.thes.co.uk/statistics/international_comparisons/2006/top_europe.aspx Last accessed 1 August 2007.

⁷⁰ University of Edinburgh, *Web 2.0 Initiative Home Page*. URL: http://www.is.ed.ac.uk/projects/Web_2.0_Initiative Last accessed 1 August 2007.

- Make use of Web 2.0 mapping technologies such as Google Maps to supplement or replace the online versions of the university campus maps. This would enable directions to be generated automatically.
- Use social bookmarking technologies such as del.icio.us to manage course reading lists, perhaps in a collaborative way so that students can benefit from others' discoveries of relevant material. Link the service with Library resources and WebCT.
- Support development projects and research projects with social bookmarking, allowing an information resource base to be constructed collaboratively.
- Provide podcasts of public lectures (honorary graduates, inaugural lectures, high-profile special events), which can be downloaded after the event from the relevant part of the university's website. (Webcasts are also possible and do take place, but require considerable staff effort and cannot be downloaded to a portable player.)
- Provide podcasts as part of support materials, e.g. a podcast tour of major university services or buildings (such as the Main Library).
- Use services such as Frappr⁷¹ to help build a sense of community amongst international postgraduate students prior to arrival (this is already under consideration in Moray House School of Education).

Besides supporting the technology, Edinburgh have also created an adoption strategy which includes:

- Identifying key individuals (evangelists), especially amongst senior administrators and senior academics.
- Provision of training to show how the tools and approaches they foster can be integrated into daily practices.
- Support of the above with promotional activity.
- Gather examples of good practice and foster a community.
- Provide the ability to surface the systems through the university web site and MyEd portal.
- Develop recommendations, jointly with other relevant parties in the university, on the management of externally-facing Web 2.0 services.
- Lead by example such as:
 - Use of blogging for major projects (e.g. the Main Library Redevelopment Project) and to replace the Information Systems staff newsletter.
 - Use a wiki to develop information systems plans.
 - Use a wiki to facilitate meetings, e.g. to prepare the agenda and deliver the minutes.
 - Use instant messaging to facilitate IT support to students.

Considerable effort is still needed to promote the services within the university, but leading by example can help. It is important to integrate the systems with the university portal to make them easy to find and use.

3.5 The University of Klagenfurt ⁷²

The University of Klagenfurt (UniKLU), in Austria, was founded in 1970 and has approximately 7,000 students and 700 staff. The university currently hosts Elgg at an institutional level⁷³ for social networking, file sharing and e-portfolio purposes. The university uses Moodle⁷⁴ as its VLE and provides a single sign-on across Elgg and Moodle so that users only need to log in once to get access to both systems. Moodle allows export of files to users' file space on Elgg so that they can be copied from the learning environment to an e-portfolio. RSS feeds, providing users with easy

⁷¹ Frappr. URL: <http://www.frappr.com> Last accessed 1 August 2007

⁷² Thanks to Wolfgang Greller for discussing work at the University of Klagenfurt.

⁷³ uni@klu Elgg, University of Klagenfurt. URL: <https://elearning.uni-klu.ac.at/elgg> Last accessed 1 August 2007.

⁷⁴ Moodle. URL: <http://www.moodle.org> Last accessed 1 August 2007.

access to news and changes from sites and blogs they are interested in, can be exported from both systems and used in the normal fashion via a news reader.

Although the following facilities are not hosted across the university, students and staff can also request personal use of WordPress⁷⁵ (blog), Coppermine⁷⁶ (image gallery), MediaWiki⁷⁷ (wiki) and Joomla!⁷⁸ and Drupal⁷⁹ (content management systems)⁸⁰.

Some specialist training for Web 2.0 is offered:

- A cross-faculty module on "e-Learning and Social Software Applications for practical usage" has been run once (in 2006/7) and is currently being considered for future use. The module supplied course credits to students registered for the Teacher Training e-Education Certificate, and for Media and Communication Studies. However the module was open to all students.
- From September 2007 the University will provide compulsory Elgg training to all incoming undergraduate students. Subsequent use of Elgg will be optional.
- UniKLU runs an e-Learning training cycle for staff which includes one dedicated session on Web 2.0 technologies entitled "Collaborative Learning with Web 2.0". The focus of this session is to raise awareness of the pedagogical potential of Web 2.0 tools. The session includes a focus on specific tools, e.g. Flickr and Elgg, and more general training on the use of blogs to document progress, share feedback from learning experiences, present competences, create learning diaries, etc. UniKLU aims to provide scaffolding for lecturers to integrate these tools into their own teaching practice.
- UniKLU is involved in the European Union's LINGUA project which is still in its initial stages. LINGUA seeks improvement in the quality of life-long language learning and language teaching, in part through improved language learning tools. To date, blogs (using Wordpress) have been used to build an online informal language learning environment to connect language learners (inside and outside the university) with both native speakers and learners from other countries.

Web 2.0 has not as yet had any strong or widespread effect on teaching and learning practice at UniKLU, but signs of change are emerging. Web 2.0 facilities are helping to make learning more student-centred, where students take greater control of managing, documenting and reflecting on their own learning. Increased tool-based social connectivity and collaboration is being exploited by some lecturers to improve learning processes. Wikis are being used for collaborative work of this kind.

UniKLU has general usage terms governing networked resources. The university does not monitor use, but rather responds rapidly where its attention is drawn to inappropriate use. Abnormal traffic level is one indicator that some investigation is needed. A few minor copyright infringements have happened, and the university has responded by taking the material in question off-line.

Elgg is integrated with the University's authentication system so that only university members can create content, though it is visible by external users. The university is, however, in the process of providing wider connections via trusted federated networks that include other universities. To date UniKLU has a formal agreement with two other institutions to let students connect, share and set up inter-institutional groups.

⁷⁵ WordPress. URL: <http://wordpress.org> Last accessed 1 August 2007.

⁷⁶ Coppermine, URL: <http://coppermine-gallery.net> Last accessed 1 August 2007.

⁷⁷ MediaWiki. URL: <http://www.mediawiki.org> Last accessed 1 August 2007.

⁷⁸ Joomla! <http://www.joomla.org> Last accessed 1 August 2007.

⁷⁹ Drupal. URL: <http://drupal.org> Last accessed 1 August 2007.

⁸⁰ Moodle, Joomla! and Drupal make some use of AJAX, which is generally considered to be a Web 2.0 technology.

However, the systems themselves are not deeply Web 2.0.

3.6 Analysis of institutional experiences

The above examples show differing rationales and approaches relating to the implementation of Web 2.0 in higher education institutions. In all of these cases, institutions have implemented Web 2.0 not just for teaching and learning, but also for purposes of research, management/administration and social/personal use. In so doing, the institutions have had to address issues including:

- Whether to host systems themselves or rely on externally (commercially) hosted systems.
- What types of tools to implement (wikis, blogs, e-portfolios, social bookmarking, etc.).
- Whether to put the tools within the VLE or make them more generally available.
- The level of visibility to the outside world, and in particular whether / how to allow / enable people from outside the university to contribute.
- How to monitor the systems for inappropriate and offensive use, and how to deal with abuses.
- How to encourage uptake and use.
- Whether to automatically enrol all members of the university or to do so by request.
- Whether to make activities student or staff led.
- How the use of Web 2.0 tools will affect learning and teaching.

4 Strategy and policy

As Web 2.0 becomes more widely accepted for learning and teaching, universities will need to consider how these technologies and approaches work with existing university strategies and policies. In some cases it is likely that these will have to be reviewed so that Web 2.0 technologies are integrated into mainstream practice and innovation is allowed to flourish. Few universities have specific Web 2.0 policies or strategies (the only one we are aware of is the University of Edinburgh⁸¹), but a considerable number of universities are beginning to address Web 2.0 when updating their strategies and policies.

There are several areas of strategy and policy that are germane, including:

- learning and teaching
- information technology
- information
- accessibility

In addition, some of the concerns that may need to be addressed in developing these strategies are discussed below.

