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E-Learning 2.0: New Frontier For Student Empowerment

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Renner, W. The University of Sydney, Australia E-Learning 2.0: New Frontier For Student Empowerment.

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ABSTRACT

Second generation web applications (Web 2.0) are transforming elearning and opening new frontiers for learner empowerment, control and engagement. New online technologies allow individuals to filter and control existing content (aggregation), easily create new content (personal publishing) and rapidly communicate, inform and distribute this information with peers through online social networking services. Learners are able to construct highly personalized learning environments, assembled from a very large range of tools available on the internet, including blogs, wikis, podcasts and social bookmarking sites. Together the technical and social advances which characterize this change may even constitute a paradigm shift, which some authors refer to as eLearning 2.0. This paper identifies emergent themes evident in this literature, and relates these themes to social, individual and scholarly empowerment by contrasting traditional eLearning with eLearning 2.0. The analysis is approached from a social constructivist perspective, applied to the technology, its pedagogical rationale and its impact on the university. The paper postulates that if individual empowerment is a necessary precondition for the adoption of these tools, then we will need to reconceptualize the policies, practices and purposes of our educational institutions.

WHAT IS WEB 2.0?

Emerging from the post dot com collapse of 2000, new generation web sites offer exciting new services for today's youth. The term Web 2.0 speaks of an evolution in how we use the web, new underlying technologies and new patterns of use – together termed Web 2.0 (O'Reilly, 2005). Since mid-2005 the term has been gaining considerable traction in the corporate world, amongst developers and increasingly amongst the general public. As of November 2006, the keyword 'Web 2.0' exceeded 60 million citations in Google, indicating the enormity of the concept in the internet mindspace.

Advocates of Web 2.0 argue that current generation web sites represent a break from those of the past (Hinchcliffe, 2006; MacManus & Porter 2005). The first ten years of the web were characterized by traditional web sites (retrospectively labeled Web 1.0) which mainly presented static information, relying on html for authoring, with search engine placement and hyperlinks for navigation. In contrast, Web 2.0 sites are doing things rather differently - harnessing new technologies and development principles to provide a more dynamic and interactive experience. Users can create and contribute content (the read/write web), share their views and opinions (conversation), vote on the relevance of material (polling and reputation systems), add keyword classifications to information bites (tagging folksonomies) and offer incentives to build up the site's online community with services which improve as more people use it (viral marketing).

Although there is little agreement over the precise characteristics which define Web 2.0, and considerable debate over where 1.0 ends and 2.0 begins (Madden & Fox, 2006, p1), the term itself is 'far less important than the concepts, projects and practices included in its scope' (Alexander, 2006, p33). Whether we are witnessing an evolution or revolution, we must acknowledge that the web has changed, in its use and its mass appeal to today's youth. More than 1000 web sites claim Web 2.0 pedigree, and espouse the now familiar open standards of XML, web services and RSS to drive interoperability. Some of the better-known examples of Web 2.0 community sites include: flickr (photo sharing), gmail (email), wikipedia (encyclopedia), linkedin (social network), myspace (friends network) delicious (social bookmarking), digg (voting) and blogger (blogs). These and

many other Web 2.0 sites have millions of members. The non-English language world has some of the largest online communities. For example Mixi, with its 7 million Japanese members, has helped propel Japan to the top position in Web 2.0 country comparisons. In April 2006, Japanese bloggers generated some 37% of the world's daily blog traffic (Sifri, 2006) .

Some suggest the Web 2.0 phenomenon brings the web closer to Tim Berners-Lee's original concept of the web as a participatory, democratic, medium of communication - the read/write web, harnessing the power of the users themselves. Web 2.0 sites have in common a new view of the internet public. Where in the past, visitors were thought to (haphazardly) surf into a web site, there is now a concerted effort amongst web developers to provide useful services for which visitors might revisit the web site and eventually become members of vibrant online communities. Part of this shift is embodied in authoring tools which allow users to easily publish and share their content. The other part of the equation resides in rising media literacy amongst today's youth and their capacity to engage with and participate in digital culture.

