

## The Three P's of Pedagogy for the Networked Society: Personalization, Participation, and Productivity

Catherine McLoughlin  
*Australian Catholic University*

Mark J. W. Lee  
*Charles Sturt University*

Web 2.0 and its associated applications and tools have, in many areas, brought about and are continuing to bring about significant shifts in the way people communicate, create, and share information. Pervasive access to broadband Internet connectivity and communication services has created new forms of relationships and patterns of communicating and learning. The expanding lexicon of Web 2.0 applications (podcasts, web logs, wikis, mashups, etc.) signal changes in the learning landscape, where learners are active participants, creators of knowledge, and seekers of engaging, personal experiences. In what has been called a culture of participation, the line separating consumers and producers of content is becoming blurred and we are witnessing a new wave of "prosumers," very often learners, who are actively creating and sharing content and ideas. By adopting an innovative learning paradigm that the authors call Pedagogy 2.0, teaching and learning strategies can enable greater engagement of learners in shaping the education they receive through participatory choice, personal voice, and ultimately, "co-production."

### Student Perspectives

*For better or for worse, Web 2.0 is reshaping our intellectual, political, and commercial landscape.*  
(Keen, 2007, p. 185)

Along with these changes, tertiary student profiles indicate that most students now juggle work and study, are technology savvy, and use social networking tools as a central part of their academic and social lives (Windham, 2005). We are witnessing a blurring of the distinctions between learning, work, and play as mobile computing devices are omnipresent, and an "always-on" culture facilitated by broadband Internet capacity is a reality. The label "digital natives" (variously referred to as "Net-Geners," "Gen-Xers," and "millennials"), although now almost a cliché, describes the characteristics of a new generation of learners, capable of operating at "twitch speed" and able to multitask, imagine, and visualize while communicating in multiple modalities (Prensky, 2001). In their desire to collaborate with one another, to exercise creativity, and with this, to gain celebrity, today's learners are also seen to belong to "Generation C" (Trendwatching.com, 2005). While we must be wary about making assumptions and generalizations, and basing claims on anecdotal evidence (see Lohnes & Kinzer, 2007; Mather, 2007; Owen, 2004), student perspectives are now a well-researched aspect in higher education, and the messages are too frequent to be ignored (Alexander, 2006; Oblinger & Oblinger, 2005). As Conole and Creanor (2006) report, students "have high expectations of how they should learn, selecting the technologies and learning environments that best meet their needs with a sophisticated understanding of how to manipulate these to their advantage" (p. 11).

In this learning landscape, there is a need to rethink models for teaching and learning in order to replace outmoded "closed classroom" models, which place emphasis on the delivery of information by an instructor and/or from a textbook rather than being learner-centric. Clearly, many popular learning management systems (LMS's) used by educational institutions to support e-learning replicate these models, conforming to a "student-as-information consumer" model in their design, thereby reinforcing instructor- and curriculum-centered approaches to teaching, learning, and knowledge. As such, the authors believe that many LMS's, despite their attempts to incorporate purportedly "Web 2.0" features, are quickly becoming outdated in the Web 2.0 era. Tim Berners-Lee (2000), the inventor of the World Wide Web, foreshadowed a more open, active suite of tools that is not simply about passive downloading and consumption of information when he stated, "I have always imagined the information space as something to which everyone has immediate and intuitive access, and not just to browse, but to create" (p. 169).

In addition to the openness of Web 2.0, there is an "architecture of participation" (Barsky & Purdon, 2006; O'Reilly, 2005), which entails sharing of digital artifacts by groups, teams, and individuals, ensuring that the Web is responsive to users. It thrives on the concept of collective intelligence, or "wisdom of the crowds" (Surowiecki, 2004), which acknowledges that when working cooperatively and sharing ideas, communities can be significantly more productive than individuals working in isolation. For example, in *Wikipedia* (2007), users create and evaluate content for other users, resulting in a dynamic and ever-expanding repository of shareable, communal information.

What, then, are the implications of Web 2.0 for education? As Web 2.0 is participatory and collaborative, reflecting the way youth engage with technologies and connect with multiple social worlds, there is an increasing gap between the formalized interactions that occur in educational establishments and the modes of learning, socialization, and communication taking place in the everyday world. Siemens (2007b) states,

Our institutions need to change because of the increasing complexity of society and globalization. Schools and universities play a dual role: accommodating learner's method and mode of learning *and* transforming learners and preparing them to function in the world that is unfolding. (para. 6).

This globally connected world is characterized by constant social mobility and diversification of life trajectories, where individuals are expected to have multiple career paths and to engage in re-skilling at various stages. Available Internet connectivity, lifelong learning, and flexible working hours are drivers of learning on-demand (Punie & Cabrera, 2006). In such a digital world, powered by ubiquitous computing and demand-driven learning, there is a need to expand our vision of pedagogy so that learners become active participants and co-producers rather than passive consumers of content, and learning processes are participatory and social, supportive of personal life goals and needs. Part of the change needed is to recognize the potential of Web 2.0 to enable the transformation of pedagogy, design of learning tasks, and promotion of learner autonomy and creativity (Leadbeater, 2006).

