Web 2.0 technologies for learning: The current landscape – opportunities, challenges and tensions

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Executive summary

This is the first report from research commissioned by Becta into Web 2.0 technologies for learning at Key Stages 3 and 4. It is based on a review of the current literature and thinking around Web 2.0 and its potential in education. Further reports based on empirical research into Web 2.0 use in education are due later in 2008.

There have recently emerged a family of internet services that attract the label 'Web 2.0'. Wide acceptance of this term implies that together these services identify a step change in the nature of the World Wide Web. This report defines that change and notes the way in which young people have engaged with it. Consideration is also given to how these new technologies create opportunities for educational practice. Because these opportunities are not yet being widely taken up, the present discussion focuses on identifying challenges that may be impeding adoption of Web 2.0 ideas in teaching and learning.

The origins of Web 2.0

A number of technological developments have come together to create new ways of using the Web. To some extent, these changes are a matter of simply scaling up user involvement. Web services are less expensive, they are faster, and wireless technology allows more widespread access. All of these factors have delivered a larger constituency of internet users. At some point, the size of that constituency seems to have made possible new forms of coordination, new forms of web activity. Moreover, these changes in access and speed have been accompanied by developments in software and data management. They also afford new patterns of internet use. In particular, the familiar web browser has become more versatile. It has allowed a wider range of user interactions, with such interactions being pursued within just this single desktop application.

All of these circumstances have led to a more participatory experience of internet use. Thus, Web 2.0 has provided a version of internet experience that encourages individual users to upload: that is, to offer up their own contributions to a vast and interleaving exchange. This is implicitly contrasted with the former (Web 1.0) experience of the internet, which was more a matter of downloading: that is, accessing the contributions of a much smaller set of information providers. In sum, the barriers to production and distribution have been loosened: an invitation for widespread participation is in place.

The consequence of this increased participation is that the internet has become a much larger enterprise of knowledge building, involving a larger constituency of participants. However, that building of knowledge has not been simply a matter of individual users making their isolated contributions. The communication and data

management resources of the internet have encouraged new forms of collaboration and coordination. These, in turn, have made possible novel, less planned forms of knowledge building. Such developments have created a demand for new tools to manipulate digital formats (especially images and video), and new tools to navigate this increasingly rich network of knowledge and experience.

Impacts of Web 2.0

Taken together, these developments in Web 2.0 create four broad forms of impact, which can be summarised as:

- inquiry
- literacies
- collaboration
- publication.

On the more cognitive side, Web 2.0 invites users to develop confidence in new modes of inquiry and new forms of literacy. Web 2.0 users must acquire the skills that are necessary to navigate and interrogate this new knowledge space. They must also become literate in digital formats for expression: formats that go beyond the familiar medium of print. On the more social side, effective Web 2.0 users must be comfortable with collaborative modes of engagement. They must also welcome new opportunities for publication on the internet and the audience attention that this entails.

To support these activities, a range of new internet tools have emerged. Most of them exist as web-based services that are accessible through a traditional browser. Most of them are also free to use. These tools have stimulated considerable growth in young people’s recreational use of the internet. Much of this has been concentrated on gaming, communication, and shaping online spaces for the expression of personal identity.

Online games with this Web 2.0 flavour allow the internet to coordinate the actions of geographically separated players. Interest in network communication has concentrated on text-based chat systems. While the celebration of personal identity has been through so-called 'social networking' sites, within which users can develop an online biography and discussion space to be shared with selected friends. Some of these uses inevitably are a source of concern in relation to the protection of young people from predatory contacts or from reckless commercial marketing.

Web 2.0 in education

At the same time, the affordances of Web 2.0 seem to harmonise well with modern thinking about educational practice. In particular, they promise learners new

opportunities to be independent in their study and research. They encourage a wider range of expressive capability. They facilitate more collaborative ways of working and they furnish a setting for learner achievements to attract an authentic audience. To encourage these possibilities, Web 2.0 tools have evolved that create distinctive forms of support for learning and for independent research in this new internet.

Lack of research and uptake

Yet while there is a groundswell of enthusiasm for adopting Web 2.0 practices in education, there is little evidence that uptake is happening to any significant degree. This is not helped by the fact that there remains very little research activity guiding the effective application of these new tools and practices. This may reflect the fast-changing nature of services and, therefore, the reluctance of researchers to aim their interest at such a moving target. However, slow educational uptake also reflects the fact that adoption of Web 2.0 creates a number of practitioner tensions; these exist as significant challenges to innovation.

Issues

The learner-centred discourse of Web 2.0 may be welcome, but learner-centredness should not imply that there are no significant new demands on teachers. Many will be hesitant to invest in acquiring the new competencies required by Web 2.0. The resources are largely generic rather than content-based and so teachers may find hidden calls on their time to orchestrate the relevant activities. In addition, institutions need to decide whether to contain Web 2.0 activities within the local areas of their learning platform, rather than risk learners publishing in the open internet. That decision is closely linked to the widespread anxiety felt regarding the threats to safety that arise from unconstrained internet interactions. It is also closely linked to the duty schools feel to restrict pupils' access to certain more playful (or morally suspect) sites that extensive Web 2.0 activity might indirectly make available.

Teachers also will have to manage the consequences of a strongly collaborative form of working that Web 2.0 activity invites. This raises issues for managing individual assessment, as well as personalisation tensions when dealing with learners who may want to learn and express themselves more privately. Teachers may also have reservations about the forms of study and research that Web 2.0 encourages. This applies in particular to the ease with which digital media and a large arena of informal knowledge encourages cut-and-paste solutions to personal research. Managing a mature approach to how learners study is a significant challenge for teachers. They must guide students into recognising the basis of authority for internet-published work – over and above simply helping them to do the necessary navigation and exploration in this environment. Teachers may also have reservations about the multi-tasking modes of working that a rich Web 2.0 desktop environment may cultivate.

Pedagogy before technology

In discussions of Web 2.0 for education, there is a danger of dwelling too much on the technology. What may be more significant about these recent developments is that they highlight a certain 'disposition' that practitioners might adopt in relation to teaching and learning. The Web 2.0 innovation may be requiring closer attention to those matters of pedagogy rather than attention to novel internet configurations. The commitment entailed by such a teaching and learning disposition is not new. It is an attitude that acknowledges the multi-perspective nature of knowledge, the reality of multiple literacies, the value of collaborative thinking, and the significance for creativity of finding an audience.

New internet tools do provide fresh impetus for this way of thinking in education. However, these Web 2.0 tools alone do not form the *necessary* basis for realising such a disposition. The associated ideas have long been debated within discussion of pedagogy. So, it is already accepted that they can only be pursued when the underlying curriculum and regimes of assessment have been designed to be in sympathy with them. It is true that the enthusiastic uptake of Web 2.0 tools depends on an educational disposition: that is, the acceptance of particular attitudes towards knowledge and knowing. But all of this can only be made to take flight if it is located within *systems* of educational delivery, management and assessment that have been fashioned in harmony with such attitudes.

Introduction

This is the first report from research commissioned by Becta into Web 2.0 technologies for learning at Key Stages 3 and 4. It is based on a review of the current literature and thinking around Web 2.0 and its potential in education. The report explores:

- what Web 2.0 technologies are and the drivers for their adoption
- their potential use and impact on education
- tensions surrounding their implementation in learning and teaching.

The resulting synthesis should be helpful for readers concerned with how new educational technology can present creative and challenging opportunities to learners. However, the synthesis here will identify significant gaps in our understanding and confidence. The identification of these gaps and issues has helped inform questions raised in the empirical research phase of the project that will report later in 2008.

The report will be of interest to policy-makers seeking to influence educational practice over the next five years. It should inform local authority and institutional decision-makers who are shaping policy on the use of Web 2.0 for educational purposes. It should guide practitioners wishing to understand the new technology that their learners are using – encouraging consideration of how they might capitalise on this engagement by drawing it into their classroom.

As will be fully discussed in this document, Web 2.0 is a technology that celebrates and builds community. It facilitates participation and it resources debate. Consequently, there are many commentaries *in* Web 2.0 that are *about* Web 2.0 – particularly concerning its significance for educational practice. Commentary is certainly welcome, but it is not enough. A principled consideration is needed of how the designs and functionalities of Web 2.0 technology relate to educational policy and to theories of learning. In particular, there is a need for more sound empirical research on adoption and impact. Studies are needed that can give authority to debate and that can address the conjecture and anecdote that the topic of Web 2.0 naturally encourages.

There is a widely acknowledged gap between the apparent enthusiasm of young Web 2.0 technology users and its slow uptake in schools. In fact, some have argued that what is entailed by Web 2.0 is more comfortably understood and appreciated by a younger generation. It is possible, therefore, that teachers are less receptive to its opportunities than learners. Others argue that, within education, Web 2.0 activity is troublesome to manage and creates situations that can prove unwelcome to young users, or even dangerous. Therefore it is possible that institutions will be even less receptive to its implementation than individual teachers.

So, there are many issues to clarify once the nature of Web 2.0 has been established. In particular: what educational practices are possible around this technology, with what potential, and with what problems of implementation? This document reviews current thinking on these questions. The empirical research phase of the project will then aim to address some of the most urgent of the issues arising.

What is Web 2.0?

Web 2.0 is a set of internet services and practices that give a voice to individual users. Such services thereby encourage internet users to participate in various communities of knowledge building and knowledge sharing. This has been made possible by the ever-extending reach of the (world wide) 'web'. Meanwhile, navigating and exploring this web of knowledge has been greatly facilitated by the increased functionality of the web 'browser'. The browser has thereby become the network reading/display tool that offers a universal point of engagement with the Web. More than that it has become a platform for using a wide range of digital tools and taking part in a wide range of community interactions. But why '2.0'?

An explanation comes from the common practice of technology versioning where decimalised numbers are appended to the names of an evolving software application: as in 'mygame 2.1'. By convention, changes in the integer part attached to the name of a program signal major evolutions in its design or implementation. Changes in this decimal part (from '0' upwards) signal refinements within those steps. It is this that prompts the contemporary allusion to 'Web 2.0'.

So, by analogy, 'Web 2.0' implies a step-change (cf. 'Web 1.0') in the structure of a whole environment of computer activity – namely, the World Wide Web. Some have suggested this environment has changed so radically and at such a pace that it now seems to exist in a new 'version'. This change in the Web is related to a new capacity for allowing users themselves to make a difference to what the internet does. In particular, this comes about because of the social activity that novel internet designs now allow. So, new forms of web designs – Web 2.0 applications – have afforded new possibilities for user involvement in what makes up the internet. And where the user is cast as a learner, this becomes an intriguing opportunity. The history of this development is reviewed in greater detail in Appendix 1 of the supplementary material where the case for continuity or discontinuity is considered in more detail.

The variety of actual activity that is embraced by Web 2.0 is summarised in Table 1 along with examples of websites to illustrate each category. The table suggests the following overarching themes:

- First, Web 2.0 is about a scaling up of user participation that creates new possibilities for sharing and 'network effects' that are emergent from this

new scale. Thus, many categories in the table refer to technologies that put users into contact with others: letting them enjoy an exchange of opinion, digital products, or conversation. The greater the number of people participating, the greater the value derived.

- Second, such sharing can evolve into more organised forms of joint knowledge building. Thus, Web 2.0 is about creating arenas for user collaboration.
- Third, Web 2.0 is about exploring a wide range of expressive formats. This is because digital media create new opportunities for manipulating more than the conventional *texts* of communication: in particular, they encourage exploration of images, sound and video. Moreover, these opportunities have now become widely available.
- Finally, the rich and democratic patterns of exchange and publishing that Web 2.0 affords mean that the internet offers novel frameworks and resources for research and inquiry.

A fuller exploration of the twelve categories of activity in Table 1 is given in Appendix 2 of the supplementary material, Web 2.0 ecology.

Table 1: Major categories of Web 2.0 activity[1]

Trading *Buying, selling or exchanging through user transactions mediated by internet communications* When users were empowered to interact with internet sites, buying and selling appeared early, particularly around books and music. This activity became more participatory as users began selling their *own* goods through classified ads (craigslist). Websites emerged that increasingly proceduralised such exchanges (ebay). Personal trading then started to include more service-oriented opportunities, for example, accommodation (couchsurfing) or parking (parkatmyhouse).	http://craigslist.org http://ebay.com http://www.couchsurfing.com http://www.parkatmyhouse.com
Media sharing *Uploading and downloading media files for*	http://www.flickr.com

[1] Websites are given as examples only and no recommendation or endorsement is intended.