Some trends evidence the claims of Web 2.0 advocates. Unlike older generations who tended to use the web to find and consume information, today's youth are content creators. According to Lenhardt et al (2005), half of all American teenagers and 57% of teens who use the internet are internet content creators. Teen bloggers, led by older girls, create blogs or webpages, post their artwork, photography, stories or videos online or remix online content into their own new creations. One-third of teens share what they create online with others, 22 percent have their own websites, 19 percent blog, and 19 percent remix online content (Lenhardt et al, 2005). A sign of the trend towards Web 2.0 is evidenced by the research suggesting that mail has already been eclipsed by instant messaging as the dominant means of teen communication. About two-thirds of American teenagers use instant messaging, with 48% using it at least once every day. For today's youth, email is seen as a way of communicating with 'old people' (Lenhardt et al, 2005, p ii). The situation in developing countries is more pronounced. According to Nelson (2006), countries such as China (soon to have the largest online population in the world) have leap-frogged over earlier internet technologies. Many Chinese teenagers do not have email addresses - they use the internet primarily as a social space, where they logon, interact and leave. In almost all countries, the use of the internet has intensified and broadened as people log on more frequently and do more of their daily activities online.

According to Jenkins (2006) and Prensky (2001), today's youth are the primary drivers of this emerging participatory culture, characterized by low barriers to artistic expression, the creation and sharing of content online, membership in online communities, the ability to work with peers to accomplish tasks and the control of media circulation through RSS subscriptions such as blogs, podcasts and news feeds. Before examining the potential of these tools in education, let us start by introducing these key technologies.

Four categories of Web 2.0 sites and services are of particular relevance to higher education: blogs, wikis, podcasts and social bookmarking. Weblogs (blogs) were perhaps first popularized during the Iraq War. Embedded journalists (among others) used them as online personal diaries, 'posting' their observations directly from the field to the web. The organizing principle of the blog is that it arranges 'posts' in reverse chronological order, placing the most recent posts at the top of the page. The popularity of blogs stems from their timeliness and their ability to accommodate comments and reflections from readers, a departure from what was hitherto available from static web sites. These features together with their ease of use has seen blogging become enormously popular since their inception in the late 1990s. By 2004 it was picked as the word of the year by Merriam-Webster's online dictionary, easily the most looked-up term on that site (BBC News, 2004). By 2006, there were over 36 million blogs tracked by Technorati (Sifri, 2006), a popular Web 2.0 site which indexes blog posts. Modern enhancements to the blog include trackbacks and permalinks, which allow users to easily create links between blogs and thereby enter into conversation. However, the most significant transformation of the blog from personal to social tool came when Really Simple Syndication (RSS) was incorporated. Users could now subscribe to their favourite blogs and be notified in real time as changes were made. This transformed the humble

blog into a powerful communication tool with prolific bloggers forming loose communities around topics of mutual interest.

Podcasts build on the success of blogs. Technically there is nothing particularly special about a podcast episode, it is simply an audio or video file which people can download and view (normally on a computer or portable media player). As with blogs, the breakthrough came when RSS was introduced as a way of managing their distribution. This has allowed the publication of podcast episodes to be staged over time and so presented as a chronologically organised feed. The user can, with great ease, download, store, view or listen to a set of audio and video files simply by subscribing to an RSS feed.

The wiki entered public consciousness through Wikipedia, an online encyclopedia established in 2001 which allows anyone to add or edit an entry (Wikipedia, 2006). It is an experiment of trust in the wisdom of crowds to regulate content creation. Simply put, the contentious idea is that if enough people are involved then they will collectively arrive at an understanding which will surpass individual opinion and automatically correct individual error and bias. Wikipedia's audience is rapidly growing, both as readers and contributors. In August 2005, at least one in five Americans visited wikipedia each week (Madden & Fox 2006, p 4). For some the wiki represents the rise of mass amateurism which inevitably degrades content, for others it is a powerful participatory movement for creating and sharing knowledge (Giles, 2005). Wikis have been embraced in the corporate world, in education and in the public sphere because they support the formation and function of communities of practice. Sites like wiki.com allow anyone to create their own wiki and invite members. The wiki represents a profound change in the dynamics of content creation for it allows groups of geographically dispersed people across different time-zones to collaboratively work on the same document. New forms of the wiki have been enthusiastically embraced by Google and its subscribed users. Google Docs (formerly called Writely) and Google Spreadsheets are variants of the wiki which allow people to share and collaborate on documents across the web and across the world.