#### Web 2.0: Affordances for Learning

While Web 2.0 does not involve radical changes in the technical specifications of the Web, most proponents of the concept describe it in terms of new possibilities and applications. O'Reilly (2005) believes that these new applications have emerged due to a changing socio-cultural context, giving rise to the perception of revolutionary new uses for the same technologies. Web 2.0-based social software tools such as weblogs (blogs), wikis, social networking sites, media sharing applications, and social bookmarking utilities are also pedagogical tools that stem from their affordances of sharing, communication, and information discovery. An affordance is an action that an individual can potentially perform in their environment by using a particular tool (Affordance, 2007; Gibson, 1977, 1979). In other words, an affordance is a "can do" statement that does not have to

be predefined by a particular functionality and refers to any application that enables a user to undertake tasks in his/her environment. For example, blogging entails typing and editing posts, which are not affordances, but which enable the affordances of idea sharing and interaction. Norman (1998) distinguishes between "real" affordances, which are affordances inherent in an object or latent in an environment, whether known or unknown to a user, and "perceived" affordances, which represent a more relational, rather than subjective or objective, concept. Perceived affordances are closely tied to the mental and perceptual capabilities of the user, and are ultimately what determines usability.

Similarly, in considering the educational affordances of Web 2.0, social software, and other ICT tools for learning, it is necessary to acknowledge that these affordances are ultimately dependent on the views and perceptions of users (learners). In other words, how learners perceive the possibilities of the tools and their "ideal" use(s) in the context of their learning may be markedly different to the ideas and intentions of the educators and educational technologists who design them. According to Kirschner (2002), educational affordances can be defined as the relationships between the properties of an educational intervention and the characteristics of the learner that enable certain kinds of learning to take place. It is imperative to acknowledge that technologies are intricately related to many other elements of the learning context (such as task design) that can shape the possibilities they offer to learners, how learners perceive those possibilities, and the extent to which learning outcomes can be realized.

In the words of Anderson (2004), "The greatest affordance of the Web for educational use is the profound and multifaceted increase in communication and interaction capability" (p. 42), which is even more evident in Web 2.0 when compared to the set of linked information sources that characterized "Web 1.0." The terms "co-creation" and "users add value" can be said to sum up the philosophy and ethos of Web 2.0, showing that it is not just an assembly of tools, software, and digital strategies but a set of concepts, practices, and attitudes that define its scope. This can be exemplified by contrasting two sites, *Encyclopædia Britannica Online* (2007) and *Wikipedia* (2007), the former maintained by a commercial organization and the latter by an open community. In Wikipedia, an example of community publishing, users can participate and create content, and in doing so become "prosumers" (both consumers and producers). This openness is the characteristic hallmark of Web 2.0, as it allows users to mix, amend, and recombine micro-content (Leene, 2005; Lindner, 2005), collaboratively and open to a global audience, inviting revision and commentary. The added dimension of scale means that the more people using the tools, the greater the network

effect – the combined efforts of hundreds of individuals in production of Wikipedia entries illustrates the power of the “wisdom of crowds.” In contrast, Encyclopædia Britannica has earned its reputation as an authoritative source of scholarly knowledge through its policies of tight control, editing, and regulation, and by allowing contributions only by a closed group of carefully selected experts. While this approach has obvious benefits in relation to the validity and reliability of information, a recent investigation by *Nature* (Giles, 2005) found Wikipedia and Encyclopaedia Britannica to be about as accurate as each other on science. Moreover, as stated by Berinstein (2006, “Apples and Oranges,” para. 2-3),

The inconvenient reality is that people and their products are messy, whether produced in a top-down or bottom-up manner. Almost every source includes errors ... People are becoming more aware of the perils of accepting information at face value. They have learned not to consult just one source. They know that authors and editors may be biased and/or harbor hidden agendas.

#### Social Software: ICT Tools that Enable Participation, Personalization, and Production of Content

As alluded to earlier, among Web 2.0 technologies are the socially-based tools and systems referred to collectively as social software, a term that has gained increased currency in recent years. The attributes of these new software tools make possible a new wave of online behavior, distributed collaboration, and social interaction, and they are already having a transformative effect on society in general and education in particular, triggering changes in how we communicate and learn. Researcher/theorist Meijas (2005, p. 1) observed that “social software can positively impact pedagogy by inculcating a desire to reconnect to the world as whole, not just the social part that exists online,” referring to the isolating and decontextualized experience of much text-based traditional education.