4.1 Intellectual property rights

4.1.1 Ownership

Web 2.0 as a platform for content generation, re-purposing and consumption presumes that many people will create and modify content, which may lead to questions as to who has ownership. Participating parties and potential content owners could include the site owner (which could be the organisation hosting it or the user in whose domain the content is being created) and people who created or contributed to any amendments of the content. With a blog or media sharing site additions are likely to be limited to comments, tags, and recommendations and are usually

⁸¹ University of Edinburgh, *Web 2.0 Initiative Home Page*. URL: http://www.is.ed.ac.uk/projects/Web_2.0_Initiative Last accessed 1 August 2007.

separate from the original content, but with a wiki the content may be created in a closely interleaved fashion by more than one content creator. As Korn and Oppenheim⁸² suggest:

Although copyright protection is automatic upon the creation of a qualifying work, many users of Web 2.0 technologies and services are not aware of this and mistakenly believe that because of the ability to create, share and adapt material, the Internet contains vast amounts of Public Domain material that can be freely accessed and used. This means that some users will use works created by others and pass these off as their own. Alternatively, they may be unaware of the complexity of rights issues within any one piece of material; for example, if they take a photograph of an art work still in copyright, although they would quite rightly own the rights in the photograph, the art work itself would still be in copyright and permission would need to be sought prior to material being posted, for example, on Flickr.

and

works generated will be the result of collaboration between many different users, most of whom will not know each other and almost certainly be based in a multitude of jurisdictions. The principle in UK law is clear – a work is jointly authored (and therefore the copyright is jointly owned) if it is a work produced by the collaboration of two or more authors in which the contribution of each author is not distinct from that of the others. This gives rise to two possibilities. The first is that it is clear, e.g., from a conversation thread, that person A contributed X and person B contributed Y. In such cases, copyright in X is owned by A and in Y by B. The second possibility is that there is such interleaving of materials by A and B that it is impossible to clearly state what A contributed and what B contributed. In such cases, then the entire material (X+Y) is jointly owned by A and B. (Of course this can be extended further to as many authors as one likes). This is important, for if a third party then wishes to use the combined materials which are indeed jointly authored, then, as the materials are jointly owned by A and B, both A and B must give their permission for reuse. Permission from just one of them is insufficient.

The issue may be further complicated by whether the system is hosted by a university or an external site and, therefore, whether institutional or site-specific policies apply. For an institutional system there may be additional complications where people outside the institution (visiting lecturers, external workers on collaborative projects, etc.) contribute. Additionally, many universities claim the intellectual property rights for any content generated by their staff (and, in some cases, students as well) in the course of their duties. This may become increasingly difficult to police where content is placed in open environments.

In addressing these issues, universities will need to consider whether they should host Web 2.0 services or make use of external services, and consequently what content they can claim ownership of, bearing in mind that this may have an impact on liability for defamatory or uncivil content, or copyright infringements for copied and re-purposed material. It is also necessary to consider what to do with content generated by students or staff who subsequently leave the university. Much of this can be addressed through having a license for the system that applies to all content posted on it, as, for instance, in the case of YouTube⁸³, but universities may also need to revisit their information strategies.

⁸² Korn, N, and Oppenheim, C (April 2007), *Web 2.0 and IPR: A short scoping study for the Users and Innovation Programme*, Draft Version, JISC. Note that this discussion is informed by UK law, and may not apply elsewhere.

⁸³ **"For clarity, you retain all of your ownership rights in your User Submissions.** However, by submitting the User Submissions to YouTube, you hereby grant YouTube a worldwide, non-exclusive, royalty-free, sublicenseable and transferable license to use, reproduce, distribute, prepare derivative works of, display, and perform the User Submissions in connection with the YouTube Website and YouTube's (and its successor's) business, including without limitation for promoting and redistributing part or all of the YouTube Website (and derivative works thereof) in any media formats and

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4.1.2 Re-use

Universities make considerable use of published materials in learning and teaching, including text books, academic papers, and learning objects. These materials may be in paper or, increasingly, electronic form. When these are used in a Web 2.0 environment they may become visible to people outside the university, which may breach current licensing arrangements, so that both re-use and license terms may need to be reconsidered.

Universities may have to negotiate licenses with suppliers that allow for appropriate use and visibility of materials. This may in turn raise issues as to who is a "member" of a university. Clearly employees and students are members, and visiting lecturers are usually deemed to be so. But what of alumni, or someone from outside who participates in a single activity? These issues are not new, or specific to Web 2.0, but the changing milieu is bringing some of these issues to the fore.

4.1.3 Control

Where there is a service (blog, wiki, content sharing, social bookmarking) that is designed to support a course, issues arise over control as much as over ownership. There are legal, ethical and pragmatic issues in controlling the environment. Further, there are potentially competing pressures (i) to ensure that material is not illegal (e.g. defamatory, contravening intellectual property rights, etc.), and (ii) to support academic freedom. Once some form of moderation is introduced the university is then asserting that content that is posted is acceptable, and it is less likely to be able to use a defence of being a common carrier. Similarly, there are grave concerns over censorship and academic freedom in relation to moderation which cannot easily be resolved. Finally, there are significant pragmatic issues, especially if the usage becomes high or is widely distributed through many different forms of technology. Some institutions attempt to resolve these issues by using post-moderation, where content is only considered for action if it is reported by users.

Universities will need to determine whether content should be moderated, and whether there should be the possibility of removing offensive or irrelevant material. As part of this they need to consider where the responsibility lies: with the course tutor, the university, or elsewhere. In our webinar series, considerable concern was expressed over any form of moderation by staff, as well as a belief that students would undertake most of the necessary control themselves through peer pressure, though there may be a need for action by the university in the last resort. Clearly, there will be differences depending on whether the service is hosted by the university or by some other supplier. This raises the question of whether a university can still be held responsible for the actions of its staff and students on external sites if this work is undertaken in the course of their duties. Universities will need to consider how best to resolve these issues, using a mixture of formal and informal moderation, the implementation of "take down" notices and similar measures. We expect practice to evolve rapidly in this area, and universities would be advised to actively monitor practice in the field.

4.2 Accessibility

While there are some accessibility concerns with a number of Web 2.0 systems from a technical point of view, many of which make use of technologies such as JavaScript, Ajax and Flash (all of which can cause accessibility problems for some) there are also a number of potential benefits. Students may be able to create content in a form appropriate to their needs using different Web 2.0 technologies. It is easy to add transcripts or notes to audio or video, for example, to offer alternative affordances for users with hearing difficulties. There are also other ways in which Web

through any media channels. You also hereby grant each user of the YouTube Website a non-exclusive license to access your User Submissions through the Website, and to use, reproduce, distribute, prepare derivative works of, display and perform such User Submissions as permitted through the functionality of the Website and under these Terms of Service. The foregoing license granted by you terminates once you remove or delete a User Submission from the YouTube Website." URL: <http://youtube.com/t/terms> Last accessed 1 August 2007.

2.0 may offer alternative affordances and enhance accessibility. For instance, scribd⁸⁴ allows documents to be uploaded in a number of formats and then offers the documents for download in a variety of formats including Microsoft Word, PDF, plain text and audio (MP3), thereby offering users a wide range of possible access methods. Similarly, it has been argued that comments (e.g. on blogs) offer a variety of views on a topic which may make the content more accessible from an intellectual perspective.

Universities will need to consider how the features of Web 2.0 can be harnessed to enhance accessibility for all students (and staff), and whether there are particular approaches that should be supported in learning and teaching strategies, perhaps with the cooperation of student support services.

4.3 Learning, teaching and assessment

Specific strategies and concerns relating to learning and teaching are discussed more fully in section 5. Here, we note only that effective learning and teaching practice using Web 2.0 is still under development. As the opportunities afforded by Web 2.0 become better understood it is likely that universities will have to revisit their learning, teaching and assessment strategies to ensure that they take account of new possibilities and enable the incorporation of new approaches. This may be particularly complex where there are external validating bodies (such as learned societies), and it will be important that the implications of Web 2.0 for learning, teaching and assessment are understood at all levels.

4.4 Security

We take security to have a very broad meaning that includes both personal security and network and IT systems security.

4.4.1 Personal security

Web 2.0 opens systems up to much wider and more open use, and there are concerns over child protection (rarely a problem in universities, though issues may arise in fields like medicine, health, social work and education as well as student services such as campus child care facilities⁸⁵) and cyber-bullying. Universities may need to re-consider or develop policies to protect staff and students from abuse.

