Ubiquitous Transformations

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Abstract

Internet-based trends that emphasize contribution, conversation, participation, and community exercise a significant impact on learning. They bring changes in where we find information, who we learn from, how learning progresses, and how we contribute to our learning and the learning of others. While much attention is given to the unlimited possibilities for retrieving from online sources, little addresses the limits to such sources or the work that devolves to the learner for critical evaluation of retrieved information. This paper highlights the invisible work of networked learning; raises the need for not only critical media literacy, but also critical retrieval and retrieval technology literacy; and articulates the transformations in roles and relations that accompany networked, ubiquitous learning.

Keywords

Ubiquitous learning, web 2.0, unanticipated consequences, critical media literacy

Transformations in Learning

Learning, in its many forms, from the classroom to independent study, is being transformed by new practices emerging around Internet use. Conversation, participation and community have become watchwords for the processes of learning promised by the Internet and new forms of communications media. Early discussion of the Internet extolled its transformative potential for democracy, perhaps best demonstrated by the US presidential nomination campaign around Howard Dean in 2000 and by contemporary political blogging. This kind of inclusive, participatory action has now spread to many aspects of daily life, often brought together under the label *Web 2.0* (O'Reilly, 2005). It is demonstrated in cooperative conversations and contribution in listservs and discussion groups, recommender systems (Resnick & Varian, 1997), cooperative classification systems (folksonomies; Mathes, 2004), wiki-based encyclopaedia (Wikipedia) and dictionaries (Wiktionary), and citizen journalism in blogs and photoblogs. These new media lay the foundation for radical transformations in who learns from whom, where, under what circumstances, and for what and whose purpose. In short, they indicate a transformation to *ubiquitous learning* – a continuous anytime, anywhere, anyone contribution and retrieval of learning materials on and through the Internet and its technologies, communities, niches and social spaces.

These trends exercise a significant impact on learning practices. They bring changes in where we find information, who we learn from, how learning progresses, and how we contribute to our learning and the learning of others. These transformations are captured in ideas of networked learning (Steeples & Jones, 2002), connectivism (Siemens, 2004), collaborative learning (CSCL; Koschmann, 1996; Miyake, 2007), community-embedded learners (Kazmer, 2005), braided learning (Preston, in press; C. Jenkins, 2004), online learning communities (Jorbring & Saljo, in press), and where 'e-learning' signifies a transformation in learning rather than a transition from off- to on-line (Andrews & Haythornthwaite, 2007).

While these transformations are thrilling, no action is without its reaction. Transformations that do not fit easily with utopian visions accompany distributed practices, including outsourcing, offshoring, disintermediation, and networked individualism (Wellman, 2002), each of which entails a general redistribution of processes and responsibilities to individuals. An autonomous learner is responsible for, and in many cases alone in creating their own learning context and content as they search the internet for materials to support their needs. Although writers such as Jenkins extol the virtues of students learning to

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engage in "collective intelligence" in a "community that knows everything and individuals who know how to tap the community to acquire knowledge on a just-in-time basis" (p. 42), such an ideal overstates the knowledge that may be present in such communities, the imbalance in who does the work and who benefits, and the actualities of altruistic contribution necessary to maintain critical mass and sustain working knowledge communities. It understates the work needed to identify and sustain useful and usable resources, and ignores the efforts and techniques embodied in certain roles and practices, now swept away as every individual is his or her own teacher, journalist, librarian, writer, and publisher.

Of concern in this hype is how little addresses the limits to online sources, the invisible work (Star & Strauss, 1999) of critical evaluation of retrieved information, and hidden issues of technology use. While passing reference is made to the use of traditional information gatekeepers – professional editors and librarians – little is mentioned of the work that devolves to the user when such gatekeepers are absent. Instead, educational rhetoric focuses on critical media literacy for individuals. Vetting sources, sorting fact from fiction, and distinguishing commentary from original data falls to individuals, or, as increasingly seems the case, to hidden algorithms owned by search engine companies. While academics lament students' reluctance to examine print resources, how many among us turn to pull a dictionary from the shelf when our hands are on the keyboard? Convenience heavily outweighs accuracy as a reason for using the Internet for obtaining information. The Pew Internet project (Horrigan, 2006) reports that 71% of the adult population surveyed turn to the Internet for science information because of its convenience, and only 13% because they feel it is more accurate. The report also confirms that the work of verifying resources has fallen to the user: 80% of these adults do some sort of "fact-checking" of this science information, checking another online source (62%), an offline source (54%), and/or the original report (54%).