purposes of audience or exchange Users empowered to download *and* upload to the internet were quick to swap digital files of their music collections via centralised websites. While music-sharing thrived on users copying of commercial material, photo-sharing (Flickr) involved user-generated content. The video-sharing that then emerged is a mixture of recycled film/TV and homemade clips (YouTube). Personalised versions exist for individual broadcasting (castpost). Other visual media that are popular for sharing include slideshow presentations (slideshare) and sketches (sketchfu). Sites now exist to package and present the various shareable media creations of individuals (loudblog), with increasing emphasis on rating and commentary from users.	http://www.youtube.com http://www.castpost.com http://www.slideshare.net http://sketchfu.com http://www.loudblog.com
Media manipulation *Using web-accessible tools to design and edit digital media files* Web-shared media invites web-based tools to produce and refine the files to be shared. Web tools are available for editing photographs (splashup, fotoflexer). Others can allow the creation and sharing of comic strips (toondoo) and for simple animated images for webpages (gifup) or the fashioning of whole personal web pages (protopage). Similar editing can be applied to sound files (soundjunction). Moreover, images or videoclips can be annotated with sound – or with visual notes (voicethread). Collections of images can be effortlessly constructed into sequential video clips (animoto) or broadcast as TV-style video (makeinternettv). More elaborate mixing of visual digital material into montages or 'mashups' is also supported (popfly). Sections of web pages themselves can be selected and pasted into such montages (kwout).	http://www.splashup.com http://fotoflexer.com http://www.toondoo.com http://gifup.com http://protopage.com http://www.soundjunction.org http://voicethread.com http://animoto.com http://makeinternettv.org
Data/web mashups *Combining data from multiple sources to create a*	http://www.popfly.com

new application, tool or service Typically mashups have been about data visualisation, such as overlaying geo-tagged photos over online maps. However, the mashup concept may move into the business application space, allowing rapid development and integration of applications. Mashups need some technical skill to create and tend to rely on open application programming interfaces (APIs). Tools such as Microsoft's Popfly, Google's mashup engine and Yahoo Pipes have made the process more straightforward.	http://code.google.com/gme http://pipes.yahoo.com/pipes
Conversational arenas *One-to-one or one-to-many conversations between internet users* The discussion forum develops the concept of a bulletin board. Users may 'post' their contributions to a topic-centred exchange (livingwithstyle.com). With large numbers of users online and with faster networks, it became possible to have conversations in real time. Thanks to freely available tools for text exchange (instant messaging and chat rooms), it became easy to create distinctive spaces for internet, text-based conversation. Some services extend text chat into higher fidelity experiences that include video links between users (paltalk, oovoo). Other services create a more game like atmosphere, whereby exchanges are through screen-based avatar characters that users can design and control (imvu).	http://livingwithstyle.com http://www.msn.com http://www.paltalk.com http://www.oovoo.com http://www.imvu.com
Online games and virtual worlds *Rule-governed games or themed environments that invite live interaction with other internet users* Being able to interact with other internet users invites the playing of games. Because users may be strangers, the game rules must avoid assuming mutual familiarity. Naming a sketch drawn by someone else, for example (isketch). Or having invisible user/partners suggest labels for random photographs – which also helps	http://www.isketch.net http://images.google.com/imagelabeler http://www.worldofwarcraft.com http://secondlife.com http://www.habbo.com http://www.virtualibiza.com http://www.clubpenguin.com

search engines tag them (imagelabeler). More traditional partner-based electronic games are possible with internet connections between players (worldofwarcraft). 'Virtual worlds' create screen environments that allow users to navigate this space and interact with others through avatars. They do not demand game-like rules but they may have an economy for trading goods or services (secondlife). These spaces may be themed so as to narrow possible interactions in rooms such as in a hotel (habbo) or in mocked-up places (virtualibiza). They may be tailored for younger users (clubpenguin). For very young users they may be based on managing a pet-like avatar (webkinz), with extensive marketing links.	http://www.webkinz.com
Social networking *Websites that structure social interaction between members who form subgroups of 'friends'* An early form of internet social interaction was based on the dating agency principle (match). Recent sites organise real world meetings between members, such as meeting for Saturday breakfasts (fruehstueckstreff) or simply based on tracking mobile phone location (dodgeball). Other sites convened members online based on alumni relations (friendsreunited) or on business CVs (linkedin). However, the greatest success has been in sites that allow users to create digital spaces into which they can invite 'friends' to share messages, texts, videos etc, or to play games. Some have a strong student base (facebook), some are more media-oriented (myspace), and some are more for teenagers (bebo). Others create social links based on users tagging their personal goals (43things), or declaring themed interests, such as green politics (care2) or clubbing (dontstayin). Finally, tools exist for special interest groups to design their own social network sites (ning).	http://match.com http://www.fruehstueckstreff.org http://www.dodgeball.com http://www.friendsreunited.com http://www.linkedin.com http://www.facebook.com http://www.myspace.com http://www.bebo.com http://www.43things.com http://www.care2.com http://www.dontstayin.com http://www.ning.com
Blogging *An internet-based journal or diary in which a user*	

can post text and digital material while others can comment Web services offer users space and tools to launch their own 'blog' (blogger). Some encourage interaction around themed concerns and thus resemble social networking sites (livejournal). Search engines exist for the 'blogosphere' of blog postings (technorati). Some users favour shorter, more whimsical and multimedia postings (tumblr). While micro-blogging sites allow only short entries, these can be from other devices such as phones; updates can be sent to selected other users (twitter). These sites tend to thrive on building a community of signed-up 'followers' for their authors.	https://www.blogger.com/start http://www.livejournal.com http://technorati.com http://www.tumblr.com http://twitter.com
Social bookmarking *Users submit their bookmarked web pages to a central site where they can be tagged and found by other users* Some sites collect and aggregate tags on bookmarks that users have shared, thus allowing organised search (del.icio.us) based on personal tags or a 'folksonomy'. Others incorporate user annotations with the tagging (diigo). Services exist to extend this beyond web pages: for instance, allowing users to share, tag and search on books that they are reading (librarything). Such activity encourages folksonomies or private or user-defined categorisation schemes rather than the more traditional hierarchical and constrained taxonomies.	http://del.icio.us http://www.diigo.com http://www.librarything.com
Recommender systems *Websites aggregate and tag user preferences for items in some domain and thereby make novel recommendations* Users may be invited to vote on items to determine which get prioritised in publication, news stories for example (digg). In such systems, 'social filtering' encourages individuals to find 'friends' with reliable selections. Or users can	http://www.backofmyhand.com http://digg.com http://www.last.fm http://www.stumbleupon.com

submit their own collections of favourites based on places or regions (backofmyhand). However, more successful have been sites that calculate recommendations based on looking at collections that users have made visible, such as their music files (last). This process may be based upon collaborative filtering whereby complementary overlaps in the tagging choices of individual users form the basis of recommendations (stumbleupon).	
Collaborative editing *Web tools are used collaboratively to design, construct and distribute some digital product* Sites may allow users scattered across large distances to collaborate in making a single entity such as a film (aswarmofangels). By centralising documents on a shared web server, a group of users may edit those documents rather than hold many individual copies (docs.google). More structured sites allow the production of collaborative artefacts such as novels (glypho).	http://aswarmofangels.com http://docs.google.com http://www.glypho.com
Wikis *A web-based service allowing users unrestricted access to create, edit and link pages* The wiki construction process is best known through the public, collaborative encyclopaedia wikipedia. Similar ventures exist for more focused interests such as travel (wikitravel.org.en) or television knowledge (tviv). Or users may use the wiki concept to design and maintain a personal organiser (tiddlywiki).	http://www.wikipedia.org http://wikitravel.org/en/Main_Page http://tviv.org http://www.tiddlywiki.com
Syndication *Users can 'subscribe' to RSS feed enabled websites so that they are automatically notified of any changes or updates in content via an aggregator.* Individual sites offer buttons that allow users to subscribe and thus be posted updated material. Other sites exist to ease the subscription process and allow users to select a profile of feeds (bloglines). However, the best known form of this	http://www.bloglines.com http://www.podcast.net

feeding involves podcasts: audio or video files that can be delivered to subscribed sites. Websites act as portals to finding these podcasting sources (podcast.net).	

Drivers for Web 2.0

Internet: technical drivers for Web 2.0 growth

A wide range of Web 2.0 services have grown and flourished thanks to a parallel growth in internet technology (discussed in greater detail in Appendix 3 of the supplementary material). The list of themes covered in that discussion are summarised below:

- **Widening internet access**: inexpensive broadband connectivity and devices has created a vast constituency of users. Moreover, many Web 2.0 services depend on 'network effects' – that is, they achieve greater viability when they attract greater numbers of users.
- **Greater fluency of interaction**: wireless networks have made access ubiquitously available and faster networks have extended the menu of material that can be downloaded and uploaded – in particular, bandwidth-demanding video is now readily shared and exchanged.
- **The browser as universal platform**: the browser is becoming the universal interface to a range of online applications and remotely stored data. These ‘Rich Internet Applications’ (RIAs) have given many online applications and services the look and feel of desktop software. These services are accessible from most devices with a full browser and internet access, making them largely independent of local operating systems and local storage.
- **Managing data on an epic scale**: inexpensive storage allows web service providers to store vast amounts of user-created or user-related material. This may include incidentally-detected choices that users have made, as well as selections or files that they have intentionally uploaded and then tagged. Many Web 2.0 services are based upon interrogating, integrating, and sharing that data.
- **Endless shelves in the internet marketplace**: although some internet contributions may be more prominent than others (made more visible by greater publicity), all internet contributions can be equally findable once a URL is assigned. The 'cost' of web publication is small and equally distributed across all users, thus creating a strongly participative culture of engagement.
- **Publication space for user-generated content**: inexpensive storage has encouraged sites to act as silos for material that users have submitted.

Thus, the range and depth of material available has increased and this, in turn, has developed a larger user base for such material.

Intersubjectivity: human drivers for Web 2.0 growth

Web 2.0 has evolved because technologies have allowed it to, but also because it offers activities that people already wanted to do. Disentangling developing technology and developing user appetites would be unwise. It is clear that 'Web 2.0' has evolved in a synergistic manner. Technical advances and existing user ambitions have become interlocked. Given that users do come with ambitions, then it is reasonable to ask *why* they might be attracted to participating in these Web 2.0 activities.

The appeal of Web 2.0 should not surprise us. These activities fit easily with modern views on the deeply social nature of human mentality (see for example Cole, 1996; Tomasello, 1999). This is not to undermine the novelty and significance of Web 2.0 activities, but it may be reassuring to locate them in the wider landscape of human psychology. This may counter any supposition that the underlying human motives at work are somehow new. Or, worse, that they are somehow the singular outcome of engaging with a certain new technology.

A key concept for exploring relevant motives here is 'intersubjectivity'. This is a cumbersome term which aims to capture the unique psychological characteristic of human beings. The reason the term is needed in a Web 2.0 context is to clarify commonplace but sweeping references to 'the social nature of human mentality'. To be helpful, such phrases must mean more than a tendency for human beings simply to organise themselves into joint activity with others. Not least because there are plenty of other species that are 'social' in this sense of coordinated action –ants and bees for example. However, human social life is different.

This difference arises because, unlike ants and bees, human beings have a sense of their own psychological states. As a species, humans are conscious of (and often actively articulate) their feelings, understandings, dispositions, emotions and so forth. This awareness of psychological state is what is meant by 'subjectivity'.

What then is seen as unique about human social life is the capacity of individual human beings to productively coordinate their subjectivities with that of other people. This '*inter*-subjectivity' is a matter of *recognising* subjectivity in another person and acting in ways that usefully take it into account. Colloquially this might be termed 'mindreading' (Byrne and Whiten, 1988). Or, more grandly, it may be said that what people are relentlessly doing is a kind of 'theorising' about the workings of other people. A basic human theory about the behaviour of others is quite simple. It depends upon recognising the existence of beliefs and desires. These beliefs and desires are understood to be the (hidden) causes of other people’s behaviour.

Moreover, it is natural to be curious about these. All of this amounts to saying that intersubjectivity equips human beings with the cognitive capacity to form a 'theory of mind': a theory that usefully guides how they relate to others (Premack and Woodruff, 1978).

In evolutionary terms, doing *clever* things in social groups would have depended on this intersubjectivity. For instance, when hunting for food, the possibility of an ambush surely depends upon the mindreading ability of the participants: each need to anticipate and understand what the others are doing. Put in very general terms, intersubjectivity allows human beings to *collaborate*. But it is probably also the reason why humans are the only species that appears actively to *teach* their young (Premack and Premack, 1996).

It is not difficult to see how intersubjective capabilities would support intelligent action. Solving a problem collaboratively exploits these capabilities. One person's assumption that they share understandings with a collaborator creates a powerful platform because, upon that platform, they may each then construct creative conversational reasoning. It should also not be difficult to see that achieving intersubjectivity has emotional or motivational force as well. Human beings seem to value and seek a certain feeling of resonance that arises from reciprocal understandings of this kind with others. There is a sense of intimacy associated with knowing that the other person knows what you know – and also that they know that you know they know this, and so on in a recursive pattern of mutuality.

This becomes significant when considering the energy and enthusiasm that is generated as Web 2.0 users engage in their various forms of participatory coordination. Often the emotion will be grounded in a strong sense of experiencing or cultivating this intersubjectivity. Web 2.0 often furnishes the sort of conditions in which such reactions are felt strongly.

To appreciate this potency, consideration must be given to where the pleasure of intersubjectivity comes from. Any individual human being's capacity for intersubjectivity will have been cultivated within their personal history of growing up. It will have arisen within a history of close interpersonal exchange – such as conversations with people close to them. Web 2.0 material typically echoes this more intimate form of intersubjective engagement. Such material communicates a more accessible, or personal sense of its authorship – where other public material that is read or viewed may often seem anonymous, or its ownership more remote. This accessibility of contributions in Web 2.0 environments may more readily allow the reader to project identity, motives, and understandings into the author. This, in turn, arouses something of that appealing sense of intimacy that is associated with intersubjective engagement.

Web 2.0 structures often allow these mutualities to be further exercised by the possibilities they offer for developing real dialogue around posted material. This may make it tempting to interpret the enthusiasm for such communication as something simpler: namely, the measure of a basic human motive to collaborate. But if any human quality is 'basic' here, it is intersubjectivity. That quality may be as easily (and just as usefully) recruited to *competition* as to collaboration. In a given situation, which of these comes to dominate may be uncertain. That said, it is clear that socialisation will often cultivate an appetite for collaboration and that the affordances for dialogue within Web 2.0 structures offer an appealing route for it.

Young people's recreational use of Web 2.0

Much of what Web 2.0 comprises involves individual users coordinating with others. Sometimes this coordination is crafted with careful intent and creative skill. At other times it may be something that is constructed in the background – as internet services detect and integrate what users are doing in common. Those emergent shared activities vary across a spectrum from the very serious to the very frivolous. It is not easy or sensible to classify what gets done into a recreational versus an educational distinction.

However, it is important to acknowledge that Web 2.0 resources can stimulate and serve interests that lie outside the demands of a school curriculum. The activities of inquiry, conversation and production that such interests may entail are sometimes termed 'informal' learning. The opportunity to pursue those interests can exercise skills that usefully support what is done at school.

Unfortunately, there is little research that indicates how young users are distributing their engagement across the various resources of the Internet. Although it is well documented that they are heavy users (see for example Lenhart, Madden, Rankin Macgill, and Smith, 2007; Livingstone and Bober, 2005; Ofcom, 2008), less has been recorded about the detailed pattern of that use: what they actually do. It is clear that, in relation to Web 2.0, much activity is concentrated on developing and viewing profiles in social networking sites (Ofcom, 2007). However, when interpreting surveys and interviews, care must be taken to notice the scale and representativeness of the sampling. For example, the much-cited Pew Internet survey (Lenhard *et al*., 2008) made (telephone) contact with less than 50 per cent of their initial sample. Extrapolation to the larger population or to sub-groups within that population must be done with care.

