

Web 2.0 for Content for Learning and Teaching in Higher Education

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Introduction

This report is the result of a study into the use of Web 2.0 technologies for content creation for learning and teaching in Higher Education, funded by the JISC, and carried out between March and May 2007. It 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) with expert contributions, both from speakers and 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 in the Moodle site that was used to support the conference.

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 (HE) 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 inducing change in the HE sector. 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.

This study has focussed on the content sharing aspects of Web 2.0, including textual, sound, and video data. The study is also cognisant of the fact that content sharing via Web 2.0 mechanisms can be the enabler of social software - software which supports groups in their day-to-day interactions.

Because Web 2.0 is a relatively 'young' technology, there are many unresolved problems and issues in its use in universities. These include: IPR 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 main report, we provide a discussion of Web 2.0 together with a compilation of the more commonly used systems for education. We then examine progress at four universities which have taken a strategic approach and implemented Web 2.0 services in different ways at the institutional level. This is followed by a discussion of Web 2.0 content and its creation and use, together with an identification of issues affecting content creation and use. The next section considers the ways in which Web 2.0 is being used in learning, teaching and assessment, and important issues associated with pedagogy and assessment. We then turn to institutional policy and strategy and consider ways in which Web 2.0 impacts them.

Because of the relative immaturity of the technology and experimentation with its use, it is too early to make specific recommendations in most of the areas above. Consequently we make various recommendations to the JISC as to actions to guide and help the UK HE community in its ongoing exploration, adoption and adaptation of Web 2.0 systems.

Most importantly, 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 take a light-weight approach use of regulations that might constrain experimentation with the technologies and allied pedagogies.

Recommendation 1: Guidelines should not be so prescriptive as to stifle the experimentation that is needed with Web 2.0 and learning and teaching that is necessary to take full advantage of the possibilities offered by this new technology.

This and other recommendations from the report are listed below.

Recommendations

Recommendation 1: Guidelines should not be so prescriptive as to stifle the experimentation that is needed with Web 2.0 and learning and teaching that is necessary to take full advantage of the possibilities offered by this new technology.

The remainder of the recommendations are grouped under Content, Learning and Teaching, Policy, and Technology. For easy access, recommendation numbering refers to recommendation ordering in the report.

Content

Recommendation 4: JISC should consider funding work looking at long-term access to student created content once they have left the university with the aim of developing good practice guides.

Recommendation 6: JISC should consider funding a study to look at how repositories can be used to provide end-user (i.e. referrer) archiving services for material that is referenced in academic published material, including Internet journal papers. Part of this consideration should extend to copyright issues.

Recommendation 17: JISC should consider commissioning studies to explore i) the accessibility issues of various commonly used Web 2.0 technologies, and how any limits can be overcome, and ii) case studies on how Web 2.0 technologies can enhance accessibility.

Learning and teaching

Recommendation 2: JISC should consider funding projects investigating how institutional repositories can be made more accessible for learning and teaching through the use of Web 2.0 technologies, including tagging, folksonomies and social software.

Recommendation 10: JISC should consider funding experiments with new forms of teaching that utilise Web 2.0 systems, and should consider funding the development of new Web 2.0 tools specifically for the educational domain, including those that allow pedagogic experimentation.

Recommendation 11: JISC should consider funding research, and build up a bank of case studies, on how Web 2.0 impacts pedagogy. This should include the impact of implementing these technologies on institutions, teaching staff, support staff and students.

Recommendation 12: JISC should urgently consider funding work that looks in detail at problems in the assessment of group work that uses Web 2.0 tools.

Recommendation 14: JISC should consider funding projects to develop a range of assessment methods suitable for application in the context of developing Web 2.0 pedagogies. This might be in the context of a larger programme encompassing pedagogies, assessment methods and Web 2.0 tools for learning, teaching and assessment.

Recommendation 18: JISC, possibly in conjunction with the Higher Education Academy and QAA, should produce briefings and advice for validating bodies on the implications of Web 2.0 for learning, teaching and especially for assessment that can inform their work. This advice would have to be kept up to date.

Policy

Recommendation 3: JISC should consider funding work looking at the legal aspects of ownership and IPR, including responsibility for infringements in terms of IPR, with the aim of developing good practice guides to support open creation and re-use of material.

Recommendation 5: JISC should consider organising a workshop to look at forms of moderation (including peer moderation) and control of Web 2.0 content, with the aim of providing institutions with practical advice and examples of good practice.

Recommendation 7: JISC should consider funding work to look at how widespread the use of "googling" candidates as part of selection procedures is, and consider producing advice and guidance to institutions and staff and students on the potentially permanent nature of postings.

Recommendation 8: JISC should consider funding studies looking at the risks to the institution associated with internally and externally hosted Web 2.0 services, and ways in which the risks can be controlled and mitigated. This could be done within the wider context of examining risks associated with Web 2.0, web services and Service Oriented Architectures.

Recommendation 15: JISC should ask the JISC Plagiarism Advisory Service to produce guidance on Web 2.0 and its implications for plagiarism that supports the use of Web 2.0 in learning, teaching and assessment.

Recommendation 16: Universities should actively monitor practice and law over control of content in a Web 2.0 environment, and update their policies accordingly.

Recommendation 19: JISC should consider organising workshops on the implications for personal security of the use of Web 2.0 technologies for learning and teaching, with the aim of producing guidance to the community.

Recommendation 20: JISC, together with other interested groups such as Becta, the NHS and TTA, should develop model policies on personal security that universities can adapt to meet their own needs.

Recommendation 21: JISC should consider funding a workshop to consider current practice and determine how best to balance the issues of openness of safety, with the aim of producing guidance to the community.

Technology

Recommendation 9: JISC should consider funding projects or case studies that look at different methods for integrating Web 2.0 into the overall university information and information technology environment while retaining flexibility of use across teaching, learning, administration and other areas of university activity.

Recommendation 13: JISC should consider funding projects to develop web-based tools to assist in ongoing monitoring of group process and in the assessment of group work, taking into account individual effort within the group.

Web 2.0

Web 2.0 encompasses a variety of different meanings that include an increased emphasis on user generated content, data and content sharing and collaborative effort, together with the use of various kinds of social software, new ways of interacting with web-based applications, and the use of the web as a platform for generating, re-purposing and consuming content.