A hidden issue exists in the routes taken to find information. Figures indicate that one search engine – Google – dominates as the retrieval mechanism for information on the web. In July 2007, Google was used for 50-65% of all searches in the U.S., followed by Yahoo (20-27%), MSN (8-10%), and Ask (3-5%)(Burn, 2007). In February 2007, Google dominated globally as the search engine most used (77%; Jarboe, 2007). What is missed by searching using only one or two algorithms for retrieval? Our information practices are becoming fixed not just around what information is or is not online, but also around the common source(s) we use to locate such resources. This is brought home in the statistics about the use of Wikipedia, which receives 24% of the traffic relating to education and reference, followed far behind by Yahoo! Answers, Dictionary.com, and Answers.com (3-5%), and SparkNotes, Google Scholar, Google Book Search, Find Articles and the U.S. National Library of Medicine (1-2%; Rainie & Trancer, 2007).

Finally, in the rush to grapple with retrieval, where is the effort to understand the dynamics and importance of contribution? What is the meaning of participation in an age of wiki wars, information saboteurs, and information vandals? (Kleeman, 2007). Where do we teach, encourage, and model participatory practices in a way that promotes useful and usable online information? New social skills, or perhaps older ones now transformed online, become essential for a workable online future. Individual retrieval becomes collaborative participation, as Jenkins (2006, p. 20) states: "the new media literacies should be seen as social skills, as ways of interacting within a larger community, and not simply an individualized skill to be used for personal expression." 'Information' is too often treated as a static, one-off, unchanging token, like a piece in a treasure hunt. In the rhetoric of online information, little is discussed of the kinds of information held in the accumulated social history of discussion and negotiated practices in an online forum. Ideas of easy access become far more problematic than simple availability when the knowledge to be retrieved entails practices, argumentation, and evolution instead of simple retrieval of data bits. Indeed, such knowledge bases resemble more the already familiar communities of practice (Wenger, 1988) and educational disciplines that an open encyclopaedia.

Further, in this ideal of training all to participate online in an equal, democratic manner, little attention has been given to likely changes in distributions. Discussions that extols the open web as a limitless source of all information ignore the potential and reality of knowledge enclaves. These may be seen positively as think-tank retreats, with entry by invitation only, permitting the selected elite to work unharassed by novices and random visitors. Or, they may be seen negatively as gated communities,

segregated from outside influence or input, carrying on in private, creating internally-constructed views of reality.

Such trends and concerns, both pro and con, are already affecting learning practices. One trajectory entails first bypassing and then obsolescence of professional teaching and information roles, leaving individuals increasingly to create and enact their own learning and learning content. However, an alternative is a rejuggling of roles that addresses the needs of a learning in a participatory culture, i.e., the creation of new networks for learning. The remainder of this paper examines changes in network relationships among learning participants emerging from and required for learning in a participatory age.

New Learning Networks

New technologies forge new roles and new relations for participants. This is highly evident in education in the way online spaces are transforming educational and authoritative practice. Emergent trends that affect educational settings include changes in: authorial relationships with leaders, instructors and documentary sources; peer relationships with other learners, both contemporary and past; and relationships with local communities and networks. The following sections examine these transformative trends in roles and relations.

Change in Relationship with Leaders and Concurrent Learners

What is expertise in the age of participatory learning, and whose definition is it anyway? In an age of participatory culture, and participatory learning, what are the roles of learners and teachers? What are the practices required of each?

Perhaps the greatest fear among those who have spent years achieving teaching certification, doctorates and tenure is that they will be obsolete or unimportant in the classroom. Similarly, information professionals, who have done the work of collecting, classifying and establishing retrieval mechanisms for information feel bypassed as students and readers move to unvetted online sources and search engines. What value does expertise have if learners are only learning from each other, if everyone can get the information on the web? The latter concern is another overstated one: textbooks have been available for less than the cost of a PC for a long time, so why the worry about online resources? A greater worry should be that learners will think the experts unnecessary, turning to online forums, blogs and communally-defined encyclopaedia for what they need. For example, why grapple with library collections when user-generated tagging in social bookmarking systems such as CiteULike, Connotea, or del.icio.us produces folk taxonomies that may better reflect contemporary organization of information (folksonomies; Mathes, 2004) – and which are at our fingertips. So, too, why grapple with university degrees and diplomas if learning can be achieved through online communities. To some extent the major job of the 21st century may be selling a university education in the age of digital competition – and not just competition from online universities, but also from user-generated learning communities. True, the certification of a degree from a particular university may still matter, but we have to ask 'to whom will it matter?' (see also, Pittinsky, 2003; Levine, 2003).