While much is made of Web 2.0 as a medium that stimulates the production and publication of user material, it is unlikely that most young people depart from Arthur's (2006) 1 per cent rule, whereby 1 per cent of the user population produces the Web 2.0 content, 10 per cent comment on it, and 89 per cent consume it. Similarly while

viewers of content on YouTube and Wikipedia tend to be the 18–24 group, content *generators* tend to be the 35-54 generations (Horrigan, 2007).

On the other hand, such 1 per cent rules apply chiefly to 'substantial' content – the keeping of a blog or the uploading of a video. Young people may be more active publishers at the micro-content level. It is probably in relation to this that Lenhart *et al*. (2007) are able to report that '64% of online teens ages 12–17 have participated in one or more among a wide range of content-creating activities on the internet'. Questions such as 'Do you create or work on your own webpage?' may solicit 'yes' responses from 27 per cent of teens. But 'own webpage' might well be taken to refer to a fairly narrow arena of publication: in particular, the profile pages on social networking sites such as bebo.com.

While material published here lacks the order and structure of a personal blog, it nevertheless will have similar expressive significance. It should therefore be recognised as a creative opportunity. Nevertheless, the slipperiness of meaning that characterises the researchers' questions needs to be noticed. In a survey, it is not easy to be confident about what will be understood as 'uploading content' or 'your own blog'. If putting a photo on one's social networking site is to count as uploading content, then the percentage of young people doing this is probably as high as the percentage that own a social networking site identity. In short, what young people are doing via Web 2.0 needs to be better understood in relation to the real scope or 'depth' of their engagements.

However, whatever the depth of participatory involvement in terms of content creation, the young internet user is inevitably exposed to the general culture of participation that Web 2.0 activities currently encourage. Dutton's (2005) research shows that over half of teenagers surveyed turned to the internet first in order to satisfy their information needs. In which case, they are very likely to encounter a range of novel and stimulating resources: for instance, the multi-perspective tradition of blogging, the considered analyses of Wikipedia, or the social knowledge building of forums and user commentaries. Yet little is known regarding the detail of how those needs are perceived or pursued as private research, although there are plenty of guides as to how the young and culturally alert *might* go about navigating this space (see for example Jennings, 2007).

Identity expression

Much research on young people's recreational usage of Web 2.0 resources stresses their most visible form of engagement: the exploration of self and friends in social networking systems. This is widespread. In the UK, Ofcom (2008) reports that almost half (49 per cent) of children aged 8 to 17 who use the internet have set up their own profile on a social networking site. A similar reach is apparent in the USA. More than half (55 per cent) of all online American youths aged 12 to 17 use an online social

networking site (Lenhart and Madden, 2007). Around half of them will visit their site(s) at least once a day. At least for these teenagers, the dominant social networking site remains MySpace. This same study shows that these sites are more likely to be used by girls, who are then more likely to use them to reinforce existing friendships. Boys, on the other hand, are more likely to be seeking new friends. Around 40 per cent of these teenagers with a personal profile report that it is visible to anyone who happens upon it online – a risk of concern to many commentators.

The extent of this engagement with social networking sites is striking. Moreover, it is something that educators and parents may need to register, not simply because it may have a productive role in supporting learning (which as a communication structure it may) but because it may have an unproductive role in competing with the demands of learning. The Ofcom report (2008) notes: 'Some teenagers and adults in their early twenties reported feeling ‘addicted’ to social networking sites and were aware that their use was squeezing their study time. Many users had experienced this drawback, although to differing degrees.' (p.40)

Amongst college students, one recent detailed survey again found gender to be a strong predictor of engagement with social networking. However, which site was favoured was found to be linked to a wider variety of demographic variables, including race and social class (Hargittai, 2007). Studies of links between Facebook use among students and their social success suggest that the service provides useful support for maintaining 'social capital' more generally. There is also evidence that using such networking sites provides benefits for students with low self-esteem (Ellison, Steinfield and Lampe, 2007).

Boyd (in press) offers an analysis of Friendster.com that explores well the dynamic of participation in social networking. This site intended to make established offline social relationships visible within its own structures – for online engagement. In this way, people’s social relations would be exposed for greater self-awareness and, if appropriate, confronted for re-mediation or repair. However, the system inevitably imposed a framework of its own for online engagement with others. In particular, it acted to flatten social distance and it created the stark distinction friend/not-friend, thereby undermining subtleties of personal relationship. Accordingly, participants found that such system features introduced new demands of social management and these, in turn, fed back into their social world to influence things offline. Moreover, Boyd found that the highly visible and persistent quality of what was done online required participants to become careful about how they articulated these relationships. They thereby adapted a more self-conscious and 'performance' attitude online. Boyd concludes by noting how the system she studied 'demonstrates the inverse relationship between the scale of social network and the quality of the relations within them…It also demonstrates that digital networks will never merely map the social, but inevitably develop their own dynamics through which they *become* the social.'

Text-based communication

There is only scattered research on other Web 2.0 services, including for instance, the nature of communication in teen chat rooms. One motive for this particular interest has been the vision that internet conversation can help build a global village in which many existing social prejudices were disposed of. The internet's lack of visual signifiers associated with gender, ethnicity or infirmities encourages this hope (Negroponte, 1995). Yet Tynes *et al*. (2004) indicate that negative allusions around these social categories remain commonplace, particularly in unmonitored teen chat areas. As with social networking sites, the activity in these spaces typically involves a significant investment in the shaping of personal identity through discourse practices (Merchant, 2005b). Moreover, those patterns of conversation can become rich and complex (Greenfield and Subrahmanyam, 2003).

A widely discussed feature of internet text chat as a medium of communication is the way in which it allows participation to be anonymous. In some respects this can be a valuable feature. It can even be deployed to the advantage of online self-help groups for young people, such as a chat room for supporting the cessation of smoking (Woodruff *et al*., 2007). On the other hand, the release of inhibition that anonymity can enable may also undermine effective communication. For instance, it may require that instructors actively take steps to cultivate good communication in learning situations where anonymous text communication is involved (Conrad, 2002). It also needs to be taken into account as something that may render young people vulnerable – given the role that chat rooms can have in constructing anonymous discussions of sexual interest (Wolak, Finkelhor, Mitchell and Ybarra, 2008).

However, as Boneva *et al*. (2006) have observed, teenagers migrate from text chat systems into other forms of online peer communication. It is communication within these alternative social networking systems that has attracted more research attention. Again, much research emphasis is on the construction of personal identity – in text and images (see for example Lampe *et al.*, 2007). However, while it is possible to document the range of expressive opportunities taken up, it is not so easy to interpret them psychologically. The area where it has been more closely studied is in relation to the particular identity complex of gender (see the collection of essays in Mazarella, 2005). Most analyses of contributions to social networking sites stress the empowering potential of this medium to support the presentation and exploration of gender identity.

Safety

A recurring concern in the popular media is the risk that might be attached to extensive communication online. These concerns tend to be concentrated on the

twin issues of falling prey to predatory strangers online and increased bullying by peers.

There is evidence that young people are less naïve about the internet and its risks than commentators assume (Yan, 2006). More generally, a review of research in the USA by Wolak *et al*. (2008) challenges a number of assumptions about the nature of the dangers from online communication. In particular, their review suggests that conversations with unknown adults rarely involve deceit about the sexual interest of the adult; it is generally broached early in conversation. Where there is risk here for young people it seems to arise more from starting and pursuing conversation in that direction.

In general, social networking sites seem less a source of concern than chat-based applications – where potentially predatory exchanges seem more readily entered into. The review by Wolak *et al*. does not challenge the reality of unwelcome contacts with unknown individuals, nor does it deny the urgency of educating young people in relation to this issue. However, there are currently many misconceptions concerning the dynamic of this predicament. These need to be better understood if there is to be effective education on safe behaviour.

So-called cyberbullying has been more widely researched and documented (see for example Li, 2007; McKenna, 2007; Stomfay-Stitz and Wheeler, 2007). A recent UK study by Smith *et al*. (2008) pursues this issue with large samples of secondary pupils. They find that the problem is less frequent than traditional modes of bullying but that it is nevertheless a significant stress for many young people. The medium for victimisation is most likely to be phone calls and text messaging and the impact is perceived by victims as being as serious as more traditional bullying. Most of the experience arises out of school, perhaps because many schools are vigilant about the use of mobile phones in the school day. However, in over half of reported cases, the perpetrator was from the same school as the victim and so the problem is often brought back to the attention of the school soon after an episode has occurred.

While there has been much attention to the unwelcome phenomenon of peer bullying, it is important to note that young people are also able to recruit Web 2.0 tools for the bullying of their teachers. Lately, these have included the posting of embarrassing video clips on media-sharing sites and inappropriate entries on sites that invite pupils to rate their teachers.

Digital native?

There is much to be understood about recreational or informal use of Web 2.0 opportunities by young people. At present, it is clear that they are often enthusiastic and frequent participants. It is also clear that they invest effort in creating an online identity that usefully interacts with their social life in the offline world. Increasingly, web services are offering tools that allow people to make visible to others their preferences and interests. This is sometimes termed 'declarative living'. Some of these services are merging with mobile phone technologies, allowing users to update their awareness of where potential contacts are located and what they are doing. It remains to be seen how attractive this will be to young people.

There is little sign of a large constituency of young users who are making extensive contributions (out of school at least) through wikis, tagging, collaborative writing and other Web 2.0 resources. However, the size of that user base deserves to be clarified. More important is research that clarifies how young people engage with Web 2.0 resources authored by others – particularly when they are concerned simply to find out more about things that interest them.

Finally, the extent of this recreational interest need not imply that young people themselves orient to technology with the same singular interest that is apparent among authors of the Web 2.0 literature. Ofcom (2008) reports that only half of the young people engaging in social networking actually recognised the term. A recent worldwide survey of 18,000 children (Microsoft/Viacom/MTV, 2007) suggests that that there is no overarching consciousness of Technology or Web 2.0 as a distinctive class of cultural resource. There is no pre-occupation with it as something that they isolate and think of as 'new media'. Rather these various internet tools and services seem to be taken for granted. They are approached as mere opportunities to complement and extend well-established patterns of communication and creativity. In a sense, the functional distinctions being explored here are relatively invisible to their young users – however energetic the use.

In sum, there are a range of urgent research issues concerning young people's recreational use of Web 2.0 technologies:

- What are the principal Web 2.0 services that young people are using?
- To what extent and in what ways are young people using the internet to research their private and recreational interests?
- How are they judging the authority of information found?
- What forms of personal digital artefacts are being created?
- What is the typical constituency of social networking contacts?
- How do online communications influence offline relations?
- What literacies are exercised by the use of Web 2.0 services?

Some of these issues will be addressed in subsequent reports from this project.

Educational Web 2.0 – the possibilities

Table 1 above identified 12 categories of Web 2.0 activities. In the Table below, the same 12 categories are explored in relation to their possible application to teaching and learning. Again, websites are identified that are indicative of the activities described and are more explicitly educational in design.

Table 2: Categories of educational Web 2.0 activity[2]

Media sharing Sites have emerged that welcome creative digital material organised by educators. An example is the education groups on YouTube (Reteachers) or those made by young people themselves (BBC blast). The more educational media of video and PowerPoint may be shared (Sentation). However, student class notes define one of the most shareable of educational products (Miniciti, Notecentric).	http://youtube.com/group/reteachers http://www.bbc.co.uk/blast http://www.zentation.com http://www.miniciti.com http://www.notecentric.com
Media manipulation Graphical representations play an important role in education. Services exist for creating and sharing diagrams (Gliffy). More general tools allow a presentation to be built and played in a browser (Thumbstacks). Sections of web pages can be extracted and fashioned into a new web representation (Yoono). Such cloning of resources allows educational mashups, particularly popular among which are themes based on geography – such as linking literature to place (Googlelittrips) or attaching data to maps given coordinate position (Frappr).	http://www.gliffy.com http://www.thumbstacks.com http://www.yoono.com http://www.googlelittrips.com http://www.frappr.com
Conversational arenas Educational conversations can be supported by a variety of generic tools, including some with high bandwidth connectivity (Vyew). Other sites provide more structure and encourage international conversation (Think).	http://vyew.com/site http://www.think.com/en http://b.whyville.net/smmk/nice http://www.bbc.co.uk/onionstreet

[2] Websites are given as examples only and no recommendation or endorsement is intended

For younger learners, the conversation may be set against more engaging visual scenery (Whyville). Chat discussion boards can support homework (Onionstreet). Users can create their own chat room (Chatmaker). Teachers also can link through discussion forums (Schoolhistory).	http://www.chatmaker.net http://www.schoolhistory.co.uk/forum
Online games and virtual worlds Platforms now exist for developing multi-player online games (Fablusi). Existing examples have taken ecology and climate as topics (Powerupthegame), and Shakespeare (Arden). Second Life has provided a development space for gifted learners (Schome) while development work for undergraduates is being explored (Vue).	http://www.fablusi.com http://www.powerupthegame.org http://swi.indiana.edu/arden http://www.schome.ac.uk http://vue.ed.ac.uk
Social networking The mainstream social networking sites typically include education-oriented friendship groups. However, they can also host institutions to establish their own college-based communities (Mynewport). Other sites provide a more explicitly child-oriented design and security service for cross-site collaboration (schoolnetglobal) or simply casual exchange around school interests (Goldstarcafe). Teachers may also be creating such communities (Learnhub).	http://apps.facebook.com/mynewport http://www.schoolnetglobal.com http://www.goldstarcafe.net http://learnhub.com
Blogging Blog hosting sites exist especially for students and teachers (Edublogs). Some student blog collections that are institutionally managed are publically readable; these exist in the domain of undergraduates (Warwick), secondary (Longeaton) and primary (Sandaigprimary). Academic publishers are now encouraging scientific authors to blog around their findings (Nature).	http://edublogs.org http://www.sandaigprimary.co.uk/pivot http://blogs.longeaton.derbyshire.sch.uk http://blogs.warwick.ac.uk http://www.nature.com/blog
Social bookmarking Some systems for sharing bookmarks are	

designed more for research and education users (Bibsonomy). Others centre on the collection and shared organisation of research publications (Citeulike).	http://www.bibsonomy.org http://www.citeulike.org
Recommender systems The tag clouds thrown up by bookmarking searches can function as recommender resources. An (infamous) example of recommendation technology in education involves user evaluation of teachers (Ratemyteachers).	http://www.ratemyteachers.com
Collaborative editing Text, spreadsheets and other documents can be stored centrally and collaborators emailed a URL to permit collaborative editing (Google docs). Wiki hosting software allows educators to create text-oriented collaborative pages (Scribblewiki). Other websites incorporate more visual tools for collaborators (Thinkature), some emphasising mindmaps for brainstorming (bubbl.us) or whiteboard simulations (Virtualwhiteboard). All of these tools might be recruited to foster international contact involving classrooms in the UK (etwinning), or internationally (Skoolaborate).	http://www.google.com/docs http://scribblewiki.com/main.php http://thinkature.com http://www.bubbl.us http://www.virtual-whiteboard.co.uk http://www.britishcouncil.org/etwinning.htm http://www.skoolaborate.com
Wikis There are sites that allow students and teachers to establish their own wiki, with an educational slant (Pbwiki). Popular wikis are well established with educational emphasis (Wikiversity) or with material for more specialist interests (Knowhomeschooling). Some schools make their student wikis visible (Westwood wikispaces). Other sites invite sharing of expertise but without the wiki structure (Squidoo).	http://pbwiki.com/education.wiki http://en.wikiversity.org/wiki http://knowhomeschooling.com http://westwood.wikispaces.com http://www.squidoo.com
Syndication Students may find many publishing websites from which they can usefully take advantage of syndicated content. Particularly popular	http://podcastschool.net http://itunes.stanford.edu

syndicated material includes podcasts such as those made for school students (Podcastschool) or sponsored by particular universities (Stanford).	