The seeds of what is now generally accepted as the read/write or shared content nature of Web 2.0 appeared in 1980 in Tim Berners-Lee's prototype web software (thus in Berners-Lee's view there is nothing new about Web 2.0¹). However, the content sharing aspects of the web were lost in the original rollout, and did not reappear until Ward Cunningham wrote the first wiki in 1994-1995. Blogs, another early part of the read/write phenomenon, were sufficiently developed to gain the name weblogs in 1997. It then took until the summer of 2005 for the term Web 2.0 to appear^{2,3}. A year later Tim O'Reilly led a conference session to explore the meaning of the term and subsequently wrote in detail about the phenomenon in September 2005⁴.

One way of summarising the change to Web 2.0 is by contrasting the former web ("Web 1.0") with Web 2.0. In Web 1.0 a few content authors provided content for a wide audience of relatively passive readers. However, in Web 2.0 everyday users of the web use the web as a platform to generate, re-purpose, and consume shared content. With Web 2.0 data sharing the web also becomes a platform for social software that enables groups of users to socialise, collaborate, and work with each other. This change of use is largely based on existing web data-sharing mechanisms being used to share content, in conjunction with the use of web protocol based interfaces to web applications⁵ that allow flexibility in reusing data and the adoption of communications protocols⁶ that allow specialised data exchange.

Web 2.0 and media and technology convergence

Although it is out of the scope of the current study, the full implications of Web 2.0 for learning and teaching will eventually need to be viewed in the light of media and technology convergence, particularly with respect to the following:

- The contemporaneous growth of Web 2.0 co-occurs with increased media convergence, particularly in respect of broadband communications, telephony and the broadcast media.
- While professionally produced and edited media are likely to persist we will see the broadcast media 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 very diverse ways.
- The increased bandwidth offered by 3G telephony will encourage a move from the desktop and the 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 social presence will increase, and will help mediate between people in different ways.

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 software. Individual systems are hosted on servers and accessed across the web via a browser, they may be interchangeably be called Web 2.0 systems, Web 2.0 services or Web 2.0 applications.

¹ A transcript of a podcast interview of Tim Berners-Lee, inventor of the Web.

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

² <http://web.archive.org/web/20040602111547/http://web2con.com/>

³ <http://www.paulgraham.com/web20.html>

⁴ O'Reilly, T, *What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software*, 2005, <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>

⁵ Application Program Interface – a software interface that allows web applications to exchange data.

⁶ Many communication protocols and data sharing formats for the web are expressed in a language called XML.

There is a large range of Web 2.0 systems; here we discuss some of the most important of these for educational application. For those interested in a more comprehensive list of Web 2.0 systems for educational we recommend the excellent “Back to school with Web 2.0” series⁷.

All of the systems that follow can be grouped under the convenient label of **social software**, 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.

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 time-ordered articles (called posts). Readers can add comment to posts.

Example 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 relatively dedicated life-long learners.
- Teachers can use a blog for course announcements, news and feedback to students.
- Blogs can be used with syndication technologies (below) to enable groups of learners and teachers to easily keep track of new posts.

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 Wikipedia⁸.

Example educational uses:

- Wikis can be used for the creation of annotated reading lists by one or more teachers (see also social bookmarking below, 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 production of collaboratively edited material, including material documenting group projects.
- Wikis can be used by teachers to supply scaffolding for writing activities – thus in a group project a teacher can supply page structure, hints as to desirable content, and 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.

Social bookmarking

A social bookmarking service provides users the ability to record (bookmark) web pages, and tag those records with significant words (tags) that describe the pages being recorded. Examples include del.icio.us⁹ and Bibsonomy¹⁰. Over time users build up collections of records with common tags, and users can search for bookmarked items by likely tags. Since items have been deemed worthy of being bookmarked and classified with one or more tags, social bookmarking services can sometimes be more effective than search engines for finding Internet resources. Users can find other users who use the same tag and who are likely to be interested in the same topic(s). In some social bookmarking systems, users with common interests can be added to an individual's own network to enable easy monitoring of the other users' tagging activity for interesting items. Syndication (discussed below) can be used to monitor tagging activity by users, by tags or by both of these.

Examples 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.

⁷ <http://www.solutionwatch.com/512/back-to-school-with-the-class-of-web-20-part-1/> Parts 2 and 3 are linked to early in the post. See also <http://itredux.com/office-20/database/>.

⁸ <http://en.wikipedia.org/>

⁹ <http://del.icio.us/>

¹⁰ <http://www.bibsonomy.org/>

- 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 resources¹¹.

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 YouTube¹² (movies), iTunes¹³ (podcasts and vidcasts), Flickr¹⁴ (photos), Slideshare¹⁵ (presentations), DeviantArt¹⁶ (art work) and Scribd¹⁷ (documents). The latter is particularly interesting as it provides the ability to upload documents in different formats and then, for accessibility, to choose different download formats, including computer-generated speech, which provides a breadth of affordances not found in traditional systems.

Podcasting is a way in which a listener may conveniently keep up-to-date with recent audio or video content. Behind the scenes podcasting is a combination of audio or video content, RSS, 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 video versions of podcasts,

Example educational uses:

- Podcasts can be used to provide introductory material before lectures, or, more commonly, to record lectures and allow students to listen to the lectures again, either because they were unable to attend, or to reinforce their learning. Podcasts can be used to make lectures redundant while still supplying (possibly didactic) presentations of learning material by lecturers.
- Vidcasts can be used to supply to supply videos of experimental procedures in advance of lab sessions
- Podcasts can be used to supply audio tutorial material and/or exemplar recordings of native speakers to foreign language learners.
- Distribution and sharing of educational media and resources. For example, an art history class could have access to a set of art works via a photo sharing system.
- The ability to comment on and critique each others work; including by people on other courses or at other institutions.
- Flickr allows for annotations to be associated with different areas of an image and for comments to be made on the image as a whole, thereby facilitating teacher explanations, class discussion, and collaborative comment. It could be used for the example above.
- For Flickr, FlickrCC¹⁸ is a particularly useful ancillary service that allows users to find 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 videos¹⁹.

Social networking and social presence systems

Systems that allow people to network together for various purposes. Examples include Facebook²⁰ and MySpace²¹ (for social networking / socialising), LinkedIn²² (for professional networking), Second Life²³

¹¹ eg members of the JISC Users and Innovation community (Emerge) are using the del.icio.us tag [jisc_emerge](http://del.icio.us/jisc_emerge) to tag resources of common interest.