Meijas adopts a broad definition of social software that includes the categories listed in Table 1, which encompass both Web 1.0 and 2.0 technologies. For the purposes of the current discussion, the focus is on social software that enables participation, communication, personalization, and productivity (e.g. content creation), as these are elements of what it means to be educated in a networked age (Bryant, 2006). For example, one of the most basic social software tools, the blog, used to teach composition, reflective writing, and collaborative exploration, has been a resounding success in many schools and universities (Ganley, 2004; Richardson, 2006). With this rich and varied functionality in mind,

it is useful to consider the educational affordances and potential value adding of Web 2.0 applications for millennial learners. Table 1 depicts a range of social software tools and categories and their corresponding pedagogical applications. It is important to remember that these tools can be used in combination, and engage people through communication, co-production, and sharing. Customization, adaptation, and innovative use of these social software tools are not merely individual pursuits or interests; they are becoming core requirements of digital literacies and creativity in the Web 2.0 era (New Media Consortium, 2005).

Many current social software applications straddle the virtual and real social worlds, as they entail both online and offline interactions and visual/verbal connectivity. For example, Flickr and YouTube facilitate the sharing of photos and videos with both “real world” and “virtual” friends; social networking sites like MySpace, Facebook, Ning, and Friendster allow users to build an online identity by customizing their personal profiles with a range of multimedia elements, as well as interacting with existing contacts and establishing new relationships. Another social networking site, Stickam, additionally allows users to interact in real-time using their web cams and microphones. These new practices are being harnessed for knowledge sharing, development of ideas, and creative production, while allowing for personal sense making and reflection. (Specific examples are presented in Appendix A.)

The “new” pedagogy is therefore not a matter of simply offering learners the technologies they are likely to use in the knowledge economy – these, like the knowledge itself, are subject to rapid change. According to Beetham and Sharpe (2007), it involves engaging learners in apprenticeship for different kinds of knowledge practice, new processes of inquiry, dialogue, and connectivity. Practices underpinning effective, innovative pedagogy will differ depending on the subject area or professional discipline in which learners seek to become proficient but are likely to include some or all of the following:

- digital competencies that focus on creativity and performance;
- strategies for meta-learning, including learner-designed learning;
- inductive and creative modes of reasoning and problem-solving;
- learner-driven content creation and collaborative knowledge-building;
- horizontal (peer-to-peer) learning and contribution to communities of learning (e.g., through social tagging, collaborative editing, and peer review).

TABLE 1  
Types of Social Software

Social Software Category	Examples	Potential Pedagogical Applications
Multi-player online gaming environments / virtual worlds	Multi-User Dungeons (MUDs); Massively-Multiplayer Online Games (MMOGs – e.g., Second Life, Active Worlds, World of Warcraft, Everquest)	Simulation; role play; visualization; collaboration
Discourse facilitation systems	Synchronous: Instant messaging (IM, e.g., Windows Live Messenger, AOL Instant Messenger, Yahoo Instant Messenger, Google Chat, ICQ, Skype); chat Asynchronous: Email; bulletin boards; discussion boards; moderated commenting systems (e.g., K5, Slashdot, Plastic)	Communication (verbal and written); engagement with multiple global communities; socialization; tracking of information flow; peer-to-peer exchange and feedback
Content management systems	Blogs; wikis; document management systems (e.g., Plone); web annotation systems	Creation and dissemination of ideas; collaborative writing, publishing, and peer review
Peer-to-peer file sharing systems	BitTorrent; Gnutella; Napster; Limewire; Kazaa; Morpheus; eMule; iMesh	Sharing, review, and collaboration
Learning management systems	Blackboard/WebCT; ANGEL; Moodle; .LRN; Sakai; ATutor; Claroline; Dokeos	Communication, groupwork; distribution and sharing of resources
Relationship management systems	MySpace; Friendster; Facebook; Faceparty; Orkut; eHarmony; Bebo	Establishing and maintaining social contacts, connectivity; spaces for communication and creation of identity
Syndication systems	List-servs; RSS aggregators	Multi-modal access to information; maintaining links with new content; filtering and customized display of content
Distributed classification systems (“folksonomies”)	Social bookmarking sites (e.g., del.icio.us, Digg, Furl); many media sharing and social networking sites also make use of tag-based folksonomies to organize and classify content	Tagging/categorizing resources; maintaining sharable collections of resources; reuse of resources; development and joint exploration of common interests

*Note.* (adapted from Mejias, 2005, p. 3)

As further evidence of the emergence of the need for new pedagogies, the report *A Global Imperative* by the New Media Consortium (2005) places great emphasis on the development of 21st Century literacy as “a set of abilities and skills where aural, visual, and digital literacy overlap ... the ability to understand the power of images and sounds, to recognize and use that power to manipulate and transform digital media, to distribute them pervasively, and to easily adapt them to new forms” (p. 2). While this manifesto targets new forms of language and communication, there are distinct calls for a rethinking of pedagogy to meet the demands of an era where ubiquitous computing and social connectivity mediated by ICT is reshaping academia. For example, some theorists consider heutagogy, the concept of truly self-determined learning, to be the next stage in the evolution of andragogy (Hase & Kenyon, 2000), particularly given the current tertiary education climate in which the value of textbooks and other prescribed content is being questioned (Fink, 2005).