One result of the last 10 or more years of online learning has been the evolution and re-negotiation of what is required of teachers and learners, and thus of where authority lies. For example, where bulletin board contributions replace classroom participation, as they do in online learning courses, equal and sustained student participation becomes vital to a successful class. The role of students changes; they take on being more responsive to each others' questions and needs, changing their role and that of the teacher. It is common to speak of the teacher as 'sage on the stage' being replaced by the facilitating 'guide on the side'. Less often is it acknowledged that the student as 'empty vessel' is being replaced by a 'learner-leader' (Montague, 2006), who contributes to their own learning and the learning of others in the community.

Participatory learning entails instructors ceding leadership and control of learning, giving it over to participants, and encouraging a new form of co-learning pedagogy. Learning practices change from models of transfer of knowledge from one to many (e.g., instructor to students), to exchange of knowledge among many (students to students); and from transfer from expert(s) to novice(s) to

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collaborative, peer-to-peer learning and discovery. In this new paradigm, novices help each other make sense of the information they are receiving. They create explanations of phenomena that fit their local setting, re-supplying context that is often lost in de-contexualized learning, and feeding that information back into the learning environment (Kazmer, 2005; Montague, 2006). Where appropriate, participants come to shared definition of meanings through collaborative, conversational interaction. Such emergent learning practices reinforce ideas from collaborative learning theories (Bruffee, 1993; Koschmann, 1996; Miyake, 2007; Haythornthwaite, Bruce, Andrews, Kazmer, Montague, Preston, 2007), and also model what others have described as the learning behaviour of experts (Bransford, Brown & Cocking, 1999; Scardamalia & Bereiter, 1996).

Changes also occur in the authority of the physical space with the entry of computerized personal space into the public space. While some view laptops in the classroom as threats to engagement because students can continue to participate in out-of-room communities (e.g., via social software, email), others adopt strategies for co-opting and integrating the use of laptops into daily practice, e.g., disseminating lecture materials to laptops for enhanced note-taking, or involving students in class in searching or other online exercises.

Of course, one of the questions arising from all this participation from newbies and non-experts is whether it is creating a nation of citizens or a "nation of ankle-biters":

> I celebrate the liberating tools that let people post their thoughts unfiltered. But as with many other utopian predictions about how the open nature of the Net will create arenas that transcend foibles of the physical world, our faults have followed us to cyberspace. We were promised a society of philosophers. But the Blogosphere is looking more and more like a nation of ankle-biters. (Levy, 2004, np).

Levy's frustration with bloggers is easily mirrored in experiences of listserv and online class participation. Murphy & Collins (1997) have noted the need to manage online discussion in classes so students engaged appropriately. However, this early attention focused on inhibiting inappropriate and off-topic behaviour. Now, the focus is on how to increase participation in online classes, trying to compensate for the reduced cues of the online environment on the way to creating online learning communities (Barab, Kling & Gray, 2004; Jorbring & Saljo, in press; Renninger & Shumar, 2002; Swan, 2006).

But generalized participation has its limits. In forums open to anyone, current learners may tolerate questions about the basics, but when novices mix in forums for experts, they are likely to be told to read the FAQ, search the archive, or search the web. The mix of levels of expertise in a forum, listserv or participatory space, requires tolerance of continuous reinvention of the wheel. Such multi-level interaction suggests a limit to the utility of a single forum, leading to factions and splinter groups (for a negative connotation), or to specialty groups (for a positive connotation). Prime movers may themselves move out as their spaces become inhabited by newcomers, or by intolerably disruptive behaviours. Unbridled participation without attention to group and space norms will have fallout. We can expect to see more gated learning communities and moderated lists arising as the tragedy of the commons strikes repeatedly in cyberspace.

Change in Relationship with Past Learners

How will the persistent record left by so much participation be used?

Online conversations and postings in listservs, bulletin boards, web pages, blogs, wikis, leave an accessible record that can be reviewed and revisited. Such persistent records can leave earlier learners still present in an online conversation long after they have left the community. Historical records in archives and FAQs hold evidence of decisions, discussion and community practice. Joining a community may now entail negotiating both current and historical discussion, all preserved in a digital form.