¹² <http://www.youtube.com/>

¹³ <http://www.apple.com/itunes/>

¹⁴ <http://www.flickr.com/>

¹⁵ <http://www.slideshare.net/>

¹⁶ <http://www.deviantart.com/>

¹⁷ <http://www.scribd.com/>

¹⁸ <http://www.bluemountains.net/>

¹⁹ <http://video.google.com/videosearch?q=genre%3Aeducational> Some of this genre has been hijacked to promote particular political points of view.

²⁰ <http://www.facebook.com/>

(virtual world) and Elgg²⁴ (for knowledge accretion and learning). Social networking systems allow users to describe themselves and their interests, and they generally implement notions of friends, ranking, and communities. The ability to record who one's friends are is a common feature that enables traversal and navigation of social networks via sequences of friends. Ranking and communities are more selectively implemented. Ranking of user contributions by community members 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 sub-community interests in an environment that provides a degree of insulation from the general hub-bub of system activity.

Example educational uses:

- The use of Elgg at the University of Brighton is discussed below.
- LinkedIn acts, at a professional level, as a model of educational use in the way in which it can be used to disseminate questions across the community for users seeking particular information.
- There are a wide variety of educational experiments being carried out in Second Life. These vary from the mundane with a virtual world gloss to more adventurous experiments that take advantage of the virtual reality facilities (e.g. construction of ancient environments for exploration by students).
- 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: e.g. Confluence²⁵, 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.

Collaborative editing tools

These allow users in different locations to collaboratively edit the same document at the same time. As yet most of these services do not allow for synchronous voice or video communication, so the use of third party synchronous communication systems are often needed to co-ordinate editing activity. Examples are Google Docs & Spreadsheets²⁶ (for text documents and spreadsheets), and Gliffy²⁷ (for diagrams). There are over 600 such applications.²⁸

Example educational uses:

- For collaborative work over the web, either edited simultaneously or simply to share work edited by different individuals at different times.
- Creation of works of art or design across disciplines. For instance, architecture and interior design students from different universities working together to complete a commercial brief.

Syndication and notification technologies

In a world of newly added and updated shared content, it is useful to be able to *easily* keep up to date with new and changed content, 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.

Example educational uses:

- In a group project where a wiki is being developed collaboratively RSS feeds can be used to keep all members of the group up to date with changes as they can be automatically notified of changes as they are made. Similarly for new blog posts made by class members.

²¹ <http://www.myspace.com/>

²² <http://www.linkedin.com/>

²³ <http://secondlife.com/>

²⁴ <http://elgg.net/>

²⁵ <http://www.atlassian.com/software/confluence/>

²⁶ <http://docs.google.com/>

²⁷ <http://www.gliffy.com/>

²⁸ Listed at <http://itredux.com/office-20/database>

- Feed Readers enable students and teachers to become aware of new blog posts in educational blogging scenarios (see above), to track the use of tags in social bookmarking systems (see above), to keep track of new shared media (see above), and to be aware of current news, e.g. from the BBC.

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, blog users can change the contents of the margins surrounding their posts to allow access to other information (e.g. their recent del.icio.us bookmarks) and communication facilities (e.g. enabling other users to contact them via Skype²⁹ using 'Skype Me' buttons). The act of experimentally building new artefacts in this way is known as **bricolage**³⁰. Sometimes bricolage facilities are built into application configuration facilities, but most bricolage relies on some HTML knowledge. In the latter case bricolage is beyond the competence of most users.

Web 2.0 also adds the notion of **mashups**, where users can mix and repurpose data for their own needs. The current state of the art is represented by Yahoo Pipes³¹, a web-based facility that allows users to mix and process web-based data without needing to know a programming language.

²⁹ <http://www.skype.com/>

³⁰ Turkle, S., and Papert, S. Epistemological Pluralism and the Revaluation of the Concrete.
<http://www.papert.org/articles/EpistemologicalPluralism.html>

³¹ <http://pipes.yahoo.com/>

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 (VLE) 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 the issues at an institutional level, and using a variety of different approaches to do so. Here, we illustrate the variety with four case studies.

University of Warwick³²

The University of Warwick was one of the earliest to offer Web 2.0 services at the institutional level, and has been offering all its students personal blogs since October 2004. This was undertaken partly in order to see what would happen, and partly to foster a community, with education seen as secondary function. The university decided to develop its own blogging system as there were no commercial systems that met its needs. In particular, they wanted to be able to take advantage of single sign-on and have the ability to integrate the system with other university systems.

The blog is widely used, and current statistics give an indication of the take up³³:

- 4,540 blogs
- 88,619 entries
- 13,255 tags
- 190,859 comments
- 111,803 images

When students leave they can have the blog deleted or frozen or they can export the data to take with them.

The blogging system has changed social context for students, but uptake for teaching has not followed through, in part because teaching staff do not look at what students have been doing before incorporating that practice into their teaching.

While there are some inappropriate and offensive posts on the system, experience shows that these lead to comments from other bloggers which render the posting more positive. In theory students (and staff) are bound by the University acceptable usage policy (AUP), but staff do not monitor and only deal with cases that are reported to them. A greater challenge may be copyright, and there is considerable evidence that students are very relaxed about re-using material from other sources³⁴.

There is the intention to develop a wiki to accompany the blogging service.

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.

³² Thanks to Graham Lewis for discussing Warwick's work with blogging with me. Also <http://technology.guardian.co.uk/online/story/0,3605,1476175,00.html>

³³ <http://blogs.warwick.ac.uk/> (data from 11 April 2007)

³⁴ http://www.bloggerme.co.uk/the_uk_web_log_forum/2005/03/john_dale_.html

University of Leeds³⁵

The University of Leeds was one of the earliest to introduce a virtual learning environment (VLE), building their own open source system called Bodington. 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 Departmental Development Unit. Training sessions and workshops identifying good practice in using Web 2.0 tools in learning and teaching have been very popular with staff. In contrast to the Warwick model, the blogging tools were not promoted directly to students. By promoting the tools directly to staff before student use, subsequent use has been focussed on delivering new ways of teaching and new ways of disseminating information within the institution. The 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. At April 2007 there are 2,000 student accounts on the system. Student and staff use of the systems are governed by the acceptable use policy. There have not, so far, been any problems.