#### New Metaphors, Emerging Paradigms, and Innovative Theories for Teaching and Learning

Calls for change and innovation in pedagogy are representative of an emerging view of learning as knowledge creation (Paavola & Hakkarainen, 2005) and mirror the societal shift towards a knowledge age, in which creativity and originality are highly valued. Applying social software tools to teaching and learning compels us to reconsider how the affordances and interconnectedness offered by Web 2.0 impact on pedagogy and opens up the debate on how we conceptualize the dynamics of student learning. Sfard (1998) distinguishes between two metaphors of learning: the acquisition metaphor and the participation metaphor. The former represents a passive-receptive view according to which learning is mainly a process of acquiring chunks of information, while the latter perceives learning as a process of participating in various cultural practices and shared learning activities. In the participation metaphor, the focus is on the

process (i.e., on learning to learn) and not so much on the outcomes or products. According to this view, knowledge does not exist in individual minds but is a product of participation in cultural practices, and learning is embedded in multiple networks of distributed individuals engaging in a variety of social processes, including dialogue, modeling, and “legitimate peripheral participation” (Lave & Wenger, 1991). Learning occurs through sustained interaction and conversation with practitioners. Social networking practices also enable the creation of virtual communities, as well as the building of relationships and sharing of common interests and ideas within these communities. These social experiences are very often the foundation of learning.

To keep pace with the content creation processes enabled by Web 2.0 and social software tools, it appears to be necessary to go a step further and venture beyond the acquisition and participation dichotomy. Paavola and Hakkarainen (2005) propose the knowledge creation metaphor of learning, which builds on common elements of Carl Bereiter’s (2002) theory of knowledge building, Ikujiro Nonaka and Hirotaka Takeuchi’s (1995) model of knowledge creation, and Yrjö Engeström’s (1987, 1999) theory of expansive learning. From the perspective of the knowledge creation metaphor, learning means becoming part of a community through participation, exchange of ideas, sharing, contribution of ideas, and knowledge generation. Students are both producers and consumers (“prosumers”) of knowledge, ideas, and artifacts. As newcomers to a community of practice, they not only engage in “legitimate peripheral participation” (Lave & Wenger, 1991) to develop their own mastery of knowledge and skills through interaction with experts, but they also have a responsibility to play a part in the continued advancement of the community’s existing body of knowledge as they progress toward full participation in the socio-cultural practices of the community (Lee, Eustace, Hay, & Fellows, 2005). The knowledge construction paradigm can be appropriately applied to learning environments where digital affordances and tools enable engagement in self-directed activities, and learners exercise agency in moving beyond mere participation in communities of inquiry to become active creators of ideas, resources, and knowledge artifacts.

These skill sets (creation, inquiry, critique, networking) are being hailed as vital in the new knowledge economy, which emphasizes creativity, entrepreneurship, and innovation, enabled by ICT tools designed to increase social connectedness and extension of personal boundaries. The metaphor of “the network” is seen by some researchers as the fundamental organizational form in today’s society (Castells, 2004; Hargreaves, 2004; Rudd, Sutch, & Facer, 2006). The

authors of the present article have adopted this perspective as they are making a case for a new understanding of teaching and learning that addresses its networked, collaborative, and connected dimensions: “The proper identification of our society is in terms of its specific social structure: networks powered by microelectronics and software-based information and communication technologies” (Castells, 2004, p. 222).

### *Learning Networks and Connectivism*

Supporting the notion of a networked society is the theory of connectivism (Siemens, 2005), which stresses the importance of building networks and collaborative linkages to foster communication and dialogue. Educational research and theory have long recognized that learning processes are socially situated and networked, and ideas are generated as a result of collective intelligence, efforts, and collaboration (Scardamalia & Bereiter, 1994; Tharp & Gallimore, 1988). Siemens’ theory builds on these ideas by conceiving of learning as a process that occurs within multiple overlapping environments of dynamic core elements that support the “amplification of learning, knowledge and understanding through the extension of a personal network” (“Connectivism,” para. 9). Essentially, Siemens presents a view of knowledge development that is aligned with the proliferation of Web 2.0-based social software tools, and premised on the kinds of digital skills needed to function effectively in the knowledge age (see also New Media Consortium, 2005). Instead of a learning theory focused on the learning processes of the individual, connectivism situates learning within the dynamics of social interaction, connection, and collaboration. Maintaining these connections is a skill that is essential for lifelong learning in a knowledge-based, networked society. Some of the salient characteristics of this theory are the following:

- Learning and knowledge are generated by accessing a diverse blend of opinions;
- Learning is a process of making connections between specialized nodes or information sources;
- Currency (accurate, up-to-date knowledge) is the focus of all connectivist learning;
- The integration of cognition and emotions in meaning making is highly important.