Other Web 2.0 sites use the 'wisdom of crowds' principle to categorise, manage and share 'discovered' information. Consider for example sites which specialize in 'social bookmarking' and 'tagging' such as del.icio.us, furl, digg and flickr. Each of these services offer people a way to classify their online photographs, bookmarks or web pages with keyword tags freely chosen by the users. Once tagged, the content can be rediscovered at a later date by searching these keywords. The content and keywords of other users can also be searched. This dramatically increases the value of such services, because content can be organized by relevance or popularity, in addition to the keyword classification. Contributors to the communities which surround these services benefit from sharing knowledge, from finding people with related interests and from consciously or unconsciously developing a so called tag 'folksonomy', the aggregate of individual contributions (Alexander, 2006). The tag folksonomy contrast with the more rigid system of a taxonomy, the familiar hierarchical approach to organizing a knowledge domain by way of a structured thesauri of terms. The classification principle of a folkonomy is, in contrast, free-flowing and cooperative.

Web 2.0 is principally a social rather than a technological phenomenon. It is very much about people connecting with people, about sharing information, contributing and adding new ideas to old and is about the discovery of new information. The web has dramatically shifted from a library of downloadable information, to a place where you can join others online to collaboratively discover new ideas, contribute, comment and offer opinion. The now familiar exemplars of blogs, wikis and podcasts are themselves being extended by many other emerging genres of Web 2.0 sites, including for example, social networking services (friendster, myspace, linkedin), geographical wikis (wayfarer, wikimapia), online calendaring (google calendar),personal organisers (43 Things) and mobile networking (dodgeball). The expanding range of online services are geared towards the cultivation of niche markets at the thin end of what Chris Anderson (2006) has termed the 'long tail', arguably the new business model of the internet age. Across this diversity, Web 2.0 sites continue to distinguish themselves from their competitors by providing useful services which empower their users to:

- contributed expertise or knowledge within online communities of practice (collaboration)
- easily create and share online content with others (contribution)
- discover new content through highly customisable subscription services (syndication)

How should educators tap into this burgeoning participatory digital culture? One approach has been to adapt Web 2.0 technologies for use in educational settings. This, according to Stephen Downes (2005), represents a second phase of e-learning – E-Learning 2.0. In the remaining sections of this article I will outline a rationale of empowerment based on social constructivist pedagogy, and suggest two alternative approaches to integrating Web 2.0 technologies within e-learning 2.0 environments.

E-LEARNING 2.0 AND STUDENT EMPOWERMENT

Student empowerment is a concept deeply embedded in social constructivism, both its discourse and theory. Constructivism is premised on the idea that knowledge is not a fixed object which can be transmitted from person to person, for example teacher to student, but is individually constructed through cognitive processes which involve students in the assimilation of new ideas with prior knowledge and experience (Piaget, 2000). Learning is therefore a complex and sometimes unconscious process requiring the learner to acquire, discard, modify, or reconstruct knowledge based on its application to task. The implication for the present study is that for a learning environment to be empowering, it must endeavour to support a high degree of individual variation in the way knowledge is sourced, categorised, presented and communicated, so that learners have the opportunity to develop their own understandings and attributions of meaning.

A second premise of social constructivism concerns the important role of social discourse in the learning process. According to this view, truths emerge when personal, possibly incomplete understandings are interrogated, questioned, justified and defended, such that learning is a product of social interaction between student and teacher and between peers (Vygotsky, 1992). Teaching is instrumental both in challenging and guiding learners towards new understandings with timely intervention and relevant feedback (Shuell, 1992). Effective learning environments must address the social aspects of learning by encouraging learners to discover and share their understandings, and debate concepts within peer networks, ultimately with a view towards transforming the classroom into a community of inquiry which extends into the wider community.