4.4.2 Network and IT Systems Security

In the UK all universities have acceptable usage policies (it is a requirement for connection to JANET, the UK academic network). Many universities go much further and block a wide variety of ports and tools. In some cases this is because of concerns over bandwidth usage (many universities have been blocking Skype, for instance, for fear of unsustainable levels of network traffic). Some sites may be blocked because of concerns over "Malware"⁸⁶ (viruses, trojans etc.) Others have blocked services such as FaceBook and MySpace over concern about legal responsibility for postings, because of issues like cyber bullying, or because of concerns over defamation⁸⁷. Universities will have to balance the educational opportunities afforded by these services with the risks. This is not a new issue for universities, of course, but Web 2.0 changes its context.

⁸⁴ Scribd. URL: <http://www.scribd.com> Last accessed 1 August 2007.

⁸⁵ Related, but for children: BBC, "Web safety warning for children".
URL: <http://news.bbc.co.uk/1/hi/uk/6652585.stm> Last accessed 1 August 2007.

⁸⁶ BBC, "Google searches web's dark side".
URL: <http://news.bbc.co.uk/1/hi/technology/6645895.stm> Last accessed 1 August 2007.

⁸⁷ BBC, "Facing up to Facebook fears".
URL: <http://news.bbc.co.uk/1/hi/technology/6639417.stm> Last accessed 1 August 2007.

4.5 Preservation of data

One of the key functions of universities has been the preservation of information. Historically this has been done through paper-based media such as published books and archival material retained in an archive or library. With electronic resources three new issues present themselves:

- What is the authoritative version of an artefact? This is especially problematic where many people are contributing to it. At what point does it become something that should be preserved? Should all the changes be preserved too?
- What is the status of a work? If it can always be changed then how can peer review (or similar processes) be used to determine the work's value and authority? How does preservation relate to the version(s) that were peer reviewed? And what is the scope of any such peer review?
- How can the content be preserved in a form in which it can continue to be accessed? Technology is changing very fast, and while some formats will be usable for a long time (HTML for instance) others may not be.

Universities would be advised to consider who is responsible for determining what information should be archived and what formats are appropriate for preservation. We note that limitations on the formats that are supported for preservation may impose restrictions on the types of content that users are able to create if they want the content to be preserved.

Related to this is the issue of citation. With dynamic content it can become difficult to refer to artefacts as they keep changing. While there is a general academic convention of adding "retrieved on <date>" to references to material on the web, the material referred to may change in ways that can not be determined, or may disappear from the web completely. This has led to the suggestion that it may be necessary to keep a copy of the page at the time it is referenced as proof that the reference is valid. There is a need to consider appropriate ways of referring to the content so that others can identify precisely what is being referred to. For instance, if one were to refer to something in a wiki the content may have changed by the time someone follows up the reference. Where a wiki supports the ability to see all previous versions it is possible to indicate a date and time to which the reference relates, provided that the page actually persists in the wiki.

Another important concern with preservation is that as students grow and mature and disciplines evolve, content which once seemed interesting or relevant may now be embarrassing. For instance, we hear of employers in some fields routinely "googling" job applicants. Students (and staff) may therefore want to use some caution before posting to the world.

4.6 Hosting

Web 2.0 raises a number of issues around the hosting of services. Either the services can be hosted by the university, which would then choose the most appropriate systems and support them, or the university can choose externally hosted services (either for free, or as a paid service). Each has advantages and risks.

4.6.1 Externally hosted services

There is a wide range of externally hosted Web 2.0 systems to help deliver teaching materials and learning opportunities. Externally hosted systems offer several advantages. They are usually easy and often free to use, sometimes with the condition that users accept advertisements being displayed as part of their pages. Sometimes the scale of use of a system is in itself an advantage. For example, 43 Things⁸⁸, a system that offers opportunities to express learning goals and find other people to learn with, works well because of the size of its user base.

⁸⁸ 43Things. URL: <http://www.43things.com> Last accessed 1 August 2007.
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Because of the wide range of functionality offered by externally hosted systems, users can generally pick and mix systems according to their needs in what is called a "small pieces loosely joined" philosophy. In our consultative work for the JISC report upon which this report is based, we found that there was a general concern about using externally hosted services for the following reasons:

- A service could be terminated at any time (possibly without warning), leading to loss of content which has not been backed up.
- Back-up facilities, procedures and responsibilities for externally hosted services are an area of concern.
- Charges could be introduced or increased at any time.
- There is limited control by lecturers and other teaching staff (except in their own spaces).
- There is less staff control over unacceptable use (this contrasts with the desire not to have staff moderation, as discussed in 4.1.3).
- There may be problems attempting to provide multiple versions (e.g. a new version for each time a course is run, or for each tutorial group).
- Academic freedoms may be impacted, for example images might be deemed offensive and result in the loss of the images or the suspension of the user's account.

Which raises the questions:

- How real are these risks?
- For the real risks, what can be done to ameliorate them?

There are no simple answers here, and it will be up to universities to undertake their own risk assessments of the issues and determine how to reduce the risks to an acceptable level.

4.6.2 Internally hosted services

Web 2.0 services that are hosted by the university offer a number of advantages, including:

- The ability to implement single sign-on.
- The ability to include licensed material without violating licensing agreements.
- The ability to offer support and training in the use of the tools, as the number is limited.
- The ability to control when updates occur, in line with university timetables to minimise any adverse impacts.
- Knowledge that the systems will be maintained and backed up.
- The ability to integrate Web 2.0 systems with other systems including the university's virtual learning environment (VLE), library services and portal.

However, internal hosting will reduce the choice of available systems as it is impossible for a university to support the vast number of Web 2.0 systems that are available. There are also a number of risks associated with hosting the services internally, including:

- Systems may not be kept up to date, depending on priorities in the service supporting them.
- Universities may have a restrictive usage policy, for example only allowing their members and associates access rights.
- There may not be a sufficient number of users to make the services work effectively.

4.6.3 Integration

There are potential advantages to the integration of Web 2.0 systems within more conventionally used e-learning systems. These advantages include provision of the tools in an integrated environment potentially providing some ease-of-use advantage through integration and single-sign

on⁸⁹. A disadvantage to integration is that one may lose the flexibility of the Web 2.0 "small pieces loosely joined" philosophy, where, as mentioned above, a user can select from a range of tools, mixing and matching according to need. There are many systems that Web 2.0 tools could be integrated with, including:

- VLEs, which are typically structured around courses.
- Portals, which are typically structured around information sources.
- e-Portfolios, which are structured around the individual and his or her activities.

There are, inevitably, tensions between these ways of viewing the world, and if Web 2.0 tools are fully integrated into one of these then it may affect how the tools are used and how they can be integrated with other tools. There are arguments that tools like blogs can be used for a wide variety of purposes across an institution including supporting learning and teaching, research and management. This gives rise to the question of whether Web 2.0 tools should be integrated into the institutional VLE, and if so, how.

Other tool-related questions include:

- Which environments should the Web 2.0 tools be integrated with?
- Should universities support more than one set of Web 2.0 tools (i.e. one set within the institutional VLE for learning and teaching purposes and one set outside the VLE for more varied uses)?
- If the Web 2.0 tools lie outside the VLE then how are they integrated, if at all, with other tools within the VLE?
- If Web 2.0 tools are supplied within the VLE for learning and teaching purposes then how are they integrated with other aspects of the university and university life?

5 Learning, teaching and assessment

5.1 Changes in student population

Web 2.0 technologies are one group of digital technologies that are increasingly helping to change some characteristics of current and future student cohorts, and these changes may in turn necessitate profound alterations in learning and teaching methods. As a result of the Internet in general, and Web 2.0 in particular, many students are entering higher education with a background and skill set different both from previous students and from their instructors. In a significant and widely-cited article, Marc Prensky⁹⁰ defined "digital natives" as a generation that has grown up with digital technology, operating at "twitch speed" and performing multiple activities simultaneously. In part two of the same article⁹¹, Prensky claims that changes in activity during development may ("almost certainly") have resulted in different neural wiring via processes of neuroplasticity. He also claims that digital natives have acquired different ways of thinking, thanks to different cultural practices. Prensky suggests that while "digital natives" have shorter attention spans, and less ability to reflect on topics, they instead have greater visual skills, the ability to concentrate on different media simultaneously, and the ability to monitor changes and make inductive discoveries.