The metaphor of the network can be seen to epitomize the social and economic changes of the last three decades, while the metaphor of learning as knowledge creation is a fundamental perspective that encapsulates the processes and outcomes that learners need to engage in so that they learn to operate

successfully in these networks. Both metaphors challenge us to question whether our current education system and pedagogy, based on the delivery and consumption of content and the acquisition of abstract knowledge and skills, are adequate to support the development of the competencies and digital literacies that characterize the knowledge society, with its associated learning communities and networks. In response to this question we propose a framework for revised pedagogy, *Pedagogy 2.0*, that recognizes the power of social software tools, together with the wider resources and distributed social networks that learners now have access to. Exemplars are provided later in the article (Appendix A) to demonstrate Pedagogy 2.0 in action, supported by empirical research.

### Pedagogy 2.0

Pedagogy 2.0 is a framework that aims to focus on desired learning outcomes in order to exploit more fully the affordances and potential for connectivity enabled by Web 2.0 and social software tools. It is envisioned as an overarching concept for an emerging cluster of practices that advocates learner choice and self-direction as well as engagement in flexible, relevant learning tasks and strategies. Though not intended a prescriptive framework, it distills a number of guidelines characterizing effective learning environments, such as choice of resources, tasks, learning supports, and communication modalities, as follows:

- *Content*: Should consist of micro units of content that augment thinking and cognition; may include a wide variety of learner-generated resources accruing from students creating, sharing, and revising ideas;
- *Curriculum*: Should not be fixed but dynamic, open to negotiation and learner input, consisting of “bite-sized” modules, interdisciplinary in focus, and blending formal and informal learning;
- *Communication*: Students should be offered multiple opportunities for open, social, peer-to-peer, and multi-faceted forms of visual, verbal, and auditory communication, using multiple media types to achieve relevance, immediacy, and clarity;
- *Learning processes*: Should be situated, contextualized, reflective, integrated with thinking processes, iterative, dynamic, performance, and inquiry-based;
- *Resources*: Should include multiple informal and formal sources that are media rich, interdisciplinary, and global in reach;

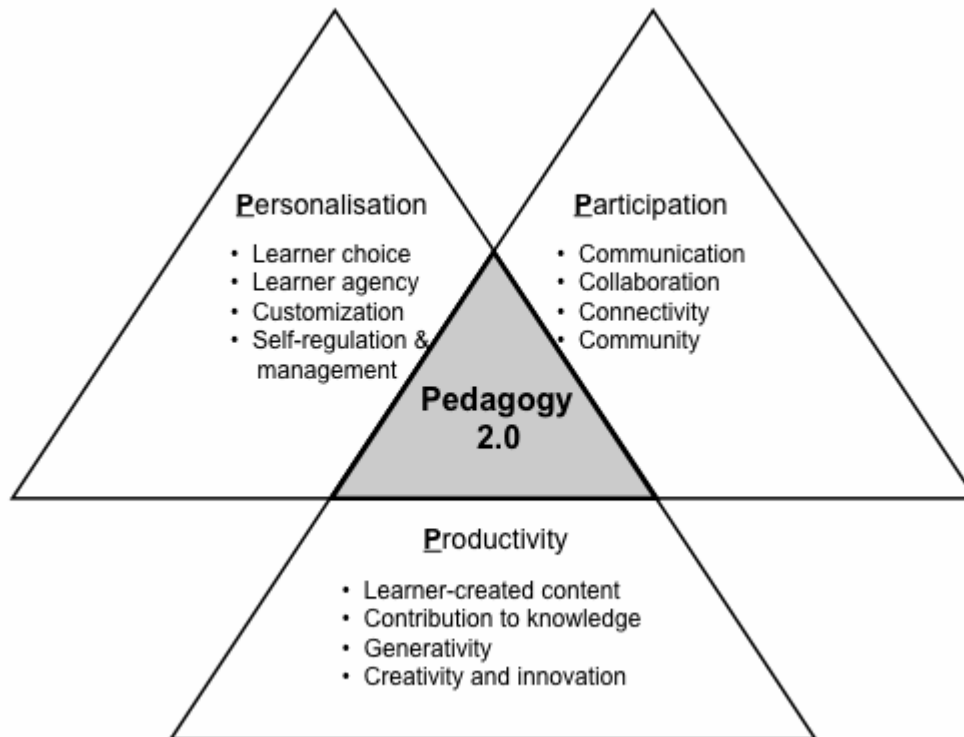
- *Scaffolds*: Support for students should come from a network of peers, teachers, experts, and communities;
- *Learning tasks*: Should be authentic, personalized, experiential, and learner driven and designed, and enable the creation of content and innovative ideas by learners.

These principles represent the intersection between established instructional design principles for the creation of constructivist, student-centered learning environments (e.g., open-ended learning, authentic learning, inquiry-based learning) and emerging perspectives on cognition including connectivism (Siemens, 2005) and the knowledge creation metaphor of learning (Paavola & Hakkarainen, 2005). They are evident in and have been derived from the exemplary practices of a growing number of teachers in tertiary education who have begun to demonstrate how social software tools offer rich possibilities for students to create and share ideas, connect, and participate in broader learning communities that are not confined to the spaces in which formal teaching and learning activities take place. Some of these exemplars are illustrated later in the present article (Appendix A). Through these pedagogical strategies, learners take on active roles such as content creators, peer teachers, mentors, researchers, innovators, and entrepreneurs.