Although written records have persisted in the past, the more complete records of conversation, and easy search and retrieval make their impact all the greater. Searching now often turns up essays written for

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classes, syllabi of courses, discussions on listservs. Although not generally made public, whole course conduct is saved in iterations of online classes. What use will be made of these various persistent records?

Persistence in the data record also allows for near-term use. How will transaction records be used to enhance, monitor, or assess online interaction in learning settings? Hyperlink analyses already examine interconnections among ideas (e.g., in the areas of webometrics, Thelwall & Vaughn, 2004; and hyperlink network analysis, Park, 2003). Efforts in data mining are just now beginning to enter the learning area. Although not yet used extensively, it can easily be imagined that it will not be long before at least some basic statistics from such applications will be integrated with learning management systems (Minaei-Bidgoli, Kortemeyer, Punch, 2004; Haythornthwaite & Gruzd, 2007)

Change in Relationship with Documents

What's in a name? What is the worth of a publisher's or journal name in the age of wikipedia?

As more and more information goes online, the effort to establish what is correct, truthful, balanced, and worth paying attention to is increasingly falling to users. Although this may seem to have been the case in choosing what to read in the past, the number of books on a topic, or journals of good repute are far more limited than the potential of postings to the web. Yet, the web is at our fingertips, and at the fingertips of learners. Already students influence instructors to choose readings that are online rather than those that entail a trip to the library. Hence, the relationship with documents changes in subtle ways that need to be examined in depth. Key issues involve trustworthiness of sources, mutability of online resources (e.g., in wikis or on web pages), authorship (e.g., is this "R. Smith" that same as any other "R. Smith" posting, an issue long dealt with for books), conversation as textual sources (e.g., taking evidence from blog postings), disappearance of sources (e.g., when web sites are no longer owned or maintained, when sites move), text as conversation (wikis), conversation as text (bulletin boards, listservs, email, blogs), and non-text documents as texts (video, multi-media texts). Again, there is an increased role for media literacy, i.e., critical evaluation and (de)construction of meaning for online contexts, and for adults as much, if not more so, than for school-age youth.

Change in Relationships with Local Communities and Networks

What does local mean when learning online? Who is in your community?

The meaning of local changes when learning and participating online. We still live in geographically-based communities with their own culture, where we meet face-to-face with friends, family and co-workers. But there are also the online communities where we engage with others around work or personal interests. Our online community may be highly local in the sense of personal, as we engage with friends and family online, or local in the sense of regional, as we engage with others about critical events in our locale. For example, during the UK foot-and-mouth disease (FMD) crisis, the Internet became a lifeline for exchanging information and support about dealing locally with the disease and its impact on the lives and livelihoods of farm neighbors (Hagar & Haythornthwaite, 2005). Our local may also become global, as the entire web-reading community gains access to our texts, or as distant others come to our support. Again, during the FMD crisis, farmers from New Zealand and Canada gave advice and support to UK farmers. In posting to the open web, what is personal becomes global, and in collaboration with others may also be multi-communal and multi-national.

As the web reaches worldwide, education via the web in increasingly becoming globalized. Different skills are emerging for teaching and learning on a global scale for a global practice, including how to teach and learn in multi-time zone, multi-institutional, and multi-cultural settings. Asynchronous learning helps with crossing time zones, but local social practices still need to be developed to manage expectations for time-distributed conversations and learning communities. Multi-institutional alliances are developing that provide opportunity for thinly distributed specialists to share expertise and learn from each other. For example, the World Universities Network (www.wun.ac.uk) supports distributed seminars facilitated through high-end videoconferencing on Grid technology, and the Web-based Information Science Education (WISE) program shares seats in online library and information science classes across participating institutions (http://www.wiseeducation.org/).

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Through such programs, online skills, knowledge, and practices spread along different geographies than offline learning. Kazmer (2005, 2007) describes how online learners form important learning relationships with both their local-online fellow students and their local offline work mates and community members. Online learning is simultaneously embedded in the geographically-based community, providing an opportunity for learners to engage locally and to share experiences globally, and in the virtual community, providing subject and career-related participation.