⁸⁹ Multiple Web 2.0 systems generally require multiple distinct sign-ons. However, the problem of moving to an easier sign-on regime is currently being addressed within the Identity 2.0 movement that aims to provide distributed user-centric identity and reputation management systems which will solve the problem of having to use multiple logins by having a single sign-on for all digital systems that require sign-on.

⁹⁰ Prensky, M (October 2001), "Digital natives, Digital Immigrants, Part 1", Vol. 9, No. 5, *On the Horizon*, NCB University Press. URL: <http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf> Last accessed 1 August 2007.

⁹¹ Prensky, M (December 2001), "Digital natives, Digital Immigrants, Part 2", Vol. 9, No. 6, *On the Horizon*, NCB University Press. URL: <http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part2.pdf> Last accessed 1 August 2007.

He writes: "While these individual cognitive skills may not be new, the particular combination and intensity is. We now have a new generation with a very different blend of cognitive skills than its predecessors—the 'Digital Natives'". Similarly, Oblinger and Oblinger⁹² have characterised net-generation ("n-gen") students as digitally literate, highly Internet familiar, connected via networked media, accustomed to immediate responses, preferring experiential learning, highly social ("being a friend of a friend is acceptable"), preferring to work in teams, craving interactivity in image-rich environments (as opposed to text-intensive environments), and having a preference "for structure rather than ambiguity". We note that this is not necessarily a function of age, as there are plenty of mature students (and even old students) who make considerable use of Web 2.0 technologies, and, conversely, young students who do not use the technologies.

Questions arise:

- Are these new student skill and preference sets different enough to demand changes in teaching methods to successfully engage with these students?
- Do the skill sets of incoming students demand (possibly only transitional) remedial teaching, for example, in using libraries and finding primary sources?
- Does the changing student profile dictate different ways of teaching that, e.g., minimise traditional patterns of attendance and increase flexibility in where and when learning takes place?

Somewhat anecdotally, there are different perspectives relating to student engagement (and therefore grades and retention):

- We have seen reports of lecturers moving part or all of their electronic course support from traditional VLEs to social networking systems like MySpace and Facebook because of greater student engagement with these kinds of social networking tools. Web 2.0-enabled approaches may therefore help lecturers engage with students. However, there is also evidence that many students see these systems as their space that should not be 'invaded' by faculty⁹³.
- On the other hand, recent student interviews⁹⁴ in a humanities school in a UK University revealed that students were not concerned about how they are taught (e.g. through lectures, seminars, or through a blended learning approach) so long as the instruction is good. This then raises the question of what is good practice in learning and teaching in different modalities.

5.2 Examples of Web 2.0 in learning and teaching

As examples of areas and approaches where Web 2.0 tools can be deployed to good effect, we discuss their use in group work, including student generation of learning materials, and in social constructivist and constructionist approaches.

Group work can often be aided by having social software available. This is no surprise when we note that social software is software that facilitates group process. Thus, for example, blogs can be used in personal writing and group critiques thereof and wikis can be used by groups co-

⁹² Oblinger, D, and Oblinger, J (2005), "Is It Age or IT: First Steps Toward Understanding the Net Generation", in Oblinger, D, and Oblinger J (eds.), *Educating the Net Generation*, Educause.
URL: <http://www.educause.edu/educatingthenetgen> Last accessed 1 August 2007.

⁹³ Hewitt, A, and Forte, A (2006), "Crossing Boundaries: Identity Management and Student/Faculty Relationships on the Facebook", CSCW'06, November 4-8, 2006.

⁹⁴ So recent, in fact, that the academic commissioned to interview students has not yet presented these results to the school concerned, precluding dissemination of the name of the particular school and university.

operatively producing artefacts directly in the wiki, or documenting group processes and external products⁹⁵.

5.2.1 Content sharing

Moving beyond support of group work, we note content-sharing opportunities for students to create course and instructional materials. There is currently a divergence of opinion as to whether (particular kinds of) students can create significantly good course materials using Web 2.0 systems. This is an interesting area where evidence will only emerge over time. However, in some sense student creation of learning materials is already happening: if one acknowledges that Wikipedia is an educational aid that contains learning materials, there are existing university courses where students, as part of their course work, contribute to Wikipedia articles. Two other examples are of interest: Wikiversity⁹⁶ seeks to establish a "community for the creation and use of free learning materials and activities" and the Open University's OpenLearn project⁹⁷ has an explicit aim of student re-mixing and modification of module materials, together with the (as yet unimplemented) ability to upload modified materials back to the OpenLearn site.

5.2.2 Social constructivism

Social constructivism has as its central precept that knowledge is created by learners in the context of and as a result of social interaction. Social constructivist approaches may be particularly aided by Web 2.0 tools as mediating mechanisms between collaborating students and between students and teachers, particularly between students who might sometimes be working in different places and at different times. Thus, for example, a group of students might construct an artefact in a wiki, but also be guided by a teacher who provides scaffolding in the same wiki. This scaffolding could take the form of wiki page structure and titles for pages to be filled in by the students, guidance as to areas to discuss in the wiki, the kind of content that is desired, and feedback on existing student-produced content. In this way a teacher can, among other things, reduce the distance between the actual level of the learners' development and the level of their potential development⁹⁸.

5.2.3 Constructionism

Constructionism, as advocated by Seymour Papert, is also amenable to Web 2.0 approaches. In Papert's words "Constructionism ... shares constructivism's connotation of learning as 'building knowledge structures' irrespective of the circumstances of the learning. It then adds the idea that this happens especially felicitously in a context where the learner is consciously engaged in constructing a public entity, whether it's a sandcastle on the beach or a theory of the universe"⁹⁹. Social software systems can be used for the construction of public entities, for example, via a video presentation on a social media system, a blog entry (for individual work) or a set of wiki pages (for individual and group work).

5.3 Independent learners and Personal Learning Environments

A major aim of university education, besides subject specific knowledge, is to produce independent (or autonomous) learners able to set their own learning goals¹⁰⁰, develop learning strategies to achieve those goals, work towards realising their goals, either on their own or with others, and

⁹⁵ Incidentally, wikis can also be used as personal media, as, for example, as a dynamic personal logbook, serving the accretion of individual knowledge.

⁹⁶ Wikiversity. URL: <http://en.wikiversity.org> Last accessed 1 August 2007.

⁹⁷ Open University, OpenLearn. URL: <http://openlearn.open.ac.uk/> Last accessed 1 August 2007.

⁹⁸ Vygotsky, L.S (1978), *Mind and society: The development of higher mental processes*, Cambridge, MA: Harvard University Press.

⁹⁹ Papert, S, and Harel, I (1991), "Situating constructionism", in Papert, S and Harel, I (eds), *Constructionism*, Westport, Connecticut., Ablex Publishing Corporation. URL: <http://www.papert.org/articles/SituatingConstructionism.html> Last accessed 1 August 2007

¹⁰⁰ Clearly in a higher education context, except in the most radical scenarios where the problem determines the syllabus, independent learning and its outcomes have to be aligned with syllabus requirements.

reflect on their learning processes and outcomes; extending their learning by reflecting on their learning and the processes used to achieve it.

The growing but still-nascent Personal Learning Environment (PLE) movement has a significant Web 2.0 following which claims that PLEs are social software tools that enable or assist learners to take control of their own education. Unless we take an approach to PLEs that counts web browsers and collections of Web 2.0 services ("small pieces loosely bound") as PLEs, there are few PLEs in existence today. The question of whether we can build tools to truly enable, rather than just help, the growth of independent learners as yet remains open.

5.4 New pedagogies and new assessment methods

Our consultative work for the JISC report upon which this report is based revealed considerable interest in and opinion on pedagogies and assessment¹⁰¹. This was, we believe, motivated by contemporaneous staff interest in finding more effective ways of learning and teaching. The view of the consultative body (participants in the final webinar) is that we are at an early stage of development in our use of Web 2.0 technologies in learning and teaching, that new pedagogies will emerge as a result of exploratory work, and that these are likely to demand new assessment methods.