### Emerging Practices: A Fresh Look at Learning Through the Lens of the Three-P's of Pedagogy 2.0

Pedagogy 2.0 also acknowledges that in a networked society, powered by a range of high-speed technologies, learners have access to ideas, resources, and communities to support their learning, are driven by personal needs and choice (personalization), and are able to develop self-regulatory skills. Pedagogies need to engage learners in the social processes of knowledge creation rather than the mere consumption of instructor-supplied information (productivity), in addition to scaffolding linkages, dialogue, and connections in and across communities and global distributed networks (participation) for the purposes of idea sharing, inquiry, and problem solving. Although not dependent on the technology, Pedagogy 2.0 capitalizes on the core energies and affordances of Web 2.0 – a raft of tools that support user autonomy, increased levels of socialization and interactivity, access to open communities, and peer-to-peer networking – in order to move beyond instructor-centered classroom environments, prescribed curricula and content, and the “walled garden” approach of learning management systems. This is achieved by facilitating personal choice, collaboration, participation, and creative

FIGURE 1  
Key Elements of Pedagogy 2.0



production. These overlapping elements are shown in Figure 1, and are discussed in detail in the subsections that follow. They represent principles that are congruent with the philosophy of the relatively new concept of Web 2.0, but, nevertheless, they are well supported by established and accepted learning concepts and theories including motivation and self-regulation (Pintrich, 1995; Pintrich & Schunk, 1996), information processing theory (Miller, 1956), multimedia learning theory (Mayer, 2001), socio-cultural learning theory (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991; Vygotsky, 1978), and experiential learning theory (Kolb, 1984; Kolb & Fry, 1975).

It is important to note that the elements depicted in Figure 1 are desired learning outcomes, while also providing principles for the design of learning activities and environments. For example, while student-generated content is a valued outcome of learning as it provides evidence of knowledge construction, the principle of active learner contribution must inform the learning task design, and provide opportunities for learners to become producers of resources as opposed to consumers of content.

#### *Participation*

More engaging, socially-based models for teaching and learning are needed to replace the traditional, “closed classroom” models, which place emphasis on the institution and instructor. A defining feature of Pedagogy 2.0 is that, alongside the increased socialization of learning and teaching, there is a focus on a less prescriptive curriculum and a greater emphasis on teacher-student partnerships in learning, with teachers as co-learners. According to Lee (2005, p. 17),

[W]e have already managed to overcome the confines of the physical classroom, but ... still remain unknowing prisoners of the instructor-centered online classroom. To move further ahead, we will need to demolish these virtual walls so as to create social learning spaces, in which learners and ... [teachers] ... become associates in a community of practice, participating in networks of interaction that transcend the old-fashioned constructs of institutions and organisations. (p. 17)

Now, social software tools make it easy for learners to engage deeply with their peers, instructors, other subject-matter experts, and the community at large. Through these tools, individuals can create and maintain their own collections of ideas, photos, and bookmarks online. These creations, while enabling personal expression and publication, also allow for social constructivist forms of participation by allowing comments and annotations by others, and, furthermore, by contributing to extant communities of interest by sharing resources. Therefore, not only is this element of Pedagogy 2.0 reflective of the “participation model of learning” (Sfard, 1998), as opposed to the “acquisition” model, but it also adds a further dimension to participative learning by increasing the level of socialization and collaboration with experts, community, and peer groups, and by fostering connections that are often global in reach. Jenkins (2007, p. 51) aptly summarizes the process as follows:

Learning in a networked society involves understanding how networks work and how to deploy them for one's own ends. It involves understanding the social and cultural contexts within which different information emerges ... and how to use networks to get one's own work out into the world and in front of a relevant and, with hope, appreciative public.

### *Personalization*

Recent research attests to a growing appreciation of the importance of the learner's self-direction and control over the whole learning process (Fazey & Fazey, 2001; Narciss, Proske, & Koerndle, 2007). Evidence suggests that we can improve learning effectiveness by giving the learner control over, and responsibility for their own learning (Dron, 2007; Nesbit & Winne, 2003). This is the foundation for such approaches as problem-based and inquiry-based learning (Desharnais & Limson, 2007; Edelson, Gordin, & Pea, 1999), and is central to the grand vision of Pedagogy 2.0, where learners have the freedom to decide how to engage in personally meaningful learning.

In fact, the notion of personalization is not entirely new to educators, and it is often linked to the term “learner-centered” education, a desirable state where learners know how to choose and make decisions relating to their personal learning needs. However, despite the efforts of many constructivist teachers, the control culture of education prevails, and pre-packaged content and pre-designed syllabi continue to dominate, denying students choice and autonomy in shaping their own learning trajectories. According to Dron (2006), such approaches lead to de-motivation, boredom, and

confusion. Web 2.0 and social software tools enable choice and allow learners to make decisions about how to best meet their goals and needs for connection and social interaction. Apart from choosing which resources and sites to subscribe and contribute to, which tools to use, and how and where to use them, we are witnessing a shift in the modalities of expression that are now available (Jenkins, 2007). Text alone is not always preferred mode of communication, as web-based multimedia production and distribution tools incorporating rich audio (podcasting, Skype), photo (Flickr) and video (vodcasting, YouTube, Stickam) capabilities are growing.