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 web master 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.

³⁵ Thanks to Melissa Highton for discussing the work at Leeds

University of Brighton³⁶

The University of Brighton implemented Elgg³⁷ across the University in September 2006, integrating it with their existing systems. As Stanier wrote:

"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 MIS 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 course 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."³⁸

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 (PDP) and 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 are using Elgg in their learning, where they upload videos that they have created, and then use the system to critique each others videos. Elgg is also providing new forms of student support. There have been cases of students who have been on the verge of quitting their courses blogging their problems – these have been picked up, either by other students or by student services who have then provided support.

While all staff and students have accounts only a small proportion of accounts are active: These have grown 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. The Warwick post and comment figures are higher, but Warwick system has been in use for longer (established in October 2004, as opposed to September 2006).

There are still some problems that need to be addressed. One disappointing aspect has been the slow take-up of the 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.

³⁶ Thanks to Stan Stanier for discussing the work at Brighton

³⁷ See <http://elgg.org/>

³⁸ <http://elgg.org/features.php>

University of Edinburgh³⁹

The University of Edinburgh is, as far as we are aware, the only university in the UK to have a Web 2.0 strategy.⁴⁰ This strategy is also supported by an action plan. The strategy recommends the establishment of appropriate infrastructure to facilitate greater use of Web 2.0 tools, and fostering their take-up by "leading by example". The strategy looks at the University's strategic plan and maps its proposed actions against parts of this to demonstrate how the Web 2.0 strategy and action plan is fulfilling the needs of the University.

Section 4.4 of the strategy considers how the university can take advantage of Web 2.0, including the following, taken directly from the Edinburgh report:

- Use blogs and RSS feeds instead of newsletters – e.g. the internal Information Services staff newsletter, the MLRP project updates, the EUCLID newsletter, the proposed University Web Development Project newsletter.
- 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.
- Social bookmarking can support development projects and research projects, allowing an information resource base to be constructed in a collaborative way.
- 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 Frappr⁴¹ 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).

This results in recommendations that the University should host wiki and blog services supported by the University's single sign-on system. Edinburgh uses WebCT as its VLE, and while recognising that this will have blog and wiki services these will not be appropriate to all the needs of the University (including research and management needs). However, the services will need to be available through WebCT. Edinburgh only intend to support a single system, and comment that it does not matter too much which one as, no matter the choice, some users will believe it is the wrong choice. They note issues around security including "blog spam"⁴² and accessibility issues associated with the "heavy use of Javascript".

Besides supporting the technology they 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 their 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:

³⁹ Thanks to Chris Adie and Jean Ritchie for this information.

⁴⁰ http://www.is.ed.ac.uk/projects/Web_2.0_Initiative

⁴¹ <http://www.frappr.com/>

⁴² Blog spam is the posting of articles or comments on blogs to gain exposure through people visiting the blog or receiving rss feeds from it.

- Use of blogging for major projects (e.g. the Main Library Redevelopment Project) and to replace the IS staff newsletter.
- Use a Wiki to develop IS plans.
- Use a Wiki to facilitate meetings – to prepare the agenda and deliver the minutes.
- Use instant messaging to facilitate IT support to students.

Overall lessons learnt

The above examples show differing rationales and differing approaches to implementing Web 2.0 at universities. All the examples cited here have implemented the tools outside the VLE, in part because they see their role as being wider than learning and teaching; encompassing research, management and social (personal) use. In part this may also be because of the lag in VLE suppliers incorporating Web 2.0 tools within their VLEs, and we can expect to see many universities offering tools via their VLE.

The University of Warwick found that there have been only a small number of offensive or inappropriate postings to the systems, and most of these are rendered more positive by the comments left by other users. This has meant that moderating has been less burdensome than expected.

The University of Leeds found that offering the services via staff encourages take up beyond learning and teaching, to support research and management as well. They also found that providing services via staff means that students see the services as part of their learning and teaching and are therefore less likely to abuse them.

The University of Brighton found that take up can be slow, but 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.

The University of Edinburgh learnt that it is less important to choose the best possible system than to implement something that meets most of people's needs most of the time. However, 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. There is no need to provide a university instant messaging capability as people are already using commercial alternatives such as MSN, Google Talk and Skype.

Universities have had to address a wide variety of issues in implementing their systems. These issues, which require decisions by institutions, include:

- 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 how to allow / enable people from outside the university to contribute.
- How to monitor the systems for inappropriate and offensive use, and deal with such use.
- How to encourage uptake and use.
- Whether to automatically enrol all members of the University or do it by request.
- Whether to make activities student or staff led.
- How the use of Web 2.0 tools will affect learning and teaching.

Web 2.0 content

In this study we are interested in any content that is created on or uploaded to the web by the use of a Web 2.0 service. The content may have been created from scratch, or it may be existing content that has been edited, altered, remixed or mashed-up in some way. The content may persist for only a short time, or it may persist for a longer period and be available to be repeatedly viewed. The content may be private to a user, accessible by a group or groups, or accessible by anyone. The control over accessibility may in some instances be alterable by one or more creators or users of the data. Content can vary in granularity, for example a tag or a rating is a fine-grained piece of content, and a video is a relatively coarse grained piece of content. In many cases the content may be alterable by people other than the original creator, who may be members of a group, or anyone on the Internet. Content may be used purely as data, as part of a process, or as an enabler of social software and social interaction.

Content sharing

Considerable work has been done on sharing of content, including some in a Web 2.0 environment. For instance, CD- LOR⁴³ reports that much work is shared in research, but that very little if any of this makes use of web 2.0 type technologies with the vast majority being by email.