We add that Web 2.0 should be seen as only one of a range of interrelated drivers mentioned above in section 2.3. Work with the development of Web 2.0-related pedagogies and assessment methods might well be seen in a broader context. In this regard, we note the following:

1. While some examples of specific pedagogical approaches are mentioned above, our earlier consultative work revealed strong feeling that educationalists do not as yet know how the increased use of Web 2.0 technology will interrelate with learning and teaching, and in turn how it will demand new pedagogies and new assessment methods.
2. The changing nature of students entering higher education may require responses, possibly in different directions. This may include a need to supply both engaging ways of tuition and remedial teaching, in, for example, reflection or the use of primary sources.
3. While within higher education there is often a need for a pragmatically chosen amalgam of pedagogic approaches that are selected on the basis of knowledge to be gained, learning and teaching context, desired learning outcomes, and so on, there may be a need for new pedagogical models to support (a) opportunities opened up by Web 2.0 technology, and (b) demands placed on the higher education system by changed characteristics in student intake.
4. Increased group work moves from the model of individual work and individual assessment that underpins and forms the basis of higher education and requires a response that provides suitable assessment methods that allow universities to grade students for degree class.
5. In group work the nature of assessment needs to change in major ways to preserve the notion of individual assessment. In a recent survey¹⁰² of student attitudes to group work the general attitude to assessment of group work was one of complaint that high achievers may be graded down, and low achievers or coasters may be graded up. Anecdotal evidence elsewhere points to extreme rigour in student assessments of each other's contribution to group work, and, subject to further investigation, students' own assessments of the relative contributions of group members might be folded into group work assessment approaches as standard practice. However, care is needed. A counter example was provided at a recent JISC Emerge meeting, of a student who was disliked by the rest of a group, and whose contribution was denied by the other members of the group as a result.

¹⁰¹ Assessment can be viewed as part of pedagogy. However, it is convenient to treat assessment separately here.

¹⁰² A sample of MSc students in the School of Computer Science, University of Manchester.

6. Simply moving to increased group work in a relatively unplanned fashion because group work is assisted by Web 2.0 tools is not desirable. Good group work demands groups that function well at an intellectual level and have good group dynamics. As a Future lab report¹⁰³ states: "The quality of your learning community becomes significant if you are relying on a group to provide you with pointers and structures of information. If you are learning from a group – it had better be a good group." One solution here is to retain teacher involvement in groups until they reach a state of quality in learning.
7. Opportunities for different kinds of assessment will emerge. These might be based on activities that are currently outside the formal course structure. We were supplied with an example where students at King's College had blogged about their course of their own volition and through this blogging activity had supplied each other with considerable peer assistance in learning. It was suggested that this kind of "informal" activity could provide material for assessment, though others suggested that this might alter the nature of the contributions.
8. Web 2.0 offers an opportunity to change assessment regimes. For example, Stiggins¹⁰⁴ makes the distinction between assessment for marks and assessment for learning. We note that much assessment of student work in universities is summative assessment for marks. In the promotion of learning, summative assessment is less desirable than formative assessment for learning – thus Attwell¹⁰⁵ writes: "The assessment of learning seeks to discover how much have students learned as of a particular point in time. Assessment for learning asks how can we use assessment to help students learn more."

A second example of potential change in assessment regimes is the opportunity that Web 2.0 offers to move to authentic assessment. Not only is authentic assessment good educational practice, but it reduces the opportunity for plagiarism. Attwell writes: "The dangers of plagiarism are greatly reduced where students are set authentic work assignments evaluated through authentic assessment. Fundamental to authentic assessment in educational theory is the principle that learners should demonstrate, rather than tell about, what they know and can do (Cole, Ryan, and Kick, 1995)¹⁰⁶. In authentic assessment, information or data is collected from various sources, through multiple methods, and over multiple points in time (Shaklee, Barbour, Ambrose and Hansford, 1997)¹⁰⁷."

5.5 Possible issues and problems

A partial list of additional problems and issues that arise in relation to Web 2.0 could include:

1. Much Web 2.0-based student work is about content sharing and re-purposing. This can easily be seen by students as part of a copy-and-paste culture that runs counter to traditional notions of plagiarism, and adjustments may need to be made, either to redefine plagiarism¹⁰⁸, or more likely to help students distinguish between this culture and the expectations in a higher education environment.

¹⁰³ Owen, M, Grant, L., Sayers, S, and Facer, K. (2006), "Social Software and Learning", Futurelab. URL: http://www.futurelab.org.uk/research/opening_education.htm Last accessed 1 August 2007.

¹⁰⁴ Stiggins, R (2004), *Student-Involved Assessment For Learning*, Prentice Hall.

¹⁰⁵ Attwell, G (2007), "e-Portfolios – the DNA of the Personal Learning Environment". URL: http://www.knownet.com/writing/weblogs/Graham_Attwell/entries/7709663746/7896831716 Last accessed 1 August 2007, citing Stiggins R (2004) *Student-Involved Assessment For Learning*, Prentice Hall.

¹⁰⁶ Cole, DJ, Ryan, C W and Kick, F (1995), *Portfolios across the curriculum and beyond*. Thousand Oaks, CA: Corwin Press.

¹⁰⁷ Shaklee, BD, Barbour, NE, Ambrose, R and Hansford, SJ (1997), *Designing and using portfolios*. Boston: Allyn and Bacon, 1997.

¹⁰⁸ But we again point to the through treatment of mashups in education in Lamb, B (July/August 2007), "Dr. Mashup or Why Educators Should Learn to Stop Worrying and Love the Remix", Vol 42, No 4, *EDUCASE Review*.

URL: <http://www.educause.edu/apps/er/erm07/erm0740.asp> Last accessed 5 August 2007.

2. There may be changes in teaching roles. For example, in describing "Learning 2.0", Stephen Downes writes: "Learning is characterised not only by greater autonomy for the learner, but also a greater emphasis on active learning, with creation, communication and participation playing key roles, and on changing roles for the teacher, indeed, even a collapse of the distinction between teacher and student altogether"¹⁰⁹. It could be argued, however, that changes in teacher role will only happen in areas where levels of teacher and student knowledge are either roughly equivalent or complementary.
3. There may be a skills and/or culture crisis as teachers are forced to use unfamiliar tools and work in unfamiliar ways and alien environments.
4. There may be economic factors at work, particularly in a world of widening participation in higher education. In an international context, not all students will have access to the requisite technology and infrastructure (broadband, an up-to-date computer) and may be disadvantaged¹¹⁰.

5.6 Education 3.0

We have examined how Web 2.0 can be used to support learning and teaching within the current higher education system. In this section we briefly look at a more radical view that Web 2.0 technologies will enable a radical transformation in the nature of higher education itself.

In "The genesis and emergence of Education 3.0 in higher education and its potential for Africa"¹¹¹, Derek Keats and Philip Schmidt of the University of the Western Cape (UWC), South Africa, explore how developments in social networking and technology, and developments in legal and economic understanding, may lead to change in educational institutions. Characterising three stages of education, they describe:

- Education 1.0, in a didactic style.
- Education 2.0, Education 1.0 enhanced by use of Web 2.0 technologies.
- Education 3.0, "characterized by rich, cross-institutional, cross-cultural educational opportunities within which the learners themselves play a key role as creators of knowledge artefacts that are shared, and where social networking and social benefits outside the immediate scope of activity play a strong role. The distinction between artefacts, people and process becomes blurred, as do distinctions of space and time. Institutional arrangements, including policies and strategies, change to meet the challenges of opportunities presented."

These concepts are gaining currency. In Europe there is a groundswell of interest in whether Web 2.0 will act as either a transformative or an enabling force in changing universities by blurring the boundaries between individual universities and between higher education and open education, by giving rise to the need for other qualification-awarding bodies, and by changing learning and teaching practice. For example, there may well be a future role for third-party accreditation organisations awarding qualifications to individuals for learning based around open-content educational materials and individual contributions to those materials¹¹².

¹⁰⁹ Downes, S (17 October 2005), "E-learning 2.0", *eLearn Magazine*, ACM.

URL: <http://www.elearnmag.org/subpage.cfm?section=articles&article=29-1> Last accessed 1 August 2007.

¹¹⁰ Which raises the issue that students could be required to have an Internet-enabled computer, just as they are required to have a pencil and paper, and be able to read. The onus for provision might not be on students though, e.g., Southampton's Computer Science (ECS) gives any student who does not have a computer one of their old computers.

¹¹¹ Keats, D, and Schmidt, P (5 March 2007), "The genesis and emergence of Education 3.0 in higher education and its potential for Africa", Vol 12 No 3, *First Monday*.