To summarise this position, learning is both personal and social. It is personal to the extent that individual students must construct their own understandings. These understandings are subsequently regulated and tested through social interaction. Previously held understandings may later be disproved and thus require 'reconstruction' as the student makes progress in their learning towards 'better' understandings. Empowerment is part of this dialectic. The empowered student must have the 'power to' explore, refine and integrate their knowledge, but also to share this 'power with' other members of a community of inquiry (Duhon-Haynes, 1996; Page & Czuba, 1999). Individual agency can be regulated through peer interaction, scaffolding, and modelling to facilitate knowledge acquisition and cognitive growth in students. In this way, the learner increasingly acquires the skills necessary to become an autonomous life-long learner.

Social constructivism is therefore a theory of learning empowerment within which students are conferred agency in the learning process, higher levels of responsibility over their learning and choice about what, where and how they learn. Of course student agency is dependent on the learner's capacity for autonomy and self-reflection as well as the nature of the curriculum. Moreover, understandings of empowerment are quite diverse across disciplines and across the range of social constructivist pedagogies.

Let us turn to the relationship between empowerment and the learning environments afforded by e-learning 2.0 technologies. In so doing, we will attempt to answer the question: To what extent do e-learning 2.0 environments support social constructivism and empower student learning? Several characteristics of social constructivist learning environments have been previously identified by Jonassen (1994) which are pertinent to our discussion:

- The environment should allow multiple representations of reality to coexist and thus approach the complexity of the real world.
- The learning environment should emphasise knowledge construction ahead of knowledge reproduction.
- Students should engage in authentic tasks in real-world settings rather than highly abstracted instruction.
- Students should have the opportunity to engage in thoughtful reflection on their experience.
- Collaboration with peers should assist in the construction of knowledge through social negotiation, rather than competition among learners
- Each of these principles will be expanded and discussed with reference both to student empowerment and e-learning 2.0.

Real world complexity

Conflicting values, opinions and assumptions abound on the web. Students must acquire the evaluative skills to understand, discern and select among multiple perspectives (Jenkins, 2006, p53), to remix these into new personal understandings, and to do so with a critical eye on the sub-texts which they encounter. These are of course the traditional research skills of the pre-internet world, but are perhaps even more important in an era of 'mass amateurism'. Web 2.0 tools which employ folksonomies such as delicious, youtube and digg assist students to sift through the wealth of online information and isolate appropriate resources based on their popularity, reputation, relevance or timeliness. In this way, the differences between fact, fiction and opinion can be more easily discerned so that suitable evidence is marshaled to support their arguments and student compositions, all while developing real world critical thinking skills. Naturally, novice learners would benefit from the support of the teacher especially when topics are complex or highly contested, and it is here that guided constructivism is complementary to an e-learning 2.0 environment.

Knowledge construction

Social constructivists regard the student as an active builder of knowledge. According to Papert (1993) technology is transformative in a teaching and learning environment when students are engaged in 'hands-on' activities in a process of 'learning-by-making', testing and expressing their understandings. The tools of learning are therefore the technologies we use to develop these understandings and transform students from receivers to producers of knowledge (Goodyear, 2004). Web 2.0 technologies offer innovative ways to engage students in the construction of knowledge. Blogs, for example, are being used in undergraduate teaching as learning spaces for students to reflect on their experiences (reflective journals), to gather their expositions and research findings (e-portfolios), to develop their writing and online literacy skills, and to share and verify their understandings with others. Personal publishing tools help students to cultivate an authentic voice, and to develop their identities as active creators of knowledge. Used in this manner, blogs effectively transfer more responsibility for learning to the student, with more control over what they learn, how they learn and the context in which learning occurs. To facilitate this type of learning, teachers must become facilitators, supporting and scaffolding learning as they progress from novice to self-regulated learners.