With all the emphasis on participation and engagement online, and with taking classes anywhere, anytime, the simultaneous demands of the local context and multiple social worlds remain an invisible part of learning contexts. Discussion of online learning overwhelmingly concentrates on the world of the class, but online learners are simultaneously juggling commitment in their home and work worlds, often adding a learning as a 'third shift' (Kramarae, 2001), and making physical and social arrangement at home to partition learning from these other social worlds (Kazmer & Haythornthwaite, 2001; Haythornthwaite & Kazmer, 2004). Overall this raises the question of what kinds of boundaries will we need to recreate in our local worlds to reinvent those formally defined physically but now needing to be enacted socially? And, as email, cell phones, and mobile computing increasingly engage us in anywhere, anytime, anyone communication, how will we partition time and attention in our cyber-worlds as messages about work, home, or learning reach us at anytime of day or night in any one of those local physical settings?

Conclusion

This paper has briefly addressed some transformations in learning roles and relationships emerging from social and technical practices around networked learning. These transformations include less regulated information content and retrieval, changing roles in who leads and who follows as authorities and consumers or learners, and a greater role for the individual in information management, contribution, and participatory citizenship. Transformations are also occurring in who learns from whom, and where we learn and engage with others. Online learning not only creates new virtual networks, but also new relationships with local communities. Both visible and invisible consequences accompany the participatory transformations heralded by networked learning and web 2.0 trends. Along with the attention to increasing media skills and participation, there is a need for critical retrieval literacy that goes beyond evaluation of sources to assess representation of content from across societal sectors, critical technology evaluation that addresses the classification systems hidden in search engines, and an understanding of how community networks are being created and sustained via the web in relation to offline networks and information ecologies.

References

Barab, S. A., Kling, R. & Gray, J. H. (Eds.) (2004). *Designing for virtual communities in the service of learning*. NY: Cambridge University Press.

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.) (1999). *How People Learn: Brain, Mind, Experience, and School*. National Academy Press: Washington, DC.

Bruffee, K. A. (1993). *Collaborative learning: Higher education, interdependence, and the authority of knowledge*. Baltimore: John Hopkins University Press.

Burn, E. (May 31, 2007). *U.S. Search Engine Rankings, April 2007*. ClickZ Stats. Retrieved July 5, 2007 from: http://www.clickz.com/showPage.html?page=3626020.

Hagar, C. & Haythornthwaite, C. (2005). Crisis, farming & community. *Journal of Community Informatics*, *1*(3). Available online at: http://ci-journal.net/viewarticle.php?id=89&layout=html

Haythornthwaite, C. & Gruzd, A. (June, 2007). A noun phrase analysis tool for mining online community. *Proceedings of the 3rd International Communities and Technologies Conference*.

Haythornthwaite, C. & Kazmer, M.M. (Eds.) (2004). *Learning, culture and community in online education: Research and practice*. NY: Peter Lang.

Haythornthwaite, C., Bruce, B. C., Andrews, R., Kazmer, M. M., Montague, R. & Preston, C. (2007). New theories and models of and for online learning. *First Monday, 12(8).* http://firstmonday.org/issues/issue12_8/haythorn/index.html

Horrigan, J. B. (2006). *The Internet as a resource for news and information about science*. Pew Internet and American Life Project. Retrieved July 5, 2007 from: http://www.pewinternet.org/pdfs/PIP_Exploratorium_Science.pdf.

Jarboe, G. (Feb. 22, 2007). Stats show Google dominates the international search landscape. ClickZ Stats. Retrieved July 5, 2007 from: http://searchenginewatch.com/showPage.html?page=3625072

Jenkins, C. (2004). The virtual classroom as ludic space. In C. Haythornthwaite & M. M. Kazmer (Eds.). *Learning, culture and community in online education: Research and practice* (pp. 229-242). NY: Peter Lang.

Jenkins, H., with Clinton, K., Purushotma, R. Robinson, A. J., & Weigel, M. (2006). *Confronting the challenges of participatory culture: Media education for the 21st century*. Chicago, IL: MacArthur Foundation.

Jorbring, O. & Saljo, R. (in press). Learning communities. *International Journal of Web Based Communities*, whole issue.

Kazmer, M. M. (2005). Community-embedded learning. *Library Quarterly, 75*(2), 190-212.

Kazmer, M. M. (2007). Community-embedded learning. In R. Andrews and C. Haythornthwaite (Eds.), *Handbook of E-learning Research* (pp. 311-327). London: Sage.

Kazmer, M.M. & Haythornthwaite, C., Juggling multiple social worlds: Distance students on and offline. *American Behavioural Scientist, 45*(3), 510-529.