URL: http://firstmonday.org/issues/issue12_3/keats/index.html Last accessed 1 August 2007.

We would like to thank Derek Keats for referring us to this article, and Philip Schmidt for commenting on our interpretation of the article and associated research.

¹¹² One author (van Harmelen) had a conversation in May 2007 with Patrick McAndrew, Director of Research and Evaluation for the Open University's Open Content Initiative, with both agreeing on the possibility of a third party

On the other hand, at least in the UK, there is also a strong opinion that with so much capital invested in universities, so much societal dependence on the degree-awarding function of universities, and so much useful research performed in universities, Education 3.0 will not significantly affect how universities function in relation to each other and to society in general. In this view, adjustments to Web 2.0 and the increased co-operation between students that it enables may simply consist of working out how the concept of individual assessment and award of degrees on (mostly) individual work can be reconciled with increased student co-operation and group work. However, in less developed countries the situation may be quite different

In this context and in relation to Education 3.0, Keats and Schmidt discuss challenges to higher education in Africa. These include skill shortages that lead to lack of critical mass in different subjects in individual institutions. The authors point to web connectivity and Education 3.0 as being able to address this challenge, with free open source software as part of the solution to high costs. However the authors also point to lack of funding that affects computing facilities and available bandwidth. We note that there are, in South Africa at least, efforts to reduce the high cost of bandwidth.

While Keats and Schmidt note that UWC is not yet at a stage to address Education 3.0, there are various UWC initiatives that could lead to the establishment of UWC as an Education 3.0 institution. These include:

- The development of open source software for educational purposes via the UWC-established African Virtual Open Initiatives and Resources (AVOIR) project ¹¹³ and the Free Software Innovation Unit (FSIU) ¹¹⁴. AVOIR received ZAR 3.7M (approximately \$US 500K) of funding from the International Development Research Centre (IDRC) in 2004¹¹⁵. AVOIR has a variety of other African universities participating in the project ¹¹⁶ as well as participants in Afghanistan, India and the Philippines.
- The Free Content and Free and Open Courseware Project ¹¹⁷ currently being established inside UWC.
- The Rip-Mix-Learn Research Group that considers both educational experience and assessment in higher education courses which make extensive use of open educational resources, and in which students create significant parts of the course content themselves. The interdisciplinary group focuses on five UWC courses which use a range of technologies and tools, including podcasting, on-line discussion forums and peer assessment.
- Collaboration in the NetTel@Africa programme, where the overall goal is "to make the provision of ICT more efficient and ubiquitous to the citizens of targeted countries" ¹¹⁸.

organisation awarding certificates based on a learner reading open content and posting contributions on a blog centred around that material.

¹¹³ African Virtual Open Initiatives and Resources. URL: <http://avoir.uwc.ac.za> Last accessed 1 August 2007.

¹¹⁴ The Free Software Innovation Unit, University of the Western Cape, South Africa. URL: <http://fsiu.uwc.ac.za> Last accessed 1 August 2007.

¹¹⁵ International Development Research Centre. URL: <http://www.idrc.ca> Last accessed 1 August 2007.

¹¹⁶ "Other universities participating in the project are the University of Jos (Nigeria), Universite Cheikh Anta Diop de Dakar (Senegal), Jomo Kenyatta University of Agriculture and Technology (Kenya), University of Nairobi (Kenya), Makerere University (Uganda), University of Dar es Salaam (Tanzania), Catholic University of Mozambique (Mozambique) and The University of Eduardo Modlane (Mozambique). In addition, a number of other universities are collaborating with the AVOIR project through other means of support, including the University of Ghana Legon (Ghana), the University of Port Elizabeth and Peninsula Technikon (South Africa)." Tectonic (25 October 2004), "UWC gets R3,7million for free software development", URL: <http://www.tectonic.co.za/view.php?id=372&tags=ind> Last accessed 1 August 2007.

¹¹⁷ The Free Content and Free and Open Courseware Project, University of the Western Cape, South Africa. URL: <http://freecourseware.uwc.ac.za> Last accessed 1 August 2007. We are told that this site is currently being redesigned and all existing content will be reposted during August 2007.

¹¹⁸ NetTel Africa. URL: <http://www.nettelafrika.org> Last accessed 1 August 2007.

- Action under an HP Digital Publishing Grant¹¹⁹ to promote the use of digital materials for learning, including the use of wikis for the development of wiki books by students. The HP grant includes membership of the Chameleon Federation¹²⁰, which is dedicated to using digital publishing to improve education. The federation includes HP and 24 participating universities in Australia, Brazil, China, France, Italy, Mexico, Puerto Rico, Singapore, South Africa, Switzerland, Russia, the UK and the US.

6 Conclusions

Web 2.0 will have enormous implications for learners and teachers in formal, informal, work-based and life-long education. Web 2.0 will affect how universities go about the business of education, from learning, teaching and assessment, through contact with school communities, widening participation, interfacing with industry and maintaining contact with alumni. However, it would be a mistake to consider Web 2.0 as the sole driver of these changes; Web 2.0 is just one part of the higher education ecosystem. Other drivers include, for example, pressures to greater efficiency, changes in student population and ongoing emphasis on better learning and teaching methods. Nonetheless, Web 2.0 is, in our view, a technology with profound potential for enabling change in this sector around the world. In this, the possible realms of learning to be opened up by the catalytic effects of Web 2.0 technologies are attractive, allowing greater student independence and autonomy, greater collaboration and increased pedagogic efficiency.

We believe that with the development of suitable pedagogical and assessment methods these changes will happen relatively straightforwardly in developed nations. Given solutions to more difficult problems of bandwidth and equipment availability in less developed countries, we believe that Web 2.0 can be an enabler of positive change when integrated with open courseware initiatives and used as a means of pooling skills and knowledge across institutions.

Web 2.0 systems are increasingly being used in universities, both within individual course modules and institution-wide. The introduction of Web 2.0 systems into universities is not without problems, as there are ramifications in the areas this report has touched on, including the choice of types of systems for institutional use, external or institutional hosting, integration with institutional systems, accessibility, visibility and privacy, data ownership, intellectual property rights and copyright for material created and modified by university members and external contributors, control over content, longevity of data, preservation, information literacy, staff and student training and appropriate teaching and assessment methods.

These potential ramifications demand institutional responses in both policy and strategy. Whilst this report has noted several different approaches and responses to Web 2.0, as far as we are aware only one university, the University of Edinburgh, has reached the stage of implementing formal policies and strategies. Because the use of Web 2.0 in learning and teaching is still a developing field, we recommend that institutions minimise implementing regulations that might constrain experimentation with the technologies and allied pedagogies while they continue to monitor developments.

¹¹⁹ Witkin L., and Vanides J, "Digital Publishing boosts higher education", Hewlett Packard.

URL: <http://h41111.www4.hp.com/globalcitizenship/uk/en/bulletin/10/interview.html> Last accessed 1 August 2007.

¹²⁰ Chameleon Federation. URL: <http://www.dp-chameleon.org> Last accessed 1 August 2007.

Resources

43Things. URL: <http://www.43things.com> Last accessed 1 August 2007.

5oup. URL: <http://www.5oup.net> Last accessed 1 August 2007.

Adie, C (3 May 2007), *Externally Hosted Web 2.0 Services: What should the policy be?* Slides. URL: <http://www.slideshare.net/markvanharmelen/externally-hosted-web-20-services> Last accessed 5 August 2007.

African Virtual Open Initiatives and Resources. URL: <http://avoir.uwc.ac.za> Last accessed 1 August 2007.

Anderson, P, *What is Web 2.0? Ideas, technologies and implications for education*, JISC TechWatch Report. URL: <http://www.jisc.ac.uk/media/documents/techwatch/tsw0701b.pdf> Last accessed 1 August 2007.

Apple, iTunes. URL: <http://www.apple.com/itunes> Last accessed 1 August 2007.

Arthur, C (20 July 2006), "What is the 1% rule?", Technology Section, *Guardian Unlimited*. URL: <http://www.guardian.co.uk/technology/2006/jul/20/guardianweeklytechnologysection2> Last accessed June 2007, and URL: <http://64.233.183.104/search?q=cache:rcJbHy8GIsYJ:www.guardian.co.uk/technology/2006/jul/20/guardianweeklytechnologysection2+http://www.guardian.co.uk/technology/2006/jul/20/guardianweeklytechnologysection2&hl=en&ct=clnk&cd=1&gl=uk> Last accessed 1 August 2007.