From the practices summarised in Table 2, it is possible to distil a small set of themes that summarise and express the impact of Web 2.0 when exercised in teaching and learning. There are many precedents in the Web 2.0 debate for doing this and the suggestions below may not therefore be definitive. However, they may offer a simple framework that helps navigate the educational issues. These four themes are identified in Table 3.

It might be claimed that the right-hand column identifies the more cognitive issues that arise in relation to learning, while the left-hand column addresses the more social or interpersonal issues. However, it could also be argued that the top row refers to *processes* of study while the bottom row refers to the *products* of study.

Table 3: Four central themes surrounding Web 2.0 application in education

Inquiry	Collaboration
Literacies	Publication

Inquiry

Web 2.0 tools and practices invite new ways for a learner to conduct personal research. Web 2.0 creates new structures for organising data on the internet, new sources to refer to, new forms of authority, and new tools to interrogate this rich space of information. All of this has the potential of empowering the student as an independent learner but it also brings challenges to both learner and teacher – especially if strong inquiry skills of exploration and interrogation are to be actively cultivated. Web 2.0 knowledge structures are not navigated with the same tools (or the same ease) as might apply to more traditional documentary collections for learning.

Literacies

The present experience of schooling has at its core the cultivation of a distinct orientation to language. Interactions with *writing* are crucial to this. It is through experience with the written word that individuals learn how to represent and communicate events and ideas outside their natural context. It is through attending to the structure of language as encountered in writing that conscious awareness arises as to how meanings are conveyed in speech. In short, culture stimulates a form of intelligence that is 'literate' (Olson and Torrance, 1983). Digital media expand this tradition by offering new modes of representation and expression. The term

'literacy' itself now has to be stretched to admit other forms of representational fluency than that associated with the printed word. Thus, as learners engage more with digital artefacts through Web 2.0, so the curriculum must address the challenge of developing their confidence with the relevant new literacies and increased potential for creativity.

Collaboration

A core function of Web 2.0 services is to support communication between users. These tools allow individuals on the shared infrastructure of the internet to coordinate their activities to various degrees of depth. This can range from the relatively trivial level of participating in anonymous recommender systems to the more intense level of interpersonal, verbal debate. At one end of this continuum, some of the exchange is better termed 'coordination', rather than 'collaboration'. But Web 2.0 offers educators a set of tools to support forms of learning that can be more strongly collaborative and more oriented to the building of classroom communities. There is a growing argument that decisions emerging from the human 'crowds' of Web 2.0 coordination are the key to innovative thinking and problem solving (Leadbeater, 2008; Surowiecki, 2004). Others argue that Web 2.0 creates a democratisation of knowledge that unhelpfully flattens expertise and disorients researchers (Keen, 2007).

Publication

This theme arises from the potential of the read-and-write web to support users in creating original material for publication. Web 2.0 provides both tools and an audience. Within the space of classrooms, it is common to see the work of learners on display – at least in early education. The creation of an audience for learners is a precious opportunity and Web 2.0 space promises to offer a stronger feeling of doing authentic research when students submit the products of their study.

These four themes define a set of *possibilities* for the appropriation of Web 2.0 in educational practice. The next section, considers why practitioners might be motivated to address the possibilities of more collaborative learning along with new modes of inquiry, new routes for learners' production, and new forms of literacy.

Educational Web 2.0 – the motive

The promise of appropriating Web 2.0 in educational practices seems considerable. Furthermore, there is a large community of energetic practitioners who are promoting its use. While it would not be possible to do justice to the full range of reasons they

voice for moving in this direction, this section summarises some of the apparent attractions of embracing Web 2.0 in the classroom

The most straightforward reason must be recognition that young people are already engaged by Web 2.0 applications. So, for pupils, there will be familiarity with a style of interacting and inquiry that arises from browsing within these spaces, even where the young learner has not been an active producer.

There are two further reasons for drawing Web 2.0 into education. The first is that that there is a match with current overarching policy and curriculum goals. The second is that the forms of activity cultivated within Web 2.0 are widely endorsed as important by theoretical perspectives on learning.

A match with policy

The educational think-tank Futurelab expressed the link to prevailing policy well when commenting about social software and learning: 'It is the combination of the technological affordances of social software with new educational agendas and priorities that offers the potential for radical and transformational shifts in education practice' (Grant *et al*., 2006). Central to those agendas are a number of intentions.

One is that school-leavers should now be prepared for engagement with the economy as knowledge workers. The activities represented in Web 2.0 are clearly significant within any modern economy. Indeed, terms such as 'enterprise 2.0' are emerging to reflect that. A second intention is that school-leavers should possess flexibility in what might be a fluid skills market. The skills sought in a fast-changing environment of work may be shifting all the time. The individual therefore has to be prepared to adapt to these changing demands. They may need to continue their study well beyond school. This means a confidence and autonomy for taking on new learning. It also means having acquired some personal capacity to motivate and direct that learning. Familiarity with the structure of Web 2.0 practices will place the continuing adult learner in a strong position to pursue their own learning agenda.

The UK government's most comprehensive statement of how technology is integrated into learning provides a set of imperatives that resonate with Web 2.0 in a manner that encourages its uptake (DfES, 2005). 'We want to do more to exploit the educational potential of the new technologies…[our priority] is to do all we can to accelerate the move to the next generation of e-learning activities and resources' (p.7). Two particular themes are stressed. One is cultivating collaborative learning; the other is engaging the less enthusiastic student.

Education is encouraged to use 'a collaborative approach to personalised learning activities' (p. 6). In addressing the learner it is proposed that 'Along with listening and reading, you will be spending more time learning in groups, working with other learners, being creative' (p. 12). Aside from the possible appeal of more social

learning, it is expected that new technologies will mean that 'At any stage of learning, ICT could re-engage the unmotivated learner, and bring an authentic and challenging task within their grasp' (p. 9).

It is therefore clear that current policy for the incorporation of ICT in education and current thinking about the nature of the learning that education must provide are both in step with the affordances of Web 2.0 activities.

A match with theories of learning

A second significant reason for educators to turn to Web 2.0 is that it seems to fit with certain experiences emphasised in contemporary theories of learning and modern thinking about how best to design the conditions of learning. Within the psychology of learning, there are four influential but overlapping frameworks (this term more appropriate than 'theories'). These are: behaviourism, constructivism, cognitivism, and the socio-cultural perspective.

Behaviourism and Web 2.0: this is the least fashionable of these four – although it once dominated thinking about learning in Psychology and Educational Studies. It is an approach that sees the basic mechanism of learning as shared by all species. That mechanism concerns the forming of associations, either between stimuli that happen to co-occur in the world (associative learning by classical conditioning) or between an action and some stimulus that follows that action (associative learning by operant conditioning). The administration of rewards and punishments is central to establishing these operant associations.

Such ideas may seem rather remote from Web 2.0 designs. However, it is less often noted that behaviourism is a perspective on *teaching*, as much as on learning. This is because a central process advocated by behaviourists was 'shaping', or the systematic guidance of the learner towards some desired goal or state. This shaping of action depended on a human agent administering rewards (say, words of approval) to the 'successive approximations' that a learner would make towards the goal. In short, rewards that are strategically delivered to the learner 'shape' the route they take, and the learning they achieve.

As a comprehensive model of learning and what is learned, this perspective may be flawed. However, any student who experiences shaping (often arranged for them to try with laboratory animals), is typically struck by the skill required, but also with the success that can be achieved. The point that is often missed is that any such success depends on effectively exercising a social process. In particular, it depends on the human teacher constantly monitoring and evaluating the learner, in order to judge whether and when to apply a reward or encouragement. Similarly, it depends on the learner being sensitive of, and responsive to, the existence of those contingencies. In other words, success here is a matter of intersubjectivity – as

defined earlier in this document. It is a matter of human beings communicating and thereby being reflective about the motives, intentions and beliefs of those communicating with them.

An engagement with Web 2.0 material does not, at first sight, appear to fit the interpersonal model of learning-by-shaping that is often promoted by behaviourism. Yet Web 2.0 exchanges are strongly social in nature and they are rich in intersubjective opportunities. The implication for the behaviouristically inclined is that learning arena that are generous in this way – that open intersubjectively-rich dialogues – are valuable sources of the contingencies that can help shape the trajectory of learning as an exchange of strategic guidance.

Constructivism and Web 2.0: from constructivism is taken the idea that learners should be deeply involved in the 'construction' of knowledge, such that it becomes their *own* understanding and it is derived from their own activity or exploration. Such ideas are most often illustrated and celebrated in relation to the material world and the imperative for hands-on experience there. But much that must be studied by learners involves knowledge building in a more abstract space than that provided by the studio, the laboratory, or the local ecology. Much that must be studied requires the student to engage actively with 'knowledge tools': resources that can be applied by them to the abstract representations of some problem or discipline. Web 2.0 resources clearly position the learner to take up these tools and to adopt this exploratory and creative position.

Yet there is a common criticism of the constructivist tradition. It centres on its apparent neglect of the social dimension of learning, overlooking the kind of human interactions invoked above in discussing behaviourism. This seems to be a blind spot in the classic constructivist work. So, Piaget's rich descriptions of the exploratory learning of his own infants (Piaget, 1936/1953) seems to render invisible his own presence with them as they explored. The creative play with bricks, clothes and pipe cleaners is not noticed to be stage managed and motivated by the human interventions of Piaget himself. This oversight has encouraged a modern reference to 'social constructivism' as an attempt to acknowledge that the construction of knowledge is invariably something that is socially achieved – in learning dialogues.

So, on the one hand, constructivism can inspire innovation in Web 2.0 because it offers tools and an arena for learner exploration. But, on the other hand, modern constructivism also endorses the need to orchestrate that learner exploration, such that it can be a social experience. The richness of exchange possible in Web 2.0 environments makes it a potent setting for socially constructive learning.

Cognitivism and Web 2.0: cognitivism provides the metaphor of 'information processing' to express the processes of thinking and reasoning. One aspiration of learners must be acquiring reflective insight into the strategic nature of managing

that processing demand. In other words, the learner must become reflective about their own thinking: how do they privately orchestrate the various components of attention, selection, reasoning, prediction, reviewing, remembering and so forth? This looking inward on one's own thinking is sometimes termed 'metacognition'. Moreover, there is good evidence (for example, Chi, 2000) that outwardly articulating one's learning as it is in flow helps learners through the self-awareness that is aroused. The blog and other journal tools are resources that support this kind of reflection. Among young people, these tools may be readily identified as a resource for looking inward on their own social lives and personal needs. However, within the context of school, they can also be recruited to the more *cognitive* aspects of the individual's identity.

The interpersonal themes noted above in relation to behaviourism and constructivism are less evident in cognitive theorising about learning. The cognitive approach is more structural: more concerned with describing an architecture of knowledge, rather than a process of coming-to-know. However, there are many cognitive theorists who would be happy to admit such a process is one that, again, is deeply social. It depends upon the opportunity to engage with other people in particular ways. The last of these four theoretical perspectives on learning is one that can fill the 'process gap' evident in much cognitive theorising.

Socio-cultural theory and web 2.0: from the socio-cultural perspective is taken two particular ideas. First, that human beings have successfully 'externalised' (or offloaded into environmental support) a significant portion of their cognitive activity. Across their long cultural history, they have constructed resources allowing them to drive cognition from the private or mental world of 'thinking' into the public and external world of acting with tools and artefacts (diSessa, 2001; Donald, 1991). Human beings thereby do much of their thinking by engaging with these cultural resources (most notably with writing and drawing, and its respective implements). In fact, this collection of resources for problem solving and reasoning is at the heart of what is meant by 'culture'. On this conception of learning, what gets done is mainly organised in the externally-designed space of action (rather than just the internal space of the mental world). This, therefore, casts learning as being a matter of gaining confidence with local cultural toolkits. Learning is a matter of appropriating tools and acquiring a fluency in using them.

There is a second theme to the socio-cultural approach. Culture is evidently also about people and about social interaction, as much as it is about material tools. Indeed, the socio-cultural view stresses the important role of other people in 'scaffolding' this cultural appropriation. Those other people – such as teachers – draw learners into temporary communities where they can experience (in a constructivist spirit) the creative potential of tools and techniques relevant to some domain of enquiry (that is to say, the community of chemistry, or history, or sociology, and so forth). Often, that scaffolding is a process of joint activity whereby

the novice and expert – the teacher and learner – collaborate in jointly affecting some thinking or problem-solving ambition.