Authentic tasks

One affordance of e-learning 2.0 is that learning can be located in real contexts and involve meaningful tasks. In the past, simulations were possible only at great expense, involving many hours of development time. A number of Web 2.0 sites have begun offering 'mashups' of multimedia information which bring learning simulations within reach of most teachers. For example, wayfarer and wikipedia combine satellite imagery with customizable annotations, effectively empowering both student and teacher to become earth explorers, and to share their discoveries with others. Similarly, podcasts and multimedia repositories such as slideshare (slideshare.net), youtube (youtube.com) and Democracy TV (getdemocracy.com) have revolutionized the availability of documentary footage, amateur recordings, film archives and animated content, which can be easily integrated within a student's online project. An archeology class can take a simulated trip around an excavation site, complete with scanned photographs and written annotations of the historical features. Personal publishing is also enabling new genres of

inquiry-based learning, by joining within a single medium the once disconnected tasks of sourcing, publishing and sharing content. Webquests are an example of this approach which involve students in authentic online assignments. For example students might be required to choose a relevant news article, a novel, or global issue, and then produce an oral or online (multimedia) product to summarize their online findings. E-learning 2.0 technologies extend such activities in new directions, but it falls on teachers to ensure that students are empowered to think critically, reflect and evaluate what they discover online.

Thoughtful reflection

Critical reflection is an essential part of learning. Reflective exercises help students to arrive at (sometimes life-changing) understandings, through a process of evaluating different perspectives and appropriating these into personal understandings. In part this is an internal conversation, which might for example require the learner to examine and justify their position in relation to dominant cultural beliefs. Thoughtful reflection is augmented when one's opinions are tested and exposed to the views of others (Laurillard, 2002). Online publishing is an excellent vehicle for reflective practice. Students can publicly express and reflect on their opinions while remaining relatively anonymous. These opinions may in turn elicit reader comments and require students to reexamine their views in light of the alternative perspectives they encounter. Creative expression is therefore in part a reflective practice facilitated through online communications.

Collaboration with peers

Effective learning environments are social spaces where learners can share their discoveries and debate concepts with peers. This suggests that students be empowered to act within and contribute to peer networks modelled as communities of inquiry. Web 2.0 tools offer much to the contemporary classroom. Social spaces can be created from online social networks such as wikis, where students can create and edit each other's content. Online communities can take the place of the classroom (distance education), extend on the classroom (blended learning) or transform the classroom into a community of inquiry extending into the wider community. Students can communicate with their peers and initiate exchanges with specialists in communities far from their classroom. Social bookmarking sites and collaborative composition tools provide students with new opportunities learn about the social production of meaning, to 'pool knowledge', 'negotiate across cultural differences' and 'reconcile conflict'… 'to form a coherent picture of the world around them' (Jenkins, 2006, p20). In so doing, they learn that contributions to a community of practice can produce a collective intelligence which is empowering both to the individual and the group.

CONCLUSION

Web 2.0 technologies give rise to new social environments which promise new possibilities for social constructivist pedagogies in blended, distance and open learning. The e-learning 2.0 movement is concerned with harnessing these tools to create learner-empowered environments which engage students in collaborative and meaning-making activities through the utility of these powerful tools (Downes, 2005). Evidence suggests that undergraduate students are rapidly adopting these tools in their private lives, to connect with friends, to build social networks and contribute to wider internet communities (Gloor, 2006; Madden & Fox, 2006). Rapid growth of these social networks is empowering a new generation of media-makers who use online tools to filter and manage content, publish photos, videos and written compositions, and rapidly communicate this information with their peers.

The pervasiveness of new online youth cultures is such that some commentators are suggesting they embody pedagogies in their own right, where students learn from their peers the technical skills and social values needed to participate effectively in the online world (Kahn & Kellner, 2005). According to this view, students are already emancipated as 'digital natives', and our intervention as teachers should be merely to 'inoculate [them] against the effects of media addiction and manipulation' (Kellner, 2002 p95). However, as Jenkins (2006, p12) points out, 'we do not need to protect them so much as engage them in critical dialogues' so they learn to read, analyse, and decode the sub-texts of the new media. After all, these are the media literacy skills par excellence which are necessary for them to be empowered as producers rather than passive consumers of

digital culture. Engaged as critical and reflective agents of learning, students might emerge from our schools and universities as makers of meaning, replete with the technical and collaborative skills that are highly valued in the modern workplace (Livingstone, 2003).