Method of sharing work in progress	Percentage of respondents using it
Email	75.3%
Personal website	26.7%
Conventional post	3.2%
By hand	27.1%
Other, including:	
Network	8.5%
Website, wiki, blog	9.7%
Meetings	6.1%
Web conferencing	2.0%
VLE	7.7%
Repository	1.2%
CD/DVD/USB	0.4%

They went on to conclude that "A very high level of sharing work-in-progress for comment and collaboration was identified in our sample, which confirms the view that repositories could play a useful role in supporting such collaboration, although – given the findings of this study – they don't appear to do so at present."⁴⁴ The SPIRE project⁴⁵ suggest that the whole conception of repositories may be mistaken, stating: "Research undertaken by the LionShare group found that academics were wary of uploading materials into digital repositories because they had little or no control over who could then view/use that material. The general trend discovered was that academics felt that their material was either of too poor quality to upload and would reflect badly on them or was of such a high standard that they were reluctant to simply 'give it away'."⁴⁶

It is worth noting that many universities are now setting up their own open access repositories (see OpenDoar⁴⁷ and ROAR⁴⁸ for registries of known open access repositories). The research councils (including the Wellcome Trust) are also increasingly requiring funded projects to publish their results, papers and even research data through open access. See for instance UK Pub Med Central⁴⁹. It is likely that these will increasingly be made accessible through the use of Web 2.0 technologies, for instance through the use of tagging, or the use of social software to build communities of contributors and users.

⁴³ <http://academy.gcal.ac.uk/cd-lor/index.html>

⁴⁴ http://www.academy.gcal.ac.uk/cdlor/CDLORdeliverable7_PRMSreport.doc p29

⁴⁵ <http://spire.conted.ox.ac.uk/>

⁴⁶ http://spire.conted.ox.ac.uk/trac_images/spire/SPIREchangereport191006.doc p1

⁴⁷ <http://www.opendoar.org/>

⁴⁸ <http://roar.eprints.org/>

⁴⁹ <http://ukpmc.ac.uk/>

Recommendation 2: JISC should consider funding projects investigating how institutional repositories can be made more accessible for learning and teaching through the use of Web 2.0 technologies, including tagging, folksonomies and social software.

The CD-LOR data suggests that currently most content is shared through informal mechanisms, though there is a significant growth of interest in using web 2.0 technologies for sharing. CD-LOR reports that almost 10% of respondents state that blogs have helped in their teaching.

However, the use of web 2.0 technologies, and the ability for the originator to control who may see and change content raises a number of issues that we wish to address here.

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 owns the content. There are various participating parties and potential content owners: 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 additional comments, tags, and recommendations and are usually separate from the original content, but with a wiki the content is created more dynamically.

Korn and Oppenheim⁵⁰ discuss copyright ownership issues:

"Although copyright protection is automatic upon the creation of a qualifying work, many users of Web2.0 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. For the former institutional policies may apply, and for the latter the site's policies may apply. For an institutional system there may be additional complications where people outside the institution (visiting lecturers, external workers on collaborative projects, etc.) contribute to the system. Additionally, many universities claim the IPR for the content that their staff (and, in some cases, students as well) create in the course of their duties. This may become increasingly difficult where content is placed in open environments, especially where they require the ceding of some or all the IPR.

⁵⁰ Korn, N and Oppenheim, C, *Web2.0 and IPR: A short scoping study for the Users and Innovation Programme*, JISC (Draft) April 2007

- Should universities host Web 2.0 services? Or should they make use of external services?
- Should universities claim ownership of the content? Do they then have to accept liability for defamatory or uncivil content, or copyright infringements for copied and repurposed material?
- What happens to student (or staff) content after they 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 YouTube has⁵¹. However, the community would benefit from some sound advice.

Recommendation 3: JISC should consider funding work looking at the legal aspects of ownership and IPR, including responsibility for infringements in terms of IPR, with the aim of developing good practice guides to support open creation and re-use of material.

Recommendation 4: JISC should consider funding work looking at long-term access to student created content once they have left the university with the aim of developing good practice guides.

Control

Where there is a service (blog, wiki, content sharing, social book marking) 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. 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 volume 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.

- Should content be moderated, should there be the possibility of removing offensive or irrelevant material? Is this the responsibility of the course tutor? And if not, then whose responsibility is it?
- What difference does it make whether the service is hosted by the university or by some other supplier? Will a university still be responsible for the actions of its staff and students on external sites if this work is in the course of their duties?

There was considerable concern expressed over any form of moderation by staff, and 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.

Recommendation 5: JISC should consider organising a workshop to look at forms of moderation (including peer moderation) and control of Web 2.0 content, with the aim of providing institutions with practical advice and examples of good practice.

We would expect the workshop to draw on staff who are involved in moderating systems, and this should include those working in schools or colleges as well as universities. It would be advisable to draw on the expertise of JISC Legal and request them to provide legal advice on the issue.

Versioning and preservation

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

⁵¹ "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 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." <http://youtube.com/t/terms>

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.

Recommendation 6: JISC should consider funding a study to look at how repositories can be used to provide end-user (i.e. referrer) archiving services for material that is referenced in academic published material, including internet journal papers. Part of this consideration should extend to copyright issues.

An important concern with preservation is that as students grow and mature, and change their roles, content which once seemed interesting or relevant may now be embarrassing, and there is anecdotal evidence that employers are "googling" people before interviewing them to get a better picture of them than is provided by a CV. Students (and staff) may therefore want to use some caution before posting to the world.

Recommendation 7: JISC should consider funding work to look at how widespread is the use of "googling" candidates as part of selection procedures, and consider producing advice and guidance to institutions and staff and students on the potentially permanent nature of postings.

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 ready to use after a self-registration procedure. Many externally hosted services are free to use, either in their most basic form (without added paid-for facilities), or with advertisements being displayed as part of their pages. Sometimes the scale of use of a system is in itself an advantage. For example externally hosted social bookmarking services being used for search offer advantages of scale. Similarly 43 Things⁵², a system which offers opportunities to find and learn with others, works well because of the size of its user base. 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.

However, in our consultative work, we found that there was a general concern about using externally hosted services in the following areas:

- 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 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.
- There may be problems attempting to provide multiple versions (eg. a new version for each time a course is run, or for each tutorial group).
- Academic freedoms may be impacted, for example images from an art history course or research might be deemed as offensive by some and result in the loss of the images or the corresponding account from the service.

Which raises the questions:

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

Recommendation 8: JISC should consider funding studies looking at the risks to the institution associated with internally and externally hosted Web 2.0 services, and ways in which the risks can be controlled and mitigated. This could be done within the wider context of examining risks associated with Web 2.0, web services, and Service Oriented Architectures.

⁵² <http://www.43things.com/>

Internally hosted services

Services that are hosted by the university also offer a number of advantages as they can be closely tied to the work of the university. The advantages include:

- The ability to implement single sign-on.
- The ability to include licensed material while keeping it within the university.
- The ability to offer support and training in the use of the tools, as the number is limited and they are known.
- 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 the systems with other functions including the virtual learning environment, library services and the portal (see below).