Some Web 2.0 debates suppose that these internet resources will dispense with the central role of the teacher, as outlined here. It is supposed that society will be de-schooled through the emergence of community learning sites (such as 43things.com and en.wikiversity.org). Or it is supposed that education will be mainly concerned with constructing personalised learning environments that put the learner in control of their own learning. Many assumptions are hidden in such scenarios, particularly in relation to the *motivation* of learning. However, the scaffolding perspective on learning draws attention to the special force that arises from joint activity implicating a more experienced other person. It seems unlikely that Web 2.0 will fundamentally displace that important relationship.

Reviewing these traditions, it seems there is no single theoretical perspective on learning that dominates current thinking. All of the frameworks outlined above make distinctive and useful points. However, in each case, the central point of theory resonates well with Web 2.0 designs. So this technology makes possible individual efforts of knowledge construction; it provides tools for more probing self-reflection; and, most significantly, Web 2.0 stimulates the experience of learning as interpersonal and communal in nature.

In sum, both recent policy and theoretical perspectives on learning are therefore sympathetic to this new online environment for stimulating educational practice.

Tensions and areas for further research

Adoption of Web 2.0 in education is a cause that attracts a good degree of evangelical encouragement. While the case for embracing it seems compelling, it is proper to take an even-handed approach to evaluating what is being urged. For many, the case is already made and it is clear. Freedman's (2006) very useful collection of practitioner case studies contains the following position statement from one experienced commentator: "I challenge anyone to reckon that blogging, podcasting and wikis are not a big deal. In my experience it's only those who don't know (and some who, with ignorant pride, refuse to ever learn) that would even bother to question that."

Yet it is important not to evaluate new resources in 'ideal world' terms. That is, terms that marginalise the demands and constraints of those contexts in which innovation has to occur. There is no question that blogging, podcasting, and wikis are important. Not only are they ingenious designs, they have become quickly popular and there are plenty of reports surfacing to show that they are making a difference to people – and such difference is traceable in all sectors of education. Yet new tools need to be evaluated in a way that pays full attention to their contexts of use. It is easy to agree

that a wiki is an ingenious design with a rich potential. And it is also easy to see that wikis and other Web 2.0 tools are not yet being drawn into educational practice unreservedly. This apparent rift may be because of lack of knowledge or confidence. However, the apparently limited scale of current uptake must encourage inquiry into what else might be involved.

Innovations have to be absorbed into *systems* of practice. Typically they disturb those systems in ways that can be difficult to accommodate. In relation to educational technology, this predicament has been well recognised and clearly documented (Cuban, 1986). Accordingly, any evaluation of a new educational technology must be made with an eye to the systemic nature of the impact it will bring about. It must be evaluated with proper attention to the constraints and affordances that practitioners and learners in the receiving system experience.

Note that Web 2.0 comes with a rich array of very far reaching prescriptions and assumptions. In their review of social software for learning, Grant *et al*. (2006) suggest it demands at least three fundamental shifts in how thinking about knowledge itself. First they note that the modes of inquiry encouraged by Web 2.0 practices tend to be less oriented to the traditional disciplinary boundaries of knowledge. Instead, the learner is invited to adopt a conception of knowledge as something available to be personalised. Second, Web 2.0 encourages engagement with knowledge in new ways. For instance, it encourages a more animated browsing and scanning orientation. Third, practices of knowledge production are being altered. In particular, learners are being drawn into inquiry methods that are more collaborative and less solitary.

These are just three of the strands of Web 2.0 influence that may re-configure the practices, roles and responsibilities of educational systems and practitioners. It must be expected that a technology with such a wide range of knock-on impacts will be approached by educational practitioners with caution. The fuller range of debate and unease that has arisen around Web 2.0 adoption in education is reviewed below as 11 distinct 'tensions'. These describe the challenges that lie beneath the surface of Web 2.0 appropriation by education and help explain any current inertia of uptake. The outline of each tension ends with suggestions for one or more researchable questions that naturally follow.

(1) Teaching versus learning

Perhaps the most basic tension to be experienced in adopting Web 2.0 practices concerns a shift in control or management of the educational experience. Web 2.0 educational agendas often foreground ambitions for learner autonomy and they can do this in fairly liberational language. However, teachers and institutions may be actively resistant to such changes. They may be suspicious of a shift from emphasising methods of teaching towards emphasising strategies of learning. The

implication of Web 2.0 is that learners take control of their own learning, and some educational practitioners may question such slippage in their implicit authority.

A favourite allusion invoked by commentators discussing this shift concerns what it must imply for the future role of teachers. This is said to require a change from 'sage on the stage' to 'guide on the side'. Neither role – sage or guide – does justice to the skills or commitment of most teachers. However, any shift towards learner-centredness need not imply a reduced or secondary role for the teacher. It need not imply that teachers must become less sage-like, in the interests of becoming mere guides.

In fact, inspiring, coordinating, and evaluating Web 2.0 learning practices may position teachers in a very significant role. Motivating and organising learners to draw upon (and contribute to) the spaces of Web 2.0 may depend upon considerable creative involvement from teachers. It cannot be taken for granted that students will transfer to schooled learning their recreational enthusiasm for Web 2.0 services. For example, it cannot be assumed that young people will see the production of internet content as so attractive when it is subjected to the traditional critical scrutiny that they will associate with school. Similarly, there is no reason to believe that students will approach internet research equipped with great skills of interrogation, perception, filtering or synthesis.

The tension to be managed here is one of new teaching responsibilities – as well as new learner opportunities. Orchestrating and supporting independent research and creativity in the vast arena of Web 2.0 is likely to be a task that draws heavily on both the wisdom and the skills of guidance that teachers traditionally exercise. If there is caution in embracing Web 2.0, it may have a lot to do with these perceived demands. The following researchable issues are implied:

- Does adoption of Web 2.0 technologies demand a greater investment of teacher time?
- What new forms of teacher support will Web 2.0 inquiry demand?
- What are the learning opportunities afforded by Web 2.0?

(2) Walled garden versus open arena

The Web 2.0 phenomenon has evolved outside educational practice but now confronts education with a challenge of appropriation. Institutions must therefore decide whether to populate the established and open arenas of Web 2.0 activity, or whether to build their own versions of these tools, in order to shape or contain that activity. In fact, there is nothing new in the principle of classrooms using ICT to create a collaborative but self-contained community of learners, tackling authentic problems, and expressing solutions in new digital formats. A compelling example of such an initiative is the family of classrooms signed up to Bereiter and Scardamalia's

Knowledge Forum (Scardamalia, 2004). Teachers may prefer the intimacy and security of such protected groups, rather than the uncertain openness of the wider internet.

For many commentators, any containment of such activity contradicts the whole spirit of Web 2.0 as a learning resource (Leslie and Landon, 2008). For authentic student research, it is argued, Web 2.0 tools depend upon network effects and open access. They depend upon the coordination and aggregation that is afforded by involvement in very large social communities and interactions with 'epic scale' data. It is argued that containing such activity undermines it. Moreover, many students will have become comfortable with identities developed in open arena contexts of the internet and may resist duplicating that identity in some local (and scaled down) walled garden.

In some respects this tension can be over-played. For instance, the value of social bookmarking may be more limited when implemented on a local scale. On the other hand, institutions might be more confident about the need for containment when it came to other Web 2.0 activities – such as managing the material that learners publish as blogs, wikis, or other digital creations. They might do this because they wish to integrate it within a self-contained and comprehensive learning platform or virtual learning environment. And the reason they might wish to do this is because such in-house learning materials are seen as not ready or not appropriate for the public domain. More likely still, they might favour a walled garden because it allows control of the dialogue that typically will evolve in response to Web 2.0 postings. In a local learning platform, there is no ambiguity about who is the author of a contribution or a comment upon it. This may be important for monitoring the evolving conversation. This monitoring may be seen as both a duty of care and a matter of encouraging academically productive exchange.

An example of this tension as acted out in higher education is the case of students from Woodbury University who had taken part in a course managed with open access to the virtual world Second Life (Second Life Herald, 2007). A small group of avatars within this group engaged in vandalism and bullying on such a scale that the site owners, Linden Labs, banned the whole student body. Evidently educational institutions may not welcome the vigorous debate on responsibility, ethics and censorship that ensues in situations of this kind.

Schools are increasingly understood in terms of risk settings (Furedi, 1997). Invoking distinctions made by Oswell (1998), public debate positions the young learner at the centre of risk in respect of three potential predicaments: 'child-as-victim', 'child-in-danger', and 'dangerous child'. Many of these perceived risks involve general access to internet sites and they are a serious concern to most practitioners. Hope (2006) reports on this through a close engagement with the staff and practices of eight primary and secondary schools. The 'child-in-danger' narrative is commonplace in

relation to pornographic images, hate-sites, and sites that encourage experimentation with drugs or explosives. However, this is not a predicament that so obviously links to Web 2.0 activity. Yet decisions about cultivating Web 2.0 activity may well be affected in such a sensitive area, if their consequences are judged as very generally loosening up engagement with the internet and increasing the chances of inappropriate contacts.

Many schools will be taking the walled-garden approach at a time when the consequences of cultivating Web 2.0 activities remain poorly documented. It becomes the safe option. There are also considerations of control, reliability and data security. Moreover, most learning platforms now marketed to schools do incorporate Web 2.0 tools and, therefore, the decision to contain such activity seems a natural one to make.

The tension to be managed here is one that involves a trade-off between authenticity and security/control. The student who published on the open arena of the internet enjoys a sense of audience and, possibly, a richer exchange. But that exchange is unchecked and can be anonymous, so institutions need to consider their responsibilities and skills in relation to handling certain consequences of this openness. The following researchable issues are implied:

- Are Web 2.0 activities mainly being encouraged on the open internet or cultivated in contained areas of school learning platforms?
- What considerations dictate decisions around this choice? What are the issues?

(3) Private learning versus collaborative learning

There is little doubt that Web 2.0 learning practices encourage a more collaborative approach to study. This may fit well with a feeling that the present world of work is more collaborative than solitary. However, while teachers are certainly expected to reproduce conditions of collaborative thinking that prevail in the world of work, they are also expected to assess the achievement and potential of *individual* learners. Embracing Web 2.0 confronts teachers with a challenge of finding new ways to achieve assessment – when collaborative learning is located in an education system that grades individuals.

However, the tension here is not simply around matters of assessment. Teachers may also have reservations about the quality of those learning experiences that demand a strong collaborative organisation. If a learner declares “I want to do my learning by myself”, what kind of unease might then be felt? How does this relate to the agenda of 'personalised' learning? Does striving for a learning experience that is 'personal' entail rejecting one that is social? Or is this merely a (slightly unwelcome) request needing to be met under the imperative to encourage personalisation – as

an issue of being allowed choice? As Grant *et al.* (2006) observed, 'Personalisation is significant only if we have choice'.

The encouragement to make learning social is widespread. Indeed, Grant *et al*. (2006) declare: 'Call it community learning, communicative learning or collaborative learning, at its heart learning is a social process'. Yet this may be blurring some distinctions that do need to be protected. For instance, declaring learning to be a social process can not mean it is not possible outside of social relations – at least not in any everyday sense of the word 'social'. Some extremely creative thinkers have done their thinking outside of social relations. For example, by the age of 15, Blaise Pascal had learned a substantial corpus of mathematics – alone, and in secret (his father having forbidden its study). Clearly, solitary learning is possible in any everyday sense of what that activity entails. And to teachers it may seem important to protect and even cultivate the possibility of privacy in learning, not least because it may allow learners to enjoy uninterrupted management of their study: that is, allow them to dictate its pace, rhythm, centres of attention, and so on.

Yet theorising the 'social' dimension of learning may not be about the everyday senses of such words, because one way of talking about learning as a social process allows 'social' to include attending a lecture or reading a textbook. The lecturer and the author exercise a voice (Wertsch, 1991). If listeners/readers choose to engage with these occasions, they experience an implicit dialogue with the lecturer/author: they (privately) select, argue, hypothesise, predict, criticise, and so forth. A well-designed lecture and a well-structured book offer invitations to do this. However, to admit that learning is social in this generous sense does not entail endorsing that it should be always and everywhere *collaborative* – in the sense of orchestrated group work or intense conversation.

The tension at issue here is one of managing the nature of the interpersonal coordination that learning can allow. Where there is a strong commitment to fostering personalised learning, then the individual must surely be permitted to opt out of collaborative experiences, if that is what they prefer. In weaker versions of personalisation, teachers may treat that preference as offering a challenge rather than demanding accommodation. In the renewed enthusiasm for collaborative working patterns, there will be a need to consider how joint activity is best organised to allow a creative *interleaving* of the private/reflective with the conversational/social. What is potentially most interesting about Web 2.0 structures is that they may allow individuals to exercise more control over when, and how, and why they enter into relations with others. They offer learners looser structures for joint activity and its management.

So the Web 2.0 tension to be managed is one of deciding how to balance the private and the social within the experience of learning. That tension is a matter of optimising the choice of working style for individual learners. But it is also a matter of

protecting the realistic demands of assessment. Against these challenges, the discourse of Web 2.0 may seem relentlessly collaborative. Of course, close examination of what is entailed reveals that the forms of collaboration implied might be more naturally termed 'coordination' than 'collaboration'. Indeed, this is sometimes expressed as a 'shift from groups to networks' (Leslie and Landon, 2008), while the term 'collective' may be necessary to describe still more diffuse forms of internet social grouping (Anderson and Dron, 2007). Yet such distinctions identify a more subtle tension: perhaps such qualities as intimacy, pace, rhythm, and flow are being lost as this 'social' experience of learning becomes less synchronous – less collaborative in the old-fashioned sense of face-to-face of 'live'. The following researchable issues are implied:

- Is Web 2.0 uptake associated with more collaborative arrangements for learning?
- In what ways do Web 2.0 technologies support joint problem solving in learning?
- Do students welcome Web 2.0 opportunities for collaboration?
- How do teachers manage and assess collaborative work?