Kleeman, J. (Mar. 25, 2007). Wiki wars. *The Observer. Guardian Unlimited*. Retrieved July 5, 2007 from: http://technology.guardian.co.uk/news/story/0,,2042368,00.html

Koschmann, T. (Ed.)(1996) *CSCL: Theory and practice of an emerging paradigm*. Mahwah, NJ: Lawrence Erlbaum.

Kramarae, C. (2001). *The third shift: Women learning online*. Washington, DC: American Association of University Women.

Levine, A. (2003). Higher education: A revolution externally, evolution internally. In M.S. Pittinsky (ed.), *Wired tower: Perspectives on the impact of the internet on higher education* (pp. 13-39). Upper Saddle River, NJ: Prentice Hall.

Levy, S. (Oct. 4, 2004). Memo to bloggers: Heal thyselves. *Newsweek*. Retrieved May 17, 2007 from http://www.msnbc.msn.com/id/6098633/site/newsweek.

Mathes, A. (2004). *Folksonomies - Cooperative classification and communication through shared metadata.* Retrieved, July 9, 2007 from: http://www.adammathes.com/academic/computer-mediated-communication/folksonomies.html

Minaei-Bidgoli, B., Kortemeyer, G., Punch, W.F. (Aug., 2004). *Enhancing online learning performance: An application of data mining methods*. The 7th IASTED International Conference on Computers and Advanced Technology in Education (CATE 2004). Kauai, Hawaii. Retrieved May 21, 2007 from http://www.lon-capa.org/papers/Behrouz_CATE2004.pdf.

Miyake, N. (2007). Computer supported collaborative learning. In R. Andrews & C. Haythornthwaite (Eds.), *Handbook of E-learning Research* (pp. 263-280). London: Sage.

Montague, R-A. (2006). *Riding the waves: A Case study of learners and leaders in library and information science education.* Unpublished Ph.D. dissertation, University of Illinois at Urbana-Champaign, Champaign, IL.

Murphy, K. L., & Collins, M. P. (1997). Communication conventions in instructional electronic chats. *First Monday, 2*(1). Available online at: http://www.firstmonday.dk/issues/isssue2_11/murphy/index.html

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

Park, H. W. (2003). What is hyperlink network analysis?: A new method for the study of social structure on the web. *Connections*, *25*(1), 49-61.

Pittinsky, M. S. (2003). *Wired tower: Perspectives on the impact of the internet on higher education*. Upper Saddle River, NJ: Prentice Hall.

Preston, C. (in press). Braided learning: An emerging practice observed in e-communities of practice. *International Journal of Web Based Communities*.

Rainie, L. & Trancer, B. (2007). *Wikipedia users, data memo*. Retrieved July 5, 2007 from: http://www.pewinternet.org/pdfs/PIP_Wikipedia07.pdf

Renninger, A. & Shumar, W. (Eds.) (2002). *Building virtual communities: Learning and change in cyberspace*. Cambridge, UK: Cambridge University Press.

Resnick, P. & Varian, H (1997). Recommender Systems. *Communications of the ACM,* 40(3), 56-58.

Scardamalia, M. & Bereiter, C. (1996). Computer support for knowledge-building communities. In T. Koschmann (Ed.) *CSCL: Theory and Practice of an Emerging Paradigm* (pp. 249-268). Mahwah, NJ: Lawrence Erlbaum.
Siemens, G. (Dec. 12, 2004). Connectivism: A learning theory for the digital age. Retrieved December 22, 2007 from: http://www.elearnspace.org/Articles/connectivism.htm
Star, S. L. & Strauss, A. (1999). Layers of silence, arenas of voice: The ecology of visible and invisible work. *CSCW, 8* (1-2), 9-30.
Steeples, C. & Jones, C. (2002). *Networked learning: Perspectives and issues*. London: Springer.
Swan, K. (2006). Collaboration Online. *Journal of Asynchronous Learning Networks*, *10*(1), whole issue. Available online at: http://www.sloan-c.org/publications/jaln/v10n1/index.asp
Thelwall, M. & Vaughn, L. (2004). Webometrics. *JASIST*, *55*(14), whole issue.
Wellman, B. (2001). The rise of networked individualism, In. L. Keeble (Ed.), *Community Networks Online* (pp. 17-42). London: Taylor & Francis.
Wenger, E. (1998). *Communities of practice : Learning, meaning, and identity*. Cambridge, UK: Cambridge University Press.