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 restrictive usage policy, only allowing their members and associates access rights.
- There may not be a sufficient number of users to make the services work effectively.

Integration

There are potential advantages to the integration of Web 2.0 systems with 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 on⁵³. 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 what tools to use 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 they are used and how they can be integrated with other tools. In particular, how should tools be integrated into the VLE, indeed should they be? 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.

- Which of these environments should the tools be integrated with?
- Should universities support more than one set of web 2.0 tools (ie. one within the VLE and one for other purposes)?
- If the tools lie outside the VLE then how are they integrated with the other tools within the VLE?
- If they lie within the VLE how are they integrated with other aspects of the university and university life?
- Do similar questions arise for portals and e-portfolios?

Recommendation 9: JISC should consider funding projects or case studies that look at different methods for integrating Web 2.0 into the overall university information and information technology environment while retaining flexibility of use across teaching, learning, administrative and other areas of university activity.

⁵³ The use of 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.

Learning, teaching and Assessment

Changes in student population

Web 2.0 technologies are one of several digital technologies that are increasingly helping change some characteristics of current and future student cohorts, and these changes may necessitate profound changes in learning and teaching methods.

Marc Prensky⁵⁴ 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 article⁵⁵, 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. 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".

Whether one believes these claims or not, there are students entering Higher Education with a different background and skill set than before. Thus Oblinger and Oblinger⁵⁶ characterise next generation ("n-gen") students as digitally literate, highly Internet familiar, connected via networked media, used 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". However 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 many young students who do not use the technologies.

Oblinger and Oblinger also point to a different kind of student, one who is non-traditional and working at the same time as studying. While their description is US-oriented, this kind of student is increasingly part of the UK HE landscape.

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? Is the changing student profile going to need 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 tool. Web 2.0 enabled approaches may therefore help engage with students. However, there is also evidence that many students see these as "their" space that should not be 'invaded' by faculty.⁵⁷

⁵⁴ Prensky, M., "Digital natives, Digital Immigrants", *On the Horizon* (NCB University Press, Vol. 9 No. 5, October 2001)

<http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf>

⁵⁵ <http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part2.pdf>

⁵⁶ Oblinger, D, and Oblinger, J. Is It Age or IT: First Steps Toward Understanding the Net Generation, in Oblinger, D, and Oblinger J. (Eds.), *Educating the Net Generation*, Educause 2005, <http://www.educause.edu/educatingthenetgen/>

⁵⁷ Hewitt, A and Forte A, *Crossing Boundaries: Identity Management and Student/Faculty Relationships on the Facebook*, CSCW'06, November 4-8, 2006,

- On the other hand, recent student interviews⁵⁸ in a humanities school in a UK University revealed that students were not concerned how they are taught (e.g. through lectures, seminars, or through a blended learning approach) so long as the instruction was good. This then raises the question of what is good practice in learning and teaching in different modalities?

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's critiques thereof. Wikis can be used by groups co-operatively producing artefacts directly in the wiki, or documenting group processes and external products⁵⁹.

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: Wikiversity⁶⁰ seeks establish a “community for the creation and use of free learning materials and activities”. The Open University's OpenLearn project⁶¹ 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.

Social constructivism has as a central precept that knowledge is created by learners in the context of and as a result of social interaction. Social constructivist approaches are particularly aided by Web 2.0 tools as mediating mechanisms between collaborating students and between students and teachers, particularly between students who might be 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 help the students progress their learning in a Zone of Proximal Development, the “distance” between the actual level of the learners development and the level of their potential development⁶².

Constructionism, advocated by Seymour Papert, is particularly 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 sand castle on the beach or a theory of the universe.’⁶³ Thus 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) and a set of wiki pages (for individual and group work).

⁵⁸ 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.

⁵⁹ Incidentally, wikis can also be used as personal media, as, for example, as a dynamic personal logbook, serving the accretion of individual knowledge.

⁶⁰ <http://en.wikiversity.org/>

⁶¹ <http://openlearn.open.ac.uk/>

⁶² Vygotsky, L.S., *Mind and society: The development of higher mental processes*, translation, Cambridge, MA: Harvard University Press, 1978.

⁶³ Papert, S. ‘*Situating constructionism*’, in *Constructionism*, edited by Idit Harel and Seymour Papert, Westport, Connecticut: Ablex Publishing Corporation., 1991

Independent learners

A major aim in universities is to produce independent (or autonomous) learners. A working definition is: Independent learners are self-directed learners who are able to set their own learning goals⁶⁴; develop strategies and plan how to achieve those goals; work towards realising the goals, either on their own or with others; and reflect on their learning processes and outcomes, in turn learning by that process of reflection.

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 help or enable 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.

New pedagogies and new assessment methods

Our consultative work revealed considerable interest in and opinion on pedagogies and assessment. 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 new pedagogies are likely to demand new assessment methods. The body also held that (i.e. there was no disagreement with) the view that the JISC should fund research and development of Web 2.0 tools for education.

We add that Web 2.0 should be seen as only one of a range of interrelated drivers mentioned above under “Web 2.0 and media and technology convergence”. As such, work with the development of Web 2.0 related pedagogies and assessment methods might well be seen in a broader context.

We note the following:

1. While some examples of specific pedagogic approaches are mentioned above, our 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 demand new pedagogies and new assessment methods.
2. The changing nature of students entering higher education may require responses, possibly in different directions. On one hand a move to supply engaging ways of tuition, on the other hand a need to supply ‘remedial’ teaching, in, eg, reflection, use of primary sources.

Recommendation 10: JISC should consider funding experiments with new forms of teaching that utilise Web 2.0 systems, and should consider funding the development of new Web 2.0 tools specifically for the educational domain, including those that allow pedagogic experimentation.

Comment: In the context of the above recommendation, we advise that projects should exchange ideas and experiences, and have a strong dissemination role. Projects of this kind should only be funded if there is a strong emphasis on observation and analysis. Projects could form a distributed laboratory, or could be hosted in a specialist unit in a particular HEI. The programme should allow for the development of new Web 2.0 tools specifically for the educational domain, including those that allow for pedagogic experimentation.