By harnessing digital technologies and social software tools, four key areas pivotal to the development of personalization through teaching are summarized by Green, Facer, Rudd, Dillon, and Humphreys (2006). According to these researchers, pedagogy must do the following:

- ensure that learners are capable of making informed educational decisions;
- diversify and recognize different forms of skills and knowledge;
- create diverse learning environments;
- include learner-focused forms of feedback and assessment.

How do we bring these principles into the design of tasks in higher education? The challenge for educators is to enable self-direction, knowledge building, and learner control by providing options and choice while still supplying the necessary structure and scaffolding. Also linked to the centrality of learner control is the on-going discussion around the notion of Personal Learning Environments (PLE's), defined by Siemens (2007a), as “a collection of tools, brought together under the conceptual notion of openness, interoperability, and learner control. As such, they are comprised of two elements – the tools and the conceptual notions that drive how and why we select individual parts” (para. 2). Moving on from LMS's, the PLE concept represents the latest step towards an alternative approach to e-learning. Unlike LMS's that take a course-centric view of learning, PLE's are learner-centric. The idea is to have learners exercise greater control over their own learning experience, rather than be constrained by centralized, instructor-controlled learning.

### *Productivity*

Students are capable of creating and generating ideas, concepts, and knowledge, and it is arguable that the ultimate goal of learning in the knowledge age is to enable this form of creativity and productivity. In recent



times, the value of textbooks is being questioned (Fink, 2005; Moore, 2003) and the open source and open content movements (Beshears, 2005; Massachusetts Institute of Technology, 2007; MERLOT, 2006) are gaining increased attention and traction. Clark (2003) points towards the “Napsterization” of e-learning through peer-to-peer (P2P) file and media content sharing services. Today’s students perceive little value in the rote learning of factual information, particularly given the accessibility and ease of use of search engines and web-based reference sites such as Google and Wikipedia. Educators are thus beginning to realize that instructor-supplied content has limitations, particularly if it pre-empts learner discovery and research, and active student involvement in the knowledge creation process. They are starting to see how social software tools make it easy to contribute ideas and content, placing the power of media creation and distribution into the hands of “the people formerly known as the audience” (Rosen, 2006), which includes their students.

Mirroring the massive outpouring of information and dynamic, user-generated content between peers on the Web, dubbed “personal publishing” (Downes, 2005), is the rise of student-generated content or student performance content (Boettecher, 2006). For example, in recent years the e-Portfolio (Abrami & Barrett, 2005; Love, McKean, & Gathercoal, 2002) has emerged as popular strategy for capturing and organizing student-generated content, which, in addition to completed project/assignment work or deliverables, may also incorporate evidence of the process of learning that is representative of the complexity and “messiness” of an authentic, problem-based learning experience, such as successive drafts of solutions, descriptions of mistakes made, or difficulties encountered. Student-generated content may also include synchronous and asynchronous computer-mediated communication (CMC) discourse such as chat logs and discussion board postings, reflective writing in the form of blog-based diaries, summaries, and reviews, created by students working individually or in teams. Last, but not least, it may also include “found” content, including the results of students’ own wide reading, gathered from websites, journals, magazines, and news articles that are brought to, and shared with others in, the learning environment.

#### Current Examples of Pedagogy 2.0 in Tertiary Teaching and Learning

Appendix A contains examples of what the authors consider to epitomize Pedagogy 2.0. They have been drawn from the practices of teachers at tertiary learning institutions worldwide, and cover a range of academic disciplines, illustrating how the principles of Pedagogy 2.0 can be applied in a variety of face-to-face classroom

settings as well as in fully online, supplemented, and blended e-learning environments. Importantly, it can be seen from these exemplars that with the advent of Pedagogy 2.0, we are witnessing a re-definition of the roles of both teachers and learners, with the latter assuming more active roles as contributors of course content and ideas while also demonstrating learning outcomes through performance and production of ideas.

The three P's of Pedagogy 2.0 are exhibited by the examples in Appendix A in a variety of different ways. For example, to support his course in General Psychology at the University of Connecticut, Professor David B. Miller (2006, 2007) hosts weekly informal discussions with students following each week’s lectures. During these discussions, students are able to seek clarification on the course material and talk about it in greater depth, as well as to actively explore and discuss issues not covered during the lecture that are of interest and relevance to the group (participation). The discussions are recorded and made available to other members of the class as a series of podcasts for individual listening at a convenient time and place (personalization). The process of creating and participating in the discussions becomes a form of student-generated content (productivity). All students in the cohort are welcome to submit questions in advance of the discussion via email; these questions, as well as those asked by students who attend in person, are answered during the discussion.