The questions remains: How do we develop effective e-learning 2.0 environments which inculcate new media literacy skills in our students, and build collaborative spaces which advance social constructivist pedagogies? In considering this challenge, we must acknowledge that our successes to date have been constrained by Learning Management Systems (LMS). These are legacy systems of the web 1.0 era, principally used by students to download lectures and exercises, to store student results and to make the teacher's job of managing these operations easier. Far from enhancing learning, they position the student at the end of the chain, as consumers of curriculum. On balance, perhaps only the discussion board has saved students from an otherwise monotonous online learning experience. This rather unsatisfactory situation was confirmed in the OECD (2005) report which found that whilst e-learning had improved administrative processes in Europe's universities, it had done so without the accompanying pedagogic change needed to advance learning. Dalsgaard (2006), who also sites this report, asks whether the LMS is the most suitable online environment for engaging students and instead suggests we take seriously the opportunities afforded by new developments in 'social software'.

Should we decide take up this challenge, three broad approaches might help us integrate Web 2.0 into university and school environments. First, we can wait for our institutional LMS packages to evolve into the e-learning 2.0 space. Leading LMS packages such as Blackboard, WebCT and Moodle are treating the challenge from Web 2.0 seriously, and are gradually incorporating blogs and wikis into their software suites. To date these are fairly crude implementations however, and do not match the functionality or social experience offered by dedicated Web 2.0 tools. We therefore turn to a second approach which is to dispense with the LMS and allow students the freedom to create 'personal learning environments' for themselves. Teachers who have experimented with this approach might for example, provide students with several tools which support different styles of learning or allow students to select their preferred tools from among those already used in their everyday lives. This approach firmly locates the student at the centre of learning activity, an affirmation of the empowered learner. The third approach, might be considered a middle ground option: to use the LMS as a central hub from which externally hosted e-learning 2.0 tools can be selected and linked by students. This middle ground option extends on the infrastructure already provided by universities and schools and has the advantage of being easy to implement.

Educators will undoubtedly continue to experiment and build new learning environments for their students. To be successful however, in a social constructivist sense, students must be invested with a degree of environmental control to accommodate their individual learning preferences. Technical and social innovation must therefore be accompanied by significant change in teaching practice. In particular, responsibility for learning and the learning environment needs to shared by teacher and students. E-learning 2.0 and the ever expanding array of Web 2.0 tools offer exciting new possibilities for teachers and students to collaboratively build these social constructivist learning environments. In so doing, we empower students to realize their potential within vibrant online communities which, not coincidentally, also constitute the learning culture of our digital world.

REFERENCES

Alexander, B. (2006) Web 2.0: A New Wave of Innovation for Teaching and Learning?, EDUCAUSE Review, 41 (2), March/April, pp 32–44.

Anderson, C. (2004) The Long Tail, Wired Magazine. Available online at: http://www.wired.com/wired/archive/12.10/tail_pr.html

BBC News (2004) 'Blog' picked as word of the year, Wednesday, 1 December. Available online at: http://news.bbc.co.uk/2/hi/technology/4059291.stm

Dalsgaard, C. (2006) Social software: E-learning beyond learning management systems, European Journal of Open, Distance and E-Learning, July (2). Available online at: http://www.eurodl.org/materials/contrib/2006/Christian_Dalsgaard.htm

Downes, S. (2005) E-learning 2.0, eLearn Magazine, 10/17/05. Available online at: http://www.elearnmag.org/subpage.cfm?section=articles&article=29-1

Duhon-Haynes, G. (1996) Student Empowerment: Definition, Implications, and Strategies for Implementation, Paper presented at the Third World Symposium (Grambling, Louisiana, March 12). Available online at:
<http://eric.ed.gov/ERICDocs/data/ericdocs2/content_storage_01/0000000b/80/26/c8/45.pdf

Giles, J. (2005) Special Report: Internet encyclopaedias go head to head, Nature, 438, 15 December, pp. 900-901. Available online at: http://www.nature.com/nature/journal/v438/n7070/full/438900a.html