3. While within HE there is often a need for a pragmatically chosen amalgam of pedagogic approaches that are selected on the basis of knowledge to be learned, learning and teaching context, desired learning outcomes, and so on, there may be a need for new pedagogic models to support (a) opportunities opened up by Web 2.0 technology, and (b) demands placed on the HE system by changed characteristics in student intake.

⁶⁴ Clearly in an HE 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.

Recommendation 11: JISC should consider funding research, and build up a bank of case studies, on how Web 2.0 impacts pedagogy. This should include the impact of implementing these technologies on institutions, teaching staff, support staff and students.

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 HEIs 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 survey⁶⁵ 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 others contribution to group work, and, subject to further investigation, this student assessment of relative contribution 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 while they were deciding on relative contributions.

Recommendation 12: JISC should urgently consider funding work that looks in detail at problems in the assessment of group work that uses Web 2.0 tools.

Recommendation 13: JISC should consider funding projects to develop web-based tools to assist in ongoing monitoring of group process and that assists in the assessment of group work, taking into account individual effort within the group.

6. Simply moving to increased group work in a relatively unplanned fashion because group work is assisted using 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 report⁶⁶ 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, peer co-teaching, and facilitated group dynamics.
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 at 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. There is a wide range of approaches to assessment that could be utilised in the assessment of Web 2.0 mediated learning. For example, Attwell⁶⁷ mentions Stiggins's distinction between assessment of learning and assessment for marks: "Stiggins (2005)⁶⁸ distinguishes between the assessment of learning and assessment for learning. 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 comes from the same paper, where Attwell discusses authentic assessment: "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)⁶⁹ In authentic

⁶⁵ A sample of MSc students in the School of Computer Science, University of Manchester.

⁶⁶ Owen, M., Grant, L., Sayers, S, and Facer, K, *Social Software and Learning*, Futurelab, 2006.
http://www.futurelab.org.uk/research/opening_education.htm

⁶⁷ Attwell, G. *e-Portfolios – x the DNA of the Personal Learning Environment*,
http://www.knownet.com/writing/weblogs/Graham_Attwell/entries/7709663746/7896831716

⁶⁸ Stiggins R., *Student-Involved Assessment For Learning*, Prentice Hall, 2004.

⁶⁹ Cole, D. J., Ryan, C. W., & Kick, F. (1995). *Portfolios across the curriculum and beyond*. Thousand Oaks, CA: Corwin Press.

assessment, information or data is collected from various sources, through multiple methods, and over multiple points in time (Shaklee, Barbour, Ambrose, and Hansford, 1997).⁷⁰

Recommendation 14: JISC should consider funding projects to develop a range of assessment methods suitable for application in the context of developing Web 2.0 pedagogies. This might be in the context of a larger programme encompassing pedagogies, assessment methods and Web 2.0 tools for learning, teaching and assessment.

Possible issues and problems

An incomplete set of additional problems and issues that arise in relation to Web 2.0 are:

1. Much Web 2.0 based student work is about content sharing and repurposing. This can easily be seen by students as part of a new teenage copy-and-paste culture that runs counter to traditional notions of plagiarism, and adjustments may need to be made, either to redefine plagiarism (unlikely to occur), or to help students transcend this culture in HE environments (more likely to occur).

Recommendation 15: JISC should ask the JISC Plagiarism Advisory Service to produce guidance on Web 2.0 and its implications for plagiarism that supports the use of Web 2.0 in learning, teaching and assessment.

2. There may be changes in teacher 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."⁷¹ It could be argued, however, that changes in teacher role will only happen in areas where the teacher and student knowledge are either roughly equivalent or complementary.
3. There may be a skills and/or culture crisis as 'old world' 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 HE. Not all students may be digitally connected with a computer and Internet connection at home or in their digs, (or even in broadband connected university residences, if they are not a computer owner). These students would be at a profound disadvantage in a new world of Web 2.0 enabled learning without specific care being taken to address their computational and connectivity needs⁷².

⁷⁰ Shaklee, B. D., Barbour, N. E., Ambrose, R., & Hansford, S. J., *Designing and using portfolios*. Boston: Allyn and Bacon, 1997.

⁷¹ Downes, S., E-learning 2.0, *eLearn Magazine*, <http://www.elearnmag.org/subpage.cfm?section=articles&article=29-1>

⁷² 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.

Strategy and Policy

Few universities have specific Web 2.0 policies or strategies (the only one we are aware of is the University of Edinburgh⁷³), but a considerable number are beginning to address Web 2.0 when updating their strategies and policies.

There are several strategies and policies that are germane, and these include

- learning and teaching,
- information technology,
- information,
- accessibility.

Some of the issues that may need to be addressed in developing these strategies are discussed below. We examine a number of issues, and pose a series of questions. Where possible we suggest ways forward and actions that JISC, universities or staff might take.

Intellectual property rights

Web 2.0 raises a variety of issues in relation to intellectual property rights (IPR). This has already been discussed under content creation, but it is worth revisiting briefly.

Ownership

Who "owns" the content when it is collaboratively created? The authors? The university? The creators of the system?

The ownership may be reasonably clear when all the creators are members of the same university, but what happens if the system is open to people who are not members of the university? Or the system is not hosted by the university? Some systems address this by making clear who the owners are and what rights people have on all systems, often making use of one of the creative commons licenses⁷⁴.

Following on from Recommendation 3 and Recommendation 4 universities may need to revisit their information strategies and update them to take account of the advice on IPR and long-term access to resources once students and staff have left the university.

Re-use

Universities make considerable use of published materials in learning and teaching. These materials may be in paper or electronic form. They include text books, academic papers, learning objects and pre-prints. 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 they may need to be reconsidered.

What are appropriate licenses to negotiate with suppliers that allow for appropriate use and visibility of materials? This may raise issues of 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 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.

Control

The nature and degree of control that universities may wish to exert over content in a Web 2.0 environment is, as discussed, problematic because there are competing pressures to ensure that material is not illegal (eg defamatory or contravening IPR), and to support academic freedom. Universities will need to consider how best to resolve these issues, using a mixture of formal and informal moderation, the

⁷³ See http://www.is.ed.ac.uk/projects/Web_2.0_Initiative

⁷⁴ See <http://creativecommons.org/> where there are a variety of licenses permitting various different forms of re-use.

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.

Recommendation 16: Universities should actively monitor practice and law over control of content in a Web 2.0 environment, and update their policies accordingly.