In another example, at the University of North Carolina at Pembroke (UNCP), Dr. Kenneth Mentor’s courses make use of a wiki-based encyclopedia, with the goal being for students to create and maintain encyclopedia entries on a variety of subjects related to law, criminal justice, sociology, and criminology. In previous courses, Mentor’s students created web pages as class assignments. The *Online Encyclopedia of Criminal Justice* (2006) project extends those efforts in two notably powerful ways: firstly, using a wiki enables the student-generated content to be readily shared in virtual “public spaces” and to a broader audience beyond the walls of the classroom, and, secondly, the wiki’s ease of use enables students to create substantial amounts of content within a short timeframe (productivity). In addition to generating and entering initial content, students also perform the roles of editing, revising, and organizing the content, which becomes part of the shared pool of resources accessible to all learners. The learning experience and activities are personalized in that students have a great deal of autonomy and choice in determining when, where and how to contribute to the collection of information on the wiki, as well as deciding which topics or entries to create, read, add to, and/or modify. Although all site content was initially written by UNCP students, the site is now available for educators to use for class

assignments, and users outside the institution are allowed to register and contribute (Sener, 2007b). In this way, Mentor's students are active participants not only in the context of the course they are studying but also in a wider, professional, academic community that extends beyond the walls of the classroom and institution in which they are based (participation).

#### Problems and Challenges Facing Pedagogy 2.0

With the above having been said, the implementation of a Pedagogy 2.0 approach is not without its issues and challenges, and these cannot be ignored. For example, as Jenkins (2007) points out, Web 2.0 signifies a participatory culture in which there is greater opportunity to initiate, produce, and share one's creations; to engage in peer-to-peer learning; and to become a global citizen, capable of communicating and working in diverse contexts. These benefits, however, need to be accompanied by pedagogical interventions that equip students with the skills needed to operate in a digital culture and that use media to enrich their learning and develop essential literacy skills, while ensuring that there is a shift in "the focus of literacy from one of individual expression to community involvement" (Jenkins, 2007, p. 4).

Recent research has shown that many higher education students currently lack the competencies necessary to navigate and select relevant sources from the overabundance of information available (Windham, 2005). In the age of personal publishing and user-generated content, essential digital literacy skills are required to locate quality sources and assess them for objectivity, reliability, and currency (Katz & Macklin, 2007). Students need to develop expertise and confidence in finding, evaluating, creating, and sharing ideas, which often involves complex critical thinking skills (Jenkins, 2007; Lorenzo & Dziuban, 2006). Fortunately, many of the examples presented in Appendix A demonstrate that the adoption of appropriate strategies can lead to opportunities for higher-order thinking and meta-cognitive development (e.g., Lee, Chan, & McLoughlin, 2006; McLoughlin, Lee, & Chan, 2006; Miller, 2006, 2007; Sener, 2007b). Moreover, in fostering learning processes that encourage learner-generated content there is still a need for accountability and recognition of authoritative sources of information; however, the review, editing, and quality assurance of content can be done collaboratively and in partnership with learners, while simultaneously drawing on input from the wider community (i.e., "wisdom of crowds").

A further challenge is that educators may not be fully aware of the potential and range of social software tools and may need opportunities for professional development to reveal how Web 2.0 applications can

support teaching and assessment. There may be a culture shock or skills crisis when "old world" educators are confronted with the expectation of working in unfamiliar environments and scenarios, and with tools with which they lack expertise and confidence. For these reasons, there is a need to make time for talking, awareness raising, and discussion of what pedagogic approaches and tools best target the desired learning outcomes. For the principles of Pedagogy 2.0 to come to fruition, institutional change may be needed to dissolve educational silos and to equip educators with the skills and facilities that allow them to engage learners in social networking, while encouraging them to become active partners in creating educational pathways that will prepare them for careers and lifelong learning journeys in the networked age. Looking ahead, it is unlikely that the role of technology in supporting personalized, learner-centered pedagogy will diminish. While recognition of the value that social software brings to education is growing, there is a need for ongoing evidence-based research demonstrating that the application of these tools and technologies is delivering on the promised of improved learning outcomes.

#### Summary and Conclusion

In summary, Web 2.0 and social software tools facilitate user-controlled, peer-to-peer knowledge creation, and network-based enquiry. The authors envision that the combination of the affordances of these technologies, coupled with a paradigm of learning focused on knowledge creation and networking, offers the potential for transformational shifts in teaching and learning practices, whereby learners can access peers, experts, the wider community, and digital media in ways that enable reflective, self-directed learning. Nevertheless, it must be recognized that technology is not of itself the sole driver of pedagogical change. Technological resources provide opportunities for a range of interactions, communicative exchanges, and sharing, but it is not possible to base an entire sequence of learning episodes solely on tools. Pedagogical frameworks, informed by learner-centered principles, and sensitive to the learning context, need to be considered. In practice, this means that before attempting to leverage the affordances of social software, teachers need to identify pedagogical outcomes (for