Atlassian, *Confluence – The enterprise wiki*. URL: <http://www.atlassian.com/software/confluence> Last accessed 1 August 2007.

Attwell, G (1 May 2007), *Content Creation and Open Educational Resource* slides. URL: <http://www.slideshare.net/markvanharmelen/content-creation-and-open-educational-resources> Last accessed 5 August 2007.

Attwell, G (2007), "e-Portfolios – the DNA of the Personal Learning Environment". URL: http://www.knownet.com/writing/weblogs/Graham_Attwell/entries/7709663746/7896831716 Last accessed 1 August 2007.

BBC, "Facing up to Facebook fears". URL: <http://news.bbc.co.uk/1/hi/technology/6639417.stm> Last accessed 1 August 2007.

BBC, "Google searches web's dark side". URL: <http://news.bbc.co.uk/1/hi/technology/6645895.stm> Last accessed 1 August 2007.

BBC, "Web safety warning for children". URL: <http://news.bbc.co.uk/1/hi/uk/6652585.stm> Last accessed 1 August 2007.

Benzinger, B, "Back to School with the Class of Web 2.0", Parts 1-3, SolutionWatch, URLs: <http://www.solutionwatch.com/512/back-to-school-with-the-class-of-web-20-part-1> <http://www.solutionwatch.com/515/back-to-school-with-the-class-of-web-20-part-2> <http://www.solutionwatch.com/519/back-to-school-with-the-class-of-web-20-part-3> All last accessed 1 August 2007.

Bibsonomy. URL: <http://www.bibsonomy.org> Last accessed 1 August 2007.

Blogger. URL: <https://www.blogger.com> Last accessed 1 August 2007.

Catone, J (1 August 2007), "Operator11: Live Netcasting Gets Social", *Read/WriteWeb*. URL: http://www.readwriteweb.com/archives/operator11_live_social_netcasting.php Last accessed 5 August 2007.

Chameleon Federation. URL: <http://www.dp-chameleon.org> Last accessed 1 August 2007.

Cheng, J (2 May 2007), "The Social Technography of Web 2.0", *ars technica*. URL: <http://arstechnica.com/news.ars/post/20070502-the-social-technography-of-web-2-0.html> Last accessed 1 August 2007.

Cole, DJ, Ryan, CW, & Kick, F (1995), *Portfolios across the curriculum and beyond*, Corwin Press.

Community@Brighton. URL: <http://community.brighton.ac.uk> Last accessed 1 August 2007.

Coppermine, URL: <http://coppermine-gallery.net> Last accessed 1 August 2007.

Dale, J (24 March 2005), "Blogs at Warwick University", Blogger Me. URL: http://www.bloggerme.co.uk/the_uk_web_log_forum/2005/03/john_dale_.html Last accessed 1 August 2007.

Del.icio.us. URL: <http://del.icio.us> Last accessed 1 August 2007.

DeviantART. URL: <http://www.deviantart.com> Last accessed 1 August 2007.

Downes, S (9 October 2004), "The Buntine Oration", *Stephen's Web*. URL: http://www.downes.ca/archive/04/10_09_news_OLDaily.htm Last accessed 1 August 2007.

Downes, S (17 October 2005) "E-learning 2.0", *eLearn Magazine*, ACM. URL: <http://www.elearnmag.org/subpage.cfm?section=articles&article=29-1> Last accessed 1 August 2007.

Drupal. URL: <http://drupal.org> Last accessed 1 August 2007.

education (a user name), "education"
URL: <http://twitter.com/education> Last accessed 1 Aug 2007.

Elgg. URL: <http://elgg.net> Last accessed 1 August 2007.

Facebook. URL: <http://www.facebook.com> Last accessed 1 August 2007.

Flickr. URL: <http://www.flickr.com> Last accessed 1 August 2007.

FlickrCC. URL: <http://flickrcc.bluemountains.net> Last accessed 1 August 2007.

Franklin, T (2 May 2007), "Web 2.0 in learning and teaching", slides. URL: <http://www.slideshare.net/markvanharmelen/web-2o-and-learning-and-teaching> Last accessed 5 August 2007.

Franklin, T, and van Harmelen, M (2007), *Web 2.0 for Content Sharing for Learning and Teaching in Higher Education*, report, JISC. URL: http://www.jisc.ac.uk/media/documents/programmes/digital_repositories/web2-content-learning-and-teaching.pdf Last accessed 1 August 2007.

Frappr. URL: <http://www.frappr.com> Last accessed 1 August 2007.

The Free Content and Free and Open Courseware Project, University of the Western Cape, South Africa. URL: <http://freecourseware.uwc.ac.za> Last accessed 1 August 2007.

The Free Software Innovation Unit, University of the Western Cape, South Africa.
URL: <http://fsiu.uwc.ac.za> Last accessed 1 August 2007.

Furl. URL: <http://www.furl.net> Last accessed 1 August 2007.

Gliffy. URL: <http://www.gliffy.com> Last accessed 1 August 2007.

Google Docs & Spreadsheets. URL: <http://docs.google.com> Last accessed 1 August 2007.

Google Video BETA, Educational Genre.
URL: <http://video.google.com/videosearch?q=genre%3Aeducational>
Last accessed 1 August 2007.

Hewitt, A, and Forte, A (2006), "Crossing Boundaries: Identity Management and Student/Faculty Relationships on the Facebook", CSCW'06, November 4-8, 2006.

iGoogle. URL: <http://www.google.com/ig> Last accessed 1 August 2007.

International Development Research Centre.
URL: <http://www.idrc.ca> Last accessed 1 August 2007.

IT Redux, "Office 2.0 Database".
URL: <http://itredux.com/office-20/database> Last accessed 1 August 2007.

Jaiku. URL: <http://www.jaiku.com> Last accessed 1 August 2007.

Joint Information Systems Committee (JISC).
URL: <http://www.jisc.ac.uk> Last accessed 1 August 2007.

Joomla! <http://www.joomla.org> Last accessed 1 August 2007.

Kay, J (31 July 2006), "Cleaning up my PLE for CLC", *Stuff:ED*.
URL: <http://jstuffed.blogspot.com/2006/07/cleaning-up-my-ple-for-clc.html>
Last accessed 1 Aug 2007.

Keats, D, and Schmidt, P (5 March 2007) "The genesis and emergence of Education 3.0 in higher education and its potential for Africa", Vol 12, No 3, *First Monday*.
URL: http://firstmonday.org/issues/issue12_3/keats/index.html Last accessed 1 August 2007.

Kelly, B (1 May 2007), *Content Creation: Web 2.0 is Providing the Solution!*, slides.
URL: <http://www.ukoln.ac.uk/web-focus/events/online/web-2.0-200705>
Last Accessed 5 August 2007.

Korn, N, and Oppenheim, C (April 2007), *Web 2.0 and IPR: A short scoping study for the Users and Innovation Programme*, Draft Version, JISC.

Lamb, B (July/August 2007), "Dr. Mashup or Why Educators Should Learn to Stop Worrying and Love the Remix", Vol 42, No 4, *EDUCASE Review*.
URL: <http://www.educause.edu/apps/er/erm07/erm0740.asp> Last accessed 5 August 2007.

Langingham, S (28 July 2006), "Tim Berners-Lee Originator of the Web and director of the World Wide Web Consortium talks about where we've come, and about the challenges and opportunities ahead", Interview, IBM DeveloperWorks Interviews.

URL: <http://www-128.ibm.com/developerworks/podcast/dwi/cm-int082206.txt>

Last accessed 1 August 2007.

Li, C (22 April 2007), "Forrester's new Social Technographics report", *The Groundswell*.

URL: http://blogs.forrester.com/charleneli/2007/04/forresters_new_.html

Last accessed 1 August 2007.

Li, C, with Bernoff, J, Fiorentino, R, and Glass, S (19 April 2007), "Social Technographics®", *Forrester*. URL: <http://www.forrester.com/Research/Document/Excerpt/0,7211,42057,00.html> Last accessed 1 August 2007.

LinkedIn. URL: <http://www.linkedin.com> Last accessed 1 August 2007.