Accessibility

While there are some accessibility concerns with a number of Web 2.0 systems, many of which make use of technologies such as JavaScript, Ajax and Flash (all of which can cause problems for some) there are also a number of potential benefits. For instance, students can describe content in other technologies. It is easy to add transcripts or notes to audio or video to offer alternative affordances. There are also other ways in which Web 2.0 may offer alternative affordances and enhance accessibility. For instance, scribd⁷⁵ 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 methods for accessing them. Similarly, it has been argued that comments (eg on blogs) offer a variety of views on the topic which may make the content more accessible by offering alternative views and affordances.

- How can the features of Web 2.0 be harnessed to enhance accessibility for all students (and staff)?
- Are there particular approaches that should be supported in learning and teaching strategies?

Recommendation 17: JISC should consider commissioning studies to explore i) the accessibility issues of various commonly used Web 2.0 technologies, and how any limits can be overcome, and ii) case studies on how Web 2.0 technologies can enhance accessibility.

Learning, teaching and assessment

It has been widely argued that Web 2.0 will fundamentally change learning and teaching, by making the students partners in the creation of knowledge rather than passive consumers. It has been suggested that Web 2.0 is particularly suited to social constructivism.

As the opportunities afforded by Web 2.0 become better understood it likely that universities will have to revisit their learning, teaching and assessment strategies to ensure that they take account of new possibilities and enable new approaches to be incorporated. This may be particularly complex where there are external validating bodies (such as learned societies), and it will be important that they are appraised of the implications of Web 2.0 for learning, teaching and assessment.

Recommendation 18: JISC, possibly in conjunction with the Higher Education Academy and QAA, should produce briefings and advice for validating bodies on the implications of Web 2.0 for learning, teaching and especially for assessment that can inform their work. This advice would have to be kept up to date.

Security

We are taking the term security very widely to include personal security and network and IT systems security.

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 education⁷⁶) and cyber-bullying.

- What policies need to be in place to protect staff and students from abuse?

⁷⁵ <http://www.scribd.com/>

⁷⁶ Related, but for children: *Web safety warning for children*, <http://news.bbc.co.uk/1/hi/uk/6652585.stm>

Recommendation 19: JISC should consider organising workshops on the implications for personal security of the use of Web 2.0 technologies for learning and teaching, with the aim of producing guidance to the community.

Comment: The workshop should include experts from university IT departments, and organisations such as Childnet which have considerable experience of the issues. The workshop should consider the legal framework, examples of good practice (which need not come from higher education) and ethical and operational issues concerned with providing a safe environment.

Recommendation 20: JISC, together with other interested groups such as Becta, the NHS and TTA, should develop model policies on personal security that universities can adapt to meet their own needs.

Network and IT Systems Security

All universities have acceptable usage policies (it is a requirement for connection to JANET), but many 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 fear of becoming a super-node and having undue network traffic). Some sites may be blocked because of concerns over "Malware"⁷⁷ (viruses, trojans etc.) Others have blocked services such as FaceBook and MySpace over concern about legal responsibility for postings, because of fear of issues like cyber bullying, or because of concerns over defamation⁷⁸.

- What is the right balance between openness and safety?

Recommendation 21: JISC should consider funding a workshop to consider current practice and determine how best to balance the issues of openness of safety, with the aim of producing guidance to the community.

Comment: The workshop should draw on the expertise that exists within the community, including UKERNA, and should address issues including network security, bandwidth usage and balancing user needs with network security. The results of the workshop should form the basis of guidance to the community.

Preservation

One of the key functions of universities has been the preservation of information. Historically this has been done using published works and theses retained in a 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. Will a MySQL database still be usable in 20 years on the hardware and operating systems available then?

These raise issues that can be addressed in information policy and might include:

- Who determines what information should be archived?
- What formats are appropriate for preservation? How far does this restrict content creation?

JISC is currently undertaking a study to look at institutional policies and practice in relation to the retention of learning materials, this may begin to answer some of these questions.

⁷⁷ Google searches web's dark side <http://news.bbc.co.uk/1/hi/technology/6645895.stm>

⁷⁸ Facing up to Facebook fears <http://news.bbc.co.uk/1/hi/technology/6639417.stm>

Conclusions

Web 2.0 will have profound 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; instead Web 2.0 is just one part of the HE 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 potentiality for inducing change in the HE sector. 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.

This study has focussed on the content sharing aspects of Web 2.0, but these are not purely limited to data, be that data textual, sound, or video. Content sharing via Web 2.0 mechanisms is also the enabler of social software, which as much as pure data content sharing has the potential to change the face of education.

Web 2.0 systems are increasingly being used in UK HE, both on an individual course module level, and at an institutional level. The introduction of Web 2.0 systems into HE is not without problems, as there are ramifications in the areas of the choice of types of systems for institutional use; external or institutional hosting; integration with institutional systems; accessibility; visibility and privacy; data ownership, IPR 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 topics demand institutional responses at the policy and strategy level. While we have seen, and recorded different approaches and responses to some of these topics by different universities, as far as we are aware only one university has reached the stage of recording Web 2.0 related policy and strategy.

We make various recommendations to the JISC as to actions to guide and help the UK HE community in its ongoing exploration, adoption and adaptation of Web 2.0 systems. Most importantly, because the use of Web 2.0 in learning and teaching is still a developing field, we recommend that institutions take a light-touch approach in the use of regulations that might constrain experimentation with the technologies and allied pedagogies.

The advent of Web 2.0 tools has drastically altered our understanding of e-learning and its potential in language classrooms. Every month we feature a free online tool which may help you motivate and captivate your students. Interactive activities that can be created with the help of these tools will inspire students to explore as a group or as individuals for their own personal autonomous learning. These tools are free and easy to download from a Web browser. For the most part, they don't require special training, so you can use or explain them quickly, and immediately engage the class. These "Web 2.0" teaching tools aren't magical, but they may seem to defy definition at times since they save time, help you to stay organized, and often take up little space on a computer. Some of these applications are Web-based, which means that they can be accessed from any computer. The following list is filled with tools that will make a teacher's, or those enrolled in the best online education programs, life easier. Use this tool for content archiving, coupled with an advanced search engine, and use advanced features to manage your configurable channels. The personal edition is free to download and use. CourseHero: Using this web learning platform, students in high school and college can access course materials such as flashcards, tutors, and courses.