(4) Digital native versus digital immigrant

There are two concerns lurking in this tension. The first is a familiar one: the digital divide. Some learners may be strangers to Web 2.0 because they do not have the necessary access to the internet. Of course, such disengagement may be self-imposed, as young learners may have internet access but not be engaged by the Web 2.0 experience. In either case, a lack of sympathy or familiarity with this way of using technology is a practical challenge for any educational system that takes on this way of working. Teachers' awareness of a divide here may deter them from embracing ways of working that invite more web-mediated but out-of-school participation.

Second, the native/immigrant tension is sometimes invoked in relation to the contrast between pupils and their teachers. Pupils are caricatured as self-assured natives while teachers are portrayed as less confident immigrants. There is work to be done determining how far this contrast is credible. Little is known about teachers' awareness of Web 2.0 technologies – in more recreational settings, outside their school work. However, it is apparent that there is often an obstacle arising from the lack of confidence that this contrast can sometimes foster – for sometimes the teacher can be revealed as a significant digital stranger to a fast-moving technology.

What follows from having become a digital native? Prensky (2001) and others highlight the changes in thinking style that may come about as a consequence of immersion in Web 2.0 activities. He comments that '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.' Not all commentators endorse the digital native idea, its demand for adjustment and tendencies to moral panic (see for example Bennett, Maton and Kervin, 2008). However, if there are changes in thinking arising from Web 2.0 immersion out of school then what happens in the classroom needs to take this into account, whether the classroom is itself embracing Web 2.0 or not.

There are two Web 2.0 tensions to be managed. First, practitioners may be wary of cultivating learning experiences that invite significant out-of-school internet activity, lest some of their students do not easily enjoy this. Second, those practitioners may have failed to notice (and thus exploit) the new digital interactive opportunities that have engaged their students. The following researchable issues are implied:

- How familiar are teachers with Web 2.0 tools and practices?
- How familiar are teachers with the Web 2.0 practices of their students?
- What degree of internet access is currently enjoyed by pupils?

(5) Social networking versus anti-social networking

A phrase such as 'social networking' generally conveys a positive tone. It seems to celebrate a human concern to be in harmony with others. Yet, in the present context, this phrase refers to a particular online format for managing such harmony. The structures that are represented in social networking software (MySpace, Facebook for example) are not universally applauded. Benninger (1989) ventures a parallel between the mechanisation of labour in the nineteenth century and the current spread of a proceduralising bureaucracy over personal relations. Social software may be contributing to this because it formalises the informal. As Boyd (in press) observes, conventions such as dichotomising relationships into friends and non-friends violate ways of perceiving relationships that have matured over a long period of personal development. At the very least, it can be said that social networking will be experienced differently by different participants. In its present form, it is not necessarily ripe to be welcomed by all learners as a model structure for a learning community.

However, a more familiar form of the 'anti social' in Web 2.0 networking arises in the guise of online bullying – sometimes termed 'cyberbullying'. There is no doubt that many young people have been victim of this kind of persecution through participating in Web 2.0 activities (Li, 2007; McKenna, 2007; Stomfay-Stitz and Wheeler, 2007). Teachers may also be victims. Such experiences can be a source of great distress. The fact that they occur and attract significant publicity will inevitably be a deterrent for many practitioners and institutions to make confident investment in Web 2.0. There are a range of other risks and issues associated with online activity and Web 2.0 in particular that will be explored in other outputs from this project.

A number of websites have arisen to help others confront the challenges of online safety, such as those from Becta and the Government.

However, in addition to issues of bullying and risks from predatory contacts, the 'anti-social' nature of Web 2.0 attracts other public concerns. These currently dwell on the how far young children are exposed to unsavoury material in this medium (Byron, 2008). The Ofcom report (2008) draws attention to the contrast between the rules of access that parents believe they apply at home and their children's reporting of such rules. The implication is that parents are not acting as gatekeepers and society may be looking to schools to make sure that they are.

The Byron report stresses how young people are confident in their internet use and yet are poorly prepared to manage the risks that society judges the internet can create. A road-crossing analogy is invoked to highlight the important role of adult scaffolding in managing young people's first steps. This inevitably locates teachers and schools in the front line of providing such support. Byron states that this was 'one of the strongest messages received in review'. Thus the report suggests the need to place e-safety matters within curriculum delivery, providing teachers with new skills in this area. Various ways are suggested, including family learning courses, initial teacher education and school ICT clubs. The UK school inspection agency, Ofsted, would be encouraged to hold schools accountable for their record on e-safety. This context of responsibility needs to be kept in view when judging the access and engagement policies adopted by schools in relation to their learners' experience of Web 2.0.

The Web 2.0 tension to be managed here concerns the extent to which institutions and individual teachers can sustain a hands-off or laissez-faire culture of internet access and use. This may be felt as a dimension of the duty of care that they owe to students. It may also be felt as a risk of protests from parents or the media, particularly when individual incidents expose the possibility of bullying or of access to internet material judged unsavoury. The following researchable issues are implied:

- How aware are young learners of the risks and possible security precautions in using Web 2.0?
- How significant are these risks for teacher and institutional attitudes to Web 2.0?
- What protective policies have been adopted by schools in relation to these issues?
- How much do parents know about their children's online activities, the risks and mitigating actions?

(6) Rip-mix-burn versus cut-tweak-paste

Music tracks can be 'ripped' from CDs, they can be mixed with other material and burned onto new CDs, or loaded into personal digital players. The products can be impressive, and the process engaging. Such material circulates around the media-sharing sites and that can be a source of pride to its creators. It is certainly possible that such blending of digital resources can work just as well in educational contexts. A good example would be the contribution of map-based mashups to geography themes (either as shared internet tools, such as http://www.wikimapia.org/ or as more local resources made by individual learners). Yet there is widely expressed concern that the mashup style of composition that is active in music production (and appreciation) has a less welcome relative in the domain of study and research.

On the one hand, this can be seen as a talent to be celebrated. It is easy to be impressed by the ease with which micro-content from web pages can be assembled and integrated into a novel narrative. Yet there is sometimes a thin line between this kind of imaginative construction and a lazier cut-and-paste approach to personal research. Approaches to homework that rely on this sort of inquiry strategy will exist independently of whether schools embrace Web 2.0 or not, because this is a solution that some learners may import to school tasks from their own recreational habits with the technology.

The Web 2.0 tension to be managed here concerns how the learner's own perspective or voice can be cultivated in a digital realm that allows such easy integration of pre-formed material. There is a space to be navigated that offers the potential for considerable creativity – as well as mindless plagiarism. There is a challenge of monitoring and evaluating the products of such easy manipulation of digital media by learners. The following researchable issues are implied:

- How familiar are learners with the tools of editing and blending digital material?
- How far are cut-and-paste presentational methods seen as a problem for school work?

(7) Transitory marks versus persistent marks

A tension here arises from the permanence of internet media. Material that is posted in Web 2.0 contexts has a way of haunting the poster. In contrast, thoughts that are *spoken* are transitory and thus potentially ignored or forgotten. They may also be reviewed and revised in the light of feedback. Even print on paper offers a better protection from embarrassment, for thoughts laid down this way may circulate far less widely. It has been often argued that students are reluctant to participate in text-based internet discussion boards because they recognise the unforgiving persistence of the medium (Dennen, 2005). Internet-posted thoughts may attract a wide audience. Remarks that seemed intelligent at the time they were composed

may look decidedly stupid a few days later – particularly in the light of comments that follow the original posting.

In social networking this is already surfacing as a problem, as friends and relatives take issue with the rights of others to post photos of them – perhaps in unflattering situations – and, generally, become more sensitised to privacy issues (Boyd, 2008). Older students may still be unaware of the growing practice whereby employers check out job candidates according to the tone of their internet presence. Moreover, educational institutions have to be similarly vigilant. A university that encourages blogging among its students and allows those blogs to be publicly readable is offering candidates for admission a potentially uncensored window into the student experience. This may favour the institution's appeal – or it may not.

The Web 2.0 tension to be managed is one of accountability. The high visibility and relative permanence of much uploaded learner material can create feelings of exposure. This may apply to the topics of learner activity. It can apply, on reflection perhaps, to learners' own online construction of identity. Or it may be the institution that feels exposed, by virtue of its perceived responsibility for material authored with its implicit endorsement. The following researchable issues are implied:

- Are learners content that material generated in school might be widely visible within internet contexts?
- How do institutions understand their role and their responsibilities in relation to material published on the internet by their learners?

(8) Print literacy versus digital literacy

The term 'literacy' has expanded to embrace much more than its original association with the *printed* word (Cervetti, Damico and Pearson, 2006). It has extended its reach from 'the ability to read and write' to 'the ability to understand information however presented' (Lanham, 1995, p. 198). Kress (2003) in particular has argued for the increased importance of 'multimodality or the ability to express ideas across a wide range of representational systems.' Merchant (2005a) illustrates how on-screen writing is articulated and shared among the communities of young users. On this analysis each medium of communication has its own constraints and affordances. Digital literacy is about acquiring confidence in 'reading' these systems (Buckingham, 1993).

Putting print and digital media into contrast is a reminder that while the internet could be a print dominated medium, it is increasingly populated by a much richer range of expressive material – in particular, visual images and video. However, print literacy is not simply one choice from a salad of literacy options. At least, it is not as long as it is *speech* that remains the dominant mode of communication during human development, and the dominant mode of reasoning in everyday human life. Writing is

visible speech and there is a considerable cognitive impact (Olson, 1986) arising from learning to attend to language presented in this format (that is, reading) and then learning to deploy it in reasoning (that is, writing).

Thus, while celebrating the internet's extension of expressive power to embrace these new literacies, it would be unwise to cultivate them at the expense of print literacy – on the logic that these alternatives were to some degree interchangeable. Of course, in the end this is a value judgement. It involves deciding the preferred way to think and reason. The written word has served modern scientific-bureaucratic societies well. Through print literacy citizens of the modern developed economies have evolved a distinctive logic for understanding their world. Yet it is not the *only* basis for making sense of that world.

The Web 2.0 tension here will be felt as a concern to protect the special potency of print literacy while wishing to cultivate fluency and sensitivity in relation to new forms of expressive representation. The following researchable issues are implied:

- Is there evidence of young learners cultivating new literacies?
- Are schools representing such literacies in the projects they pursue?
- How are the necessary skills (digital literacy) for independent learning being taught?

(9) Serial processing vs. parallel processing

Brains, it seems, work at their best when they are processing sensory experience in a parallel fashion. Neuroscientists explain that neural networks function by integrating the messy array of incoming signals in this *parallel* fashion, making fuzzy and rapid estimates of what some current stimulus being processed is about. For example, brains do very well at pattern processing such as that required in the recognition of human faces. Yet this is a remarkable achievement of information integration and one that it is very hard to get a machine to do. There is a sense in which the style of research and inquiry that is encouraged by Web 2.0 echoes this parallel processing. Tag clouds and folksonomies have the same kind of fuzzy uncertainty – and perhaps invite the same kind of rapid processing.

Yet parallel processing, while powerful for some purposes, may be unsuitable for others. Although the brain is very good at parallel processing, our intellectual tradition has flourished on a style of reasoning and logic that is more serial. Clark (1998) argues that *language* should be understood as the way in which human beings escaped the limitations of a parallel processing brain (very good for getting around the environment). Humans imposed the invention of language on their experience, thereby creating a more formal and linear kind of reasoning (very good for doing science). In computer metaphors, evolution has created a way of running

one kind of machine (a serial language-based processor) inside another type of machine (a parallel processing brain).

There is a link here to the loss of formalisms and taxonomies that some Web 2.0 designs encourage. There may be good reasons for organising and processing data the Web 2.0 way. But, for some problem solving, the greatest gain may be from a more serial form of reasoning and that may depend on well formed semantic categories and a logic to reason on them.

The Web 2.0 tension here concerns how far learning should privilege forms of reasoning that are based on language and other (serial) systems of formal notation. The emergence of more informal, pattern-based methods of reasoning about data may well offer important new modes of analysis. Yet students may gain from retaining confidence with the traditional formalisms that such methods seem to displace. The following researchable issue is implied:

- How do teachers relate to the informal systems of data organisation characterised by personal tagging and folksonomies?

(10) Successive attention versus simultaneous attention

Attention that is 'simultaneously' managed is what might otherwise be called 'multi-tasking'. This can be contrasted with attention that is 'successive' in structure and proceeds more linearly from one task or stimulus to another. It is clear that multi-tasking computers invite multi-tasking computer *use*. The modern computer user typically is animated, even agitated in movement between applications (Crook and Barrowcliff, 2002). Sutherland-Smith (2002) observes the impatience of students who can not find information quickly for school work and thereby adopt a 'snatch and grab philosophy'. Moreover, it may be that this animated style of simultaneous processing, or multi-tasking, extends itself into other domains where thinking and reasoning are exercised.

For example, it is commonly observed that delegates at meetings who place a laptop open in front of them will not be able to avoid doing something with that device during a talk. Levine *et al*. (2007) have pursued this in relation to learners in their classes. They show that students who spend a great deal of time on multi-tasking instant messaging appear to have higher ratings on distractibility measures in more focused study tasks. Perhaps this does not matter. Indeed, perhaps it should be celebrated as a distinctive form of engaging with material to be studied (Hartmann, 1999). However, the way in which technology practices shape management strategies for attention deserves to be better understood. It becomes a Web 2.0 issue insofar as many of the social networking activities that make up that genre are naturally running as background tasks that users drop in and out of according to the interruptions of others.

The Web 2.0 tension to be managed, therefore, is one that concerns the responsibility of teachers to cultivate in their learners a tolerance of sustained focus on material for study. Individual practitioners may find it hard to decide whether this must be prioritised or whether they should welcome the volatile exploration that might be more naturally encouraged by interactions within Web 2.0. The following researchable issues are implied:

- Do learners manifest significant multi-tasking in their internet interactions?
- Do such attention patterns manifest in other learning contexts?