Furl. URL: <http://www.furl.net> Last accessed 1 August 2007.

McClellan, J (5 May 2005) "Just do it ... blog it", Technology Section, *Guardian Unlimited*.

URL: <http://technology.guardian.co.uk/online/story/0,3605,1476175,00.html>

Last accessed 1 August 2007.

MediaWiki. URL: <http://www.mediawiki.org> Last accessed 1 August 2007.

MIT, OpenCourseWare. URL <http://ocw.mit.edu> Last accessed 1 August 2007.

Moodle. URL: <http://www.moodle.org> Last accessed 1 August 2007.

MySpace. URL: <http://www.myspace.com> Last accessed 1 August 2007.

NetTel Africa. URL: <http://www.nettelafrika.org> Last accessed 1 August 2007.

NetVibes. URL: <http://www.netvibes.com> Last accessed 1 August 2007.

Oblinger, D, and Oblinger, J (2005), "Is It Age or IT: First Steps Toward Understanding the Net Generation", in Oblinger, D, and Oblinger J (eds.), *Educating the Net Generation*, Educause. URL: <http://www.educause.edu/educatingthenetgen> Last accessed 1 August 2007.

Observatory on Borderless Higher Education.

URL: <http://www.obhe.ac.uk> Last accessed 1 August 2007.

Oehlert, M (25 October 2006), "A Short Experiment: Six Word Lesson Plans", *The Learning Circuits Blog*. URL: <http://learningcircuits.blogspot.com/2006/10/short-experiment-six-word-lesson-plans.html> Last accessed 1 August 2007.

Open University, LearningSpace.

URL: <http://openlearn.open.ac.uk/> Last accessed 1 August 2007.

Open University, OpenLearn.

URL: <http://www.open.ac.uk/openlearn> Last accessed 1 August 2007.

OpenCourseWare Consortium. URL: <http://ocwconsortium.org> Last accessed 1 August 2007.

O'Reilly, T (2005), "What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software". URL: <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html> Last accessed 1 August 2007.

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O'Reilly and MediaLive International (2004), *Web 2.0 Conference – Oct 5-7, 2004*.
URL: <http://web.archive.org/web/20040602111547/http://web2con.com>
Last accessed 1 Aug 2007.

Owen, M, Grant, L, Sayers, S, and Facer, K (2006), "Social Software and Learning", Futurelab.
URL: http://www.futurelab.org.uk/research/opening_education.htm
Last accessed 1 August 2007.

Pageflakes. URL: <http://www.pageflakes.com> Last accessed 1 August 2007.

Papert, S, and Harel, I, "Situating constructionism", in Papert, S and Harel, I (eds),
Constructionism, Westport, Connecticut:, Ablex Publishing Corporation, 1991.
URL: <http://www.papert.org/articles/SituatingConstructionism.html> Last accessed 1 August 2007.

Pownce. URL: <http://www.pownce.com> Last accessed 1 August 2007.

Prensky, M (October 2001), "Digital natives, Digital Immigrants, Part 1", Vol. 9, No. 5, *On the Horizon*, NCB University Press. URL: <http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf>
Last accessed 1 August 2007.

Prensky, M (December 2001), "Digital natives, Digital Immigrants, Part 2", Vol. 9, No. 6, *On the Horizon*, NCB University Press. URL: <http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part2.pdf>
Last accessed 1 August 2007.

Read/WriteWeb, "Weekly Wrapups".
URL: http://www.readwriteweb.com/archives/cat_weekly_wrapups.php
Last accessed 5 August 2007.

Richardson, W (23 July 2007), "iHiking", Weblogg-ed,.
URL <http://weblogg-ed.com/2007/ihiking> Last accessed 1 August 2007.

Scribd. URL: <http://www.scribd.com> Last accessed 1 August 2007.

SecondLife. URL: <http://secondlife.com> Last accessed 1 August 2007.

Seomoz.org (9 May 2007), "2007 Web 2.0 Awards".
URL: <http://www.seomoz.org/web2.0> Last accessed 1 August 2007.

Shaklee, BD, Barbour, NE, Ambrose, R, & Hansford, SJ (1997), "Designing and using portfolios", Allyn and Bacon.

Skype. URL: <http://www.skype.com> Last accessed 1 Aug 2007.

Slideshare. URL: <http://www.slideshare.net> Last accessed 1 Aug 2007.

Stanier, S (31 April 2007), *Elgg at the University of Brighton*, slides.
URL: <http://www.slideshare.net/markvanharmelen/elgg-at-the-university-of-brighton-stanier>
Last accessed 5 August 2007.

Stanier, S (undated), Quote in "An example user – University of Brighton", Elgg.
URL: <http://elgg.org/features.php> Last accessed 1 Aug 2007.

Stiggins R (2004), *Student-Involved Assessment For Learning*, Prentice Hall.

studiVZ, URL: <http://www.studivz.net> Last accessed 1 August 2007.

Tectonic, UWC gets R3,7million for free software development.

URL: <http://www.tectonic.co.za/view.php?id=372&tags=ind> Last accessed 1 August 2007.

Times Higher Educational Supplement, World Rankings 2006, *International comparison: Europe's top 50 universities*. URL:

http://www.thes.co.uk/statistics/international_comparisons/2006/top_europe.aspx Last accessed 1 Aug 2007.

Trancer, B (2007), "Measuring the Participatory Web", Web 2.0 Expo 2007. URL:

http://www.businessweek.com/the_thread/blogspotting/archives/pdf/Tancer%20Web2expo1.pdf
Last accessed 1 Aug 2007.

Turkle, S, and Papert, S, "Epistemological Pluralism and the Revaluation of the Concrete" in Papert, S. and Harel, I. (Eds), *Constructionism*, Ablex Publishing Corporation, 1991.

URL: <http://www.papert.org/articles/EpistemologicalPluralism.html> Last accessed 1 Aug 2007.

Twitter. URL: <http://twitter.com> Last accessed 1 Aug 2007.

UKOLN / ahds, *What is Web 2.0*, Briefing note 92,

URL: <http://www.ukoln.ac.uk/qa-focus/documents/briefings/briefing-92/briefing-92-A4.doc> Last accessed 1 Aug 2007.

uni@klu Elgg , University of Klagenfurt. URL: <https://elearning.uni-klu.ac.at/elgg>

Last accessed 1 August 2007.

University of Edinburgh, *Web 2.0 Initiative Home Page*.

URL: http://www.is.ed.ac.uk/projects/Web_2.0_Initiative Last accessed 1 Aug 2007.

van Harmelen, M (2 May 2007), *Learning, Teaching, and Web 2.0*, slides.

URL <http://www.slideshare.net/markvanharmelen/learning-teaching-and-web-20>
Last accessed 5 August 2007.

van Harmelen, M (2007), "Web 2.0 in Learning and Teaching", Web site for the JISC Web 2.0 Webinar Series. URL: <http://moodle.cs.man.ac.uk/web2/> Last accessed 1 Aug 2007.

Vygotsky, LS (1978), *Mind and society: The development of higher mental processes*, Cambridge, MA: Harvard University Press.

Warwick University, warwickblogs. URL: <http://blogs.warwick.ac.uk> Last accessed 1 Aug 2007.

Wassell, T (31 April 2007), *Web 2.0 supporting a Learning and Teaching Strategy*

URL: <http://www.slideshare.net/markvanharmelen/web-20-supporting-a-learning-and-teaching-strategy-wassell> Last accessed 5 August 2007.

White, D (3 May 2007), *Policy and Strategy*, slides.

URL: <http://www.slideshare.net/markvanharmelen/policy-and-strategy>
Last accessed 5 August 2007.

Wikipedia. URL: <http://en.wikipedia.org> Last accessed 1 Aug 2007.

Wikiversity. URL: <http://en.wikiversity.org> Last accessed 1 Aug 2007.

Witkin L, and Vanides J, "Digital publishing boosts higher education", Hewlett Packard.
URL: <http://h41111.www4.hp.com/globalcitizenship/uk/en/bulletin/10/interview.html>
Last accessed 1 Aug 2007.

WordPress. URL: <http://wordpress.org> Last accessed 1 August 2007.

Yahoo Pipes. URL: <http://pipes.yahoo.com> Last accessed 1 Aug 2007.

YouTube. URL: <http://www.youtube.com> Last accessed 1 Aug 2007.