Gloor, P. (2006) Innovation through collaboration, Elearning!, Spring, pp 17-21

Goodyear, P. (2004). Patterns, pattern languages and educational design. In R. Atkinson, C. McBeath, D. Jonas-Dwyer & R. Phillips (Eds), Beyond the comfort zone: Proceedings of the 21st ASCILITE Conference (pp. 339-347). Perth, 5-8 December. Available online at:
<http://www.ascilite.org.au/conferences/perth04/procs/goodyear.html>

Hinchcliffe, D. (2006) The state of Web 2.0, Web Services Journal, April. Available online at: http://web2.wsj2.com/the_state_of_web_20.htm

Jenkins, H. (2006) Confronting the Challenges of Participatory Culture: Media Education for the 21st Century, An occasional paper on digital media and learning, The MacArthur Foundation, Chicago. Available online at: http://www.digitallearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS_WHITE_PAPER.PDF

Jonassen, D. (1994). Thinking Technology: Towards a Constructivist Design Model, Educational Technology, (April, 1994), 34-37.

Kahn, R. and Kellner, D. (2005) Reconstructing Technoliteracy: A Multiple Literacies Approach. Available online at: http://www.gseis.ucla.edu/faculty/kellner/essays/technoliteracy.pdf

Kellner, D. 2002. New Media and New Literacies: Reconstructing Education for the New Millennium in Lievrouw, L., and Livingstone, S. (eds) The Handbook of New Media, SAGE Publications, London, pp. 90-104.

Laurillard, D. (2002). Rethinking University Teaching. A conversational framework for the effective use of learning technologies. Routledge, London.

Lenhart, A. Madden, M. & Hitlin, P. (2005) Teens and Technology: Youth are Leading the Transition to a Fully Wired and Mobile Nation, PEW INTERNET, July 27. Available online at: http://www.pewinternet.org/pdfs/PIP_Teens_Tech_July2005web.pdf

Livingstone, S. (2003). The Changing Nature and Uses of Media Literacy. Working paper. London School of Economics. Available online at
http://www.lse.ac.uk/collections/media@lse/mediaWorkingPapers/ewpNumber4.htm

MacManus, R. & Porter, J. (2005) Web 2.0 for Designers, Digital Web Magazine, May. Available online at: http://www.digital-web.com/articles/web_2_for_designers/

Madden, M. & Fox, S. (2006) Riding the Waves of 'Web 2.0': More than a buzzword, but still not easily defined, PEW INTERNET, October 5. Available at http://www.pewinternet.org/pdfs/PIP_Web_2.0.pdf

Nelson, M. (2006) Lessons from the Real World, Presentation at the TERENA Conference, Catania, Italy, 15-18 May. Available online at: http://www.terena.nl/events/tnc2006/programme/presentations/show.php?pres_id=176

OECD (2005). E-learning in Tertiary Education: Where do we stand? Available online at: http://www.oecd.org/document/56/0,2340,en_2649_37455_34900984_1_1_1_37455,00.html

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

Page, N. & Czuba, C. (1999) Empowerment: What Is It?, Journal of Extension, 37 (5). Available online at: http://www.joe.org/joe/1999october/comm1.html

Papert, S. (1993) Mindstorms: Children, Computers, and Powerful Ideas, 2nd edition, Basic Books, New York.

Piaget, J. (2000). Commentary on Vygotsky, New Ideas in Psychology, 18, 241-59.

Prensky, M. (2001). Digital natives, digital immigrants, On the Horizon. NCB University Press, 9 (5). Available online at: http://www.marcprensky.com/writing/Prensky%20-%20Digital%20Natives,%20Digital%20Immigrants%20-%20Part1.pdf

Shuell, T. (1992) Designing instructional computing systems for meaningful learning, in Jones, M. & Winne, P. (eds). Adaptive Learning Environments, Springer Verlag, New York.

Sifri, D. (2006) State of the Blogosphere, April 2006 Part 2: On Language and Tagging, Technorati Weblog. Posted on May 1. Available online at: http://technorati.com/weblog/2006/05/100.html

Vygotsky, L. (1992) Educational Psychology. Originally published 1926. Translated by Robert Silverman. St. Lucie Press, Florida.

Wikipedia (2006) History of 'Wikipedia'. Available online at: http://en.wikipedia.org/wiki/Wikipedia