(11) Authorised knowledge versus distributed knowledge

Anderson's (2006) thesis of the 'long tail' draws attention to the effect of internet on the traditional long tail of retail demand. Basically, the effect of internet is to help the viability of more obscure items. Materials that would not normally survive in the real world marketplace may more easily find an internet niche where they might then be discovered. Finding low-popularity books and music is often cited as a reward of this long tail protection. However, it applies to more than books and music. Information of any kind can be long-tail protected in this way. Web 2.0 provides powerful tools for a wider constituency of authors (on the flat of this tail) to publish their ideas. If Amazon.com is the iconic case of the long tail working on books and music, then Wikipedia is the iconic case of the long tail working on knowledge.

This apparent democratisation of knowledge must surely seem welcome. But it has attracted critical debate. Most notably, Keen (2007) has forcefully attacked what he considers a dangerous 'cult of the amateur'. Put simply, there are three lines of argument about the effect of Web 2.0 structures on the promotion and publication of cultural knowledge.

First an argument is made for trivialisation. This is the perceived outcome of the ease with which material can be published, coupled with a 'wisdom of the crowds' (Surowiecki, 2004) basis for determining its prominence. So, Keen argues that silos of user-generated content are dominated by contributions that are trivial or narcissistic. This argument is not novel and, perhaps, has been applied at some time to all new media (see, for example Meyrowitz, 1985). It is less relevant to the present concern with tensions for educators.

More relevant is a second critique – more implied than stated by Keen. It concerns a retreat from the empirical. The corpus of knowledge on the topic of the present project (say, 'educational Web 2.0') is a case in point. While there is a rich seam of commentary on the blogosphere, it is fairly rare for contributions to go beyond 'commentary'. Certainly, they may *reference* real interventions and real practitioner successes but depth of description will typically fall short of the detail an impartial and researching reader might seek in making a judgement. The consequence tends

to be that much debate is conducted at a meta-level: that is, arguments about documented exchanges in the blogosphere rather than arguments about documented exchanges in the classroom.

Finally, Keen's central concern is with the issue of authority. Within traditional educational practice there is much emphasis on learning from credible sources. Controversies of 'authority' will arise within the learner's constant struggle in moving from (mere) information to (firm) knowledge. In navigating this path, it is necessary to rely on material that gains its credibility from data, argument, and expertise. All such properties are expected to enjoy protection in publication by some form of quality control. The form that this quality management takes will vary, but within the world of scholarly communication (including of course texts for classrooms), there is an assumption of peer review. Before claims or arguments are circulated, their content is independently scrutinised by relevant (and perhaps anonymous) expertise to determine if those claims or arguments are honest and well-grounded. Educational commentators are increasingly expressing concerns about the possible erosion of student critical awareness, as exemplified by these traditions (Times Newspaper, 2007).

The ease with which material can be published on the internet – the affordances of Web 2.0 – have destabilised mechanisms of quality control. It is not that those mechanisms are no longer being operated in traditional publication (whether online or on paper), but that on the internet practices are more fragile. The innocent browsing learner needs to make far more difficult decisions about authority when they encounter something published as a web page. This problem may be acute in populations where confidence is already stretched. Thus, Radia and Stapleton (2008) studied the web citations made in the project writing of 70 students who had English as a second language. On interviewing these students they were found to be relatively unaware of the ideological agendas of many of the websites they were invoking for authority.

Increasingly, caution remains necessary even when reading work that has undergone traditional peer review. For instance, in one paper cited here (Leslie and Landon, 2008) the following observation is made: 'As Cross related in a YouTube-delivered talk, most investigations find that 80 per cent of the learning in organisations happens informally and yet 80 per cent of learning budget expenditures support formal learning efforts' (p. 20). This is a significant point and its importance is emphasised through invoking statistical support. Yet, a video on YouTube is a cumbersome source for fixing such a claim and its authority as a source about organisational learning is bound to hinge merely on the credibility or expertise of its author (Cross) – something a student may find hard to judge.

Finally, there is a less discussed dimension of the move towards a more distributed knowledge culture. It is the more ephemeral nature of the products that are

published. There is no reason, in principle, that the internet should not provide stability for material that is placed there. But the reality is that sources discovered on the internet can be short lived. For instance, one book cited here (Richardson, 2006) refers in its bibliography to a large number of URLs to illustrate its points. Yet at the time of writing (and very soon after its publication), 19 per cent of these seem no longer active as web addresses. So, this transience is a further problem in the management of authority.

The Web 2.0 tension to be managed in this case is one between welcoming the diversity of Web 2.0 publication, while recognising the need to help students navigate it with confidence and a critical attitude. It might be easy to underestimate the scale of the responsibilities that this new imperative brings to teachers. The following researchable issues are implied:

- How do students judge the authority of sources when researching in a Web 2.0 environment?
- Do teachers address the skills of inquiry required to make such judgements?

Educational Web 2.0 – the emerging practice

Confident adoption of Web 2.0 practices must be grounded on convincing research that shows its appeal and its impact. Yet empirical studies in this area are rather rare. This may reflect the neglect of researchers or it may be an indication that Web 2.0 practices themselves are still poorly represented in the curriculum and, therefore, hard to investigate *in situ*. This encourages consideration of the reservations that practitioners may feel and the obstacles that they may encounter as innovators.

Web 2.0 in secondary education: blogs and wikis

One of the ways in which Web 2.0 is making an impact is through the creation of internet-based communities of teachers using Web 2.0, through services such as blogs and wikis. While this might be considered an indirect mode of influence on learning, it is probably a significant one. Dissemination websites aimed at practitioners can create a community of discourse for teachers who have a shared interest in the practices under discussion here. Moreover, these links are beginning to extend to support the exchange of shareable learning objects (see for example http://teachertube.com, http://lemill.net, and http://slideshare.com). This is consistent with government ambition for teachers to '…achieve greater efficiency and effectiveness, with online research, access to shared ideas and lessons plans...' (DfES, 2005 p.5).

There is a modest corpus of research reports that suggest blogs and wikis can enjoy success in primary and secondary contexts. Thus Lund and Smordai (2006) describe an empowering wiki project, although it is remarked how difficult it can be for students to move towards willingly editing the text of their peers. Desilets and Paquet (2005) report a successful project in primary classrooms based upon collaborative wiki story writing. However, they comment that it was important for the children to develop their ideas on paper as they felt uncomfortable writing them directly to the screen.

At present, our understanding of the possibilities of these key Web 2.0 services is limited to a corpus of informal reflection in the blogosphere itself and to a small number of publications that integrate these experiences through brief reports (Freedman, 2006; Richardson, 2006). These are encouraging reflections and they furnish good suggestions for practice. Taken together, they imply that teachers can become enthusiastic and inspired about these opportunities, and that students greatly appreciate the potency of (internet) audience for their work. However, it is urgent that the informal case studies currently on the table are extended through larger scale research exercises.

Still less is known about how far learning platforms or virtual learning environments (VLEs) are harbouring Web 2.0 activity. Of course, some commentators suggest that such walled garden activity does not count, but this is a severe threshold to apply. If learning platforms are stimulating online forums, wikis, blogs, podcasts, and internet-based knowledge building, then that activity deserves to be recognised and evaluated, and the insights disseminated. At present, personal accounts of learning platform initiatives are less commonplace than accounts of work with podcasts, blogs and wikis on the internet. Nevertheless, conference reports suggest there are interesting developments taking place (see for example http://www.online-conference.net/vle2006/presenters.htm).

Web 2.0 in secondary education: inquiry methods

A recurring concern around Web 2.0 in school work is the challenge for young people of searching and navigating these vast and disordered information spaces. Moreover, following search, there are challenges of evaluating and interpreting what has been found. A recent research report from the British Library (Rowlands *et al*., 2008) suggests a tendency for younger students to scan pages rapidly, and click through on hyperlinks rather than reading sequentially. Formulating searches is evidently difficult for them. Advanced search features are rarely invoked and there is an optimistic faith in whole phrase searching (as in making a search on 'what is the effect of global warming on penguins?') – although this may be encouraged by services such as ask.com which offer a search engine using this more intuitive approach.

Examining where hits on the BL's own resources came from gave some further indication of how young learners were approaching search. The BL team found that 40 per cent of such hits started from an image search. Rarely did searches start from a blog posting. Taken together, such observations suggest that attention needs to be directed towards actively supporting the development of more effective inquiry skills in learners.

To that end, researchers have recently evaluated the effectiveness of intervention training programmes on web searching for young people. Gergjets and Hellenthal-Schorr (2008) report a design for a training programme that seems more successful than those more commonly in school use. Their results suggest it is possible to help children make progress on search strategy. Kulper, Volman and Terwel (2008) implemented an eight-week programme for 11-year-olds that was also successful, although there appeared to be problems of making long-term changes in strategy. The designers stress the importance of methods that draw out underlying metacognitive skills – abilities that overcome a basic reaction of impatience and impulsivity. While these studies indicate the potential of well-designed programmes for cultivating search practices, they do not suggest that skill is easily come by or readily sustained.

Web 2.0: in secondary education: dissemination

Consistent with the collaborative and community spirit of Web 2.0, it is not surprising to find that most of what can be learned about successes in primary and secondary education is currently disseminated in the Web 2.0 medium itself. That is, it takes the form of blog postings and other informal accounts of case study experiences. In addition to individual blogs, social networking websites have evolved to serve the interests of teachers exploring Web 2.0 (for example, http://www.l4l.co.uk/; http://nextgen.ning.com/ and http://www.classroom20.com/;)

It would be a daunting task to systematise and evaluate all the references to Web 2.0 initiatives that are mentioned through conversations and accounting in the Web 2.0 arena. Moreover, there is every reason to believe that there are many more lurking behind the walled gardens of learning platforms thanks to their designs commonly including the relevant tools. Of course, this marginalisation of learners from the mainstream of Web 2.0 activity is not totally in the spirit of its ideals. While there is a disappointing volume of research directed at secondary school Web 2.0 usage, there is rather more within higher education.

Higher education: general take-up

Selwyn (2007) makes the case that these new technologies could allow universities to reinvent themselves. They would require institutions to make a shift 'from the representational capabilities of ICTs (i.e., their ability to represent commoditized

informational delivery modes of higher education) to their more expansionist and relational potentials' (p. 91). Yet it is hard to find a university where Web 2.0 opportunities have been deeply integrated in course structures.

Edinburgh is the only institution which appears to have a Web 2.0 strategy and action plan (Franklin and Van Harmelen, 2007). There, blogs and RSS feeds have replaced newsletter and other routine circulations. Social bookmarking has replaced traditional reading lists. There is podcasting of important lectures and access to blogs for community building.

Elsewhere there is merely a good deal of speculative encouragement for institutions to adopt the use of such tools (see for example Boulos Maramb, and Wheeler 2006; Craig, 2007). Yet take-up is tentative and rather piecemeal. Most institutions have invested heavily in a virtual learning environment and surveys suggest that staff make rather limited use of the Web 2.0 facilities that are often embedded in these systems (Dutton, Cheong and Park, 2003; Woods, Baker and Hopper, 2004). One way in which the VLE could be extended by Web 2.0 tools would be through creating a stronger sense of informal community and informal communication. This has been shown to be an important dimension in computer-mediated learning (Kreijns, Kierschner, Jochems and van Burren, 2007) – echoing the well-documented importance of 'classroom climate' effects on students' learning.

Higher education: social software

Few universities have embraced the idea that analogues of social networking sites might be provided for students, although Newport University's 'Mylearning Essentials' is an ongoing effort to create a parallel to Facebook for supporting course presentations [http://www3.newport.ac.uk/displayPage.aspx?object_id=3290&type=PAG]. However, as Hewitt and Fote (2006) have reported, students may not wish to have more than one social networking identity. Moreover, insofar as they do have one they tend to see it as their own 'territory' and not a space to be invaded by lecturers or communications about the curriculum of their study.

UK universities have been more vigorous in adopting both blogs and wikis. Franklin and van Harmelen (2007) provide a useful summary of current blogging practice based on close engagement with sites that have reached a good degree of maturity. Warwick University has been offering blog spaces since 2004 and these journals are openly readable. This is institutionally quite courageous. For example, students are prone to comment on such things as the quality of campus services and the availability of accommodation or nightlife in the local area. If intending students become audiences for these postings, the institution needs to be confident about the quality of student experience. At Warwick in 2007 there were 4,540 active blogs and

some 88,619 postings. This is a large number of bloggers but a relatively small proportion of the total university community.

At Leeds University the blogging initiative has been more led by staff who have been encouraged to use both blogs and wikis. In 2007 there were 2,000 students actively using this system. Brighton University provides an indication that such active development of the practice is important. Although 36,000 students are registered as blog users only 4.5 per cent are active and only 13,700 posts were registered in the year considered in this survey. Franklin and van Harmelen (2007) stress that blogging needs to be actively coordinated with classes. It is a set of communication practices, not just a network with inbuilt assurance of spontaneous energy.

There are informal reports that blogging is cultivated by many course leaders in universities. However, these initiatives are typically 'encouraged' rather than embedded. Moreover, where there has been evaluation of cases that are embedded they tend to refer to blogging that is linked to assessment and thereby carries an external motivation (in contrast with Du and Wagner, 2005). Recent evidence from the Open University tends to reinforce the importance of such motivation: students there were not particularly welcoming of blogs in their course structures (Conole, Kerawalla, Kirkup, Minocha, Schencks and Sclater (2007).

Wikis have arguably made a deeper impact on higher education. The Open University has made progress towards integrating wikis in a number of its courses. An evolution by Minocha and Thomas (2007) of an Engineering course suggests that the wiki innovation is effective. At least there was evidence of reference to wiki contributions in the students' coursework assignments. It should be noted that use of the tool was partly integrated with assessment and so there would have been some pressure to engage – although this is common in many reports. Insofar as the students needed contributions to construct their assignments, there were some student misgivings about the integration of contributions with deadlines.

One way to engage students is by encouraging active authoring in the ultimate wiki environment: Wikipedia. The online encyclopaedia includes a page that lists the very large number of campuses in which students are doing projects that involve editing or making new entries [http://en.wikipedia.org/wiki/Wikipedia:School_and_university_projects]. While few of these initiatives are formally evaluated, it is clear from the outlines that they have great potential to inspire and challenge students.

However, more modest and local projects are possible and the wiki may be more attractive than the blog as a medium because it offers a more collaborative basis for learner activity. Enthusiasts for wiki use will typically suggest such possibilities as: making summaries of personal thoughts on course reading, class-constructed glossaries, lecturers publishing course resources for students to comment on, group

authoring of reports and papers, collating the collection of data, and feedback review on classes and teachers. While some such initiatives may be concealed behind the structures of an institutional VLE, others are openly published on the internet for the benefit of students everywhere (see for example h20.law.harvard.edu and Pentags at the University of Pennsylvania). There are as yet few research studies evaluating the impact of these initiatives but there is evidence that they can lead to academic gains, for example in the support of writing (Forte and Bruckman, 2006).

On the other hand, Notari (2006) comments on the difficulty of getting students involved in commenting on the work of others. There was clearly a cultural obstacle to be overcome in relation to such practices. Britcliffe and Walker (2007) make a similar point regarding student unwillingness to join a collaborative wiki and press this point to suggest that 'it runs counter to the ‘digital native’ thesis (Prensky, 2001) that students are naturally drawn to collaborative software in learning contexts'.

Higher education: other Web 2.0 tools

Podcasting is the third member of a trilogy of applications – with blogs and wikis – that have gained some momentum in higher education. However, many reports concentrate on how it makes possible a traffic in fairly conventional materials such as recordings of lectures or interviews. Indeed, Apple has made available a free service (iTunes U) to support such initiatives. Potential in language learning is particularly strong and there are reports of successfully stimulating authentic experiences with foreign culture and dialogue (Chinnery, 2006).

Other Web 2.0 tools are less conspicuous in higher education. However, there are signs that more is possible. For example, Cann (2006) reports an elaborate structure of course support that integrates RSS feeds from relevant disciplinary sources into the VLE-based notes for that teaching. However, away from the mainstream of wikis, blogs and podcasting, it is important to note other Web 2.0 initiatives that are surfacing under the direction of students themselves. Thus Miniciti.com, Notecentre.com and Notemesh.com all allows students to share notes and texts from courses that they are taking in common. Moreover, there are over 300 education-based applications on Facebook that have evolved to support students in communication and study.

Of course there is a lag between the completion of research field work and the publication of a report. Therefore, a recent (September 2007) conference of the Association for Learning Technologies can be considered a shop window for research that is ongoing in this area. The ALT tends to concentrate on higher education so it is not surprising that most of the papers were concerned with initiatives in universities. However, this is still a reminder that work in other education sectors seems urgently needed. Of the papers reported, around 15 per cent were concerned with Web 2.0 issues. Of those, eight were describing wikis. Five of these

were demonstrations of systems ready to use. Two were reporting outcomes from significant interventions. There were five empirical reports on blog use, five on podcasting, three on social networking structures and one on data tagging. The overall impression is of case studies where there is relatively little reporting of the learning process and rarely a comparison point that helps evaluate the impact of an intervention relative to alternative learning structures. Conference reports are inevitably light on empirical detail and there are many questions that need to be asked regarding the likely context conditions for success in these areas.

Educational Web 2.0: why research is needed

It is heartening to find that the blogosphere and other Web 2.0 spaces are disseminating enthusiastic reports of Web 2.0 initiatives. Probably there have always been these stories associated with the arrival of new educational technology opportunities – the example of Logo (Papert, 1980) might be a case in point where the technology enjoyed an enthusiastic initial uptake although it was not fully sustained. In the case of Web 2.0, the medium demands conveying the message about the medium. While case study reports are welcome and often inspiring, it would be unfortunate if they seemed to render more traditional research scrutiny unnecessary.

One reason why research may be scarce in this area is that the field changes so fast that researchers may be deterred from entering – lest their findings seem irrelevant by the time they come into public view. Yet electronic journals and online early publication practices do not make this a very convincing excuse for neglecting such an important area of educational practice.

What can a research lens offer that is not emerging from informal accounts of innovation? Hopefully it can offer a critical and probing perspective and some experience in capturing the learning processes that underlie the technical and social designs. For example, there are questions that a good educational researcher would ask that either are not asked within informal accounts or at least not reported. So, often a reader will want to know a great deal about the context of the intervention in order to evaluate the nature of the success (or failures) that are reported. That context will be deeply familiar to the informal author perhaps and so helpful framing is omitted. A researcher might also be guided by theory in a way that would encourage aiming to understand more of how an intervention worked. This might mean probing a little more deeply into the institutional circumstances within which it was initiated and also probing the course of the learning experience itself: attempting to clarify how the design of the setting for learning shaped the trajectory of progress taken.

Sadly, many accounts of successful interventions are hard to evaluate in a way that helps other practitioners judge the likelihood of successes in their own ecology of

practice. Similarly, educational theorists will be seeking more insight into the dynamic that underlies a successful Web 2.0 intervention. There is a particular urgency to understand more at this level because it seems that Web 2.0 practices are not widespread within the educational system. It is encouraging that individual innovators and some whole institutions are making progress with an obviously promising technology. But one thing that must be better understood is how the transformation possibility of Web 2.0 practices are realised. They can be usefully set against the following sobering observations about transformational change:

The problem with transformation is that it always seems out of reach, conceptually far removed from the everyday classroom realities of forming relationships with pupils, organizing learning and teaching, managing behaviour and so on. Whilst waiting for the bright new future, teachers have to get on with coping with the present, with all the rewards, and frustrations that involves. And so, in the continually reforming world of education, enrichment may be a more attractive model. With this model there is no need for major change and little disruption, just some new equipment and the appropriate retraining. (Burnett, Dickinson, Myers and Merchant, 2006, p.12)

Conclusion

Web 2.0 technology or Web 2.0 mentality?

Over the course of a few years a new communications technology annihilated distance and shrank the world faster and further than ever before. A world wide communications network whose cables spanned continents and oceans, it revolutionized business practice and gave rise to new forms of crime. Romances blossomed. Secret codes were devised by some and cracked by others. The benefits of the network were relentlessly hyped by its advocates and dismissed by the sceptics. Governments and regulators tried and failed to control the new medium and attitudes to everything from news gathering to diplomacy had to be completely rethought. (Standage,1998)

In these words, Standage characterises a revolution in communications: one with far-reaching effects. Yet what he is describing is not the internet or Web 2.0 but the development of the telegraph in the 1840s. As Woolgar has pointed out in discussing virtual society (Woolgar, 2002): 'We've been here before'. This reminds us that communication technologies are constantly re-configuring human relations. Often they send their waves of disturbance through cultural traditions. The danger is to dwell on only the technology, thereby adopting some narrow deterministic view of its 'effects'.

The broader view should be taken for another reason. Technologies and social forces exist in intimate harmonies. Because a particular technical phenomenon (say the blog) is suddenly very visible, it would be careless to invest it with all the causal force necessary to explain ongoing cultural changes in social relations. In short, Web 2.0 technology is a response, as well as a stimulus. Web 2.0 may be simply one point of general disturbance on a trajectory of societal change.

For this reason, it might be better to talk less of 'Web 2.0 technology' and consider instead 'Web 2.0 mentality'. On doing so, it may seem that many practices typically mentioned for capturing a Web 2.0 disposition are already visible in the wider cultural context with its greater emphasis on participation, informality and irreverence. This is not simply to note that 'we've been here before', but that Web 2.0 perhaps *reflects* wider trends in society and culture.

It is also true that Web 2.0 has played its significant part in *shaping* the way things are now. It is part of a momentum visible in the participatory, collaborative and self-confident creativity that characterises the present cultural mood. Concentrating on defining and exploring the mentality (rather than the technology) should lead to less disorientation by apparent 1.0/2.0-type discontinuity and more thought about the *origins* and motives of how people are now acting.

All of these points about familiarity and continuity apply to the particular cultural domain of education. Within that domain, the same cultural 'disposition' becomes one that acknowledges: the multi-perspective nature of knowledge, the importance of multiple literacies, the value of collaborative thinking, and the significance of audience for creativity. Certainly, Web 2.0 internet tools do provide new impetus for this established way of thinking to be played out in educational practice.

Yet it should not be suggested to practitioners that these tools are a *necessary* basis for realising such a disposition. Insofar as these ideas have always been significant within pedagogy, it is already widely understood that they only gain ground when the underlying curriculum and regimes of assessment are designed in sympathy with them. For this reason, the enthusiastic uptake of web 2.0 tools will, first, depend on the acceptance of particular attitudes towards knowledge and knowing. But these, in turn, can only be made to happen within systems of educational delivery and assessment that are fashioned to welcome and nurture such attitudes.

Key texts

A number of books have been influential in defining the nature of Web 2.0 and analysing its trajectory. Not all of them are directly concerned with internet, some articulate theoretical perspectives from other domains but which may be perspectives that are readily recruited into the Web 2.0 arena. They are listed here in order of the number of hits the title achieves in a Google search (as of March 2008).

The Long Tail (Anderson, 2006)

Journalist Anderson is currently editor of *Wired* magazine. This influential book introduces the statistical concept of a long tail as it applies to the marketing of products with varying degrees of market appeal. The internet is discussed in terms of how it disturbs the normal market dynamic governed by the long tail – and, in particular, how this applies to the dissemination of knowledge.

The Wisdom of Crowds (Surowiecki, 2004)

A book that is not centrally about Web 2.0 but which addresses the broad idea of intelligent decision-making being the outcome of group processes. This relates to the significance of Web 2.0 structures that coordinate the choices made by very large constituencies of users. The book helps theorise the making of decisions based upon such social processes.

The Cult of the Amateur (Keen, 2007)

Digital pioneer turned digital sceptic reflects on dangers arising from the democratising ease with which anyone can publish on the internet. Keen argues that this has given rise to a confident amateurism that works at the expense of genuine expertise and presents web users with dilemmas of judging authority. In short, an argument for Web 2.0 having a dark side.

Wikinomics: How Mass Collaboration Changes Everything (Tapscott and Williams, 2006)

An influential book aimed at business, not education but it theorises and celebrates the ideas of large-scale collaboration, as mediated by the coordination of technology.

Everything is Miscellaneous: The Power of the New Digital Disorder (Weinberger, 2007)

Confronts the implications of digital media for our ideas about classification and the imposition of order on cultural artefacts. It contrasts traditional systems of classification with the new methods arising from management of artefacts held in digital form.

We-Think (Leadbeater, 2008)

Leadbeater articulates the new culture of sharing that he believes is central to Web 2.0. A business-oriented argument is made for the power of technology-mediated collaboration to drive innovation.

Ambient Findability (Morville, 2005)

This accessible book by an experienced information science consultant widely explores the issues surrounding how humans navigate their environments – with special concern for their information environments and the new information structures of the world wide web. It considers the economic and cultural significance of these new structures and tools for defining the 'findability' of cultural material.

The Tipping Point (Caldwell, 2002)

An influential thesis concerning the processes underlying 'social epidemics' with special emphasis on critical points that determine their emergence. Not directly about Web 2.0, it is often cited by commentators making sense of social network effects.

Net, Blogs and Rock ‘n’ Roll (Jennings, 2007)

An insider overview of the variety of new digital media engaging young people and the forms of activity that are emerging from this engagement. A useful and streetwise introduction to the wider landscape.

Their Space: Education for a digital generation (Demos, 2007)

The UK think-tank reflects on its fieldwork with young people as recreational users of Web 2.0 and the extent to which the education system needs to adapt to their new culture of communication and digital play.

Key online documents

Anderson, P. (2007), *What is Web 2.0? Ideas, Technologies and Implications for Education*. JISC: Bristol , Retrieved April 11, 2008 from URL: http://www.jisc.ac.uk/media/documents/techwatch/tsw0701b.pdf

A thorough review of the nature and implementation of Web 2.0 written for the UK higher education community

O'Reilly, T. (2005), *What Is Web 2.0: Design Patterns and Business Models for the Next Generation of Software*. Retrieved April 11, 2008 from URL: http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html

Essay on the reach of Web 2.0 ideas from one of the early pioneers and a central publisher in this arena

Ofcom (2008), *Social Networking: A quantitative and qualitative research report into attitudes, behaviours and use*. Retrieved April 5 2008 from URL http://www.ofcom.org.uk/advice/media_literacy/medlitpub/medlitpubrss/socialnetworking/report.pdf

Significant integration of research from various UK sources evaluating the scope and significance of social networking, particularly among young people

Franklin, T. and Van Harmelen, M. (2007), *Web 2.0 content for Learning and Teaching in Higher Education*. Bristol: JISC. Retrieved June 19, 2007 from http://www.jisc.ac.uk/media/documents/programmes/digitalrepositories/Web 2.0-content-learning-and-teaching.pdf
A government-commissioned review that considers the use of Web 2.0 tools in higher education. Based upon interviews with relevant staff, a number of case studies are outlined. Recommendations are made on a range of issues including security, assessment, IPR etc.

Freedman, T. (2006), *Coming of age: An introduction to the new world wide web.*

Retrieved February 5, 2008 from http://www.ictineducation.org

A collection of case study reflections by practitioners in primary and secondary education who are active in the use of Web 2.0 tools.

Grant, L., Owen, M., Sayers, S. and Facer, K. (2006), *Social software and learning*. Opening Education Reports. Bristol: Futurelab. Retrieved November 24, 2007 from http://www.futurelab.org.uk/resources/documents/opening_education/Social_Software_report.pdf

An overview of Web 2.0 ('social') software and its potential for education by media and education think-tank. Emphasis is upon the skill demands of new knowledge economies and, particularly, the flexibility of students to be lifelong learners. The role of Web 2.0 technologies is discussed in relation to changing conceptions of knowledge and knowing with particular emphasis on the importance of communities of knowledge and means for entering them.

Lenhart, A., and Madden, M. (2007), *Social networking websites and teens: An overview*. Pew Internet and American Life Project report. Retrieved November 9, 2007 from http://www.pewinternet.org/PPF/r/198/report_display.asp

Summary findings from a US survey of teenagers on their use of social networking websites. It stresses older girls as strong users and notes the role of these sites in reinforcing existing friendships rather than forming new ones.

Microsoft/Viacom/MTV (2007), *Circuits of Cool/Digital Playground Study* Press release retrieved February 2 2008, from http://www.viacom.com/news/pages/newstext.aspx?rid=1029951

Commercially funded survey of 16 nations that draws attention to the range of use for digital technologies among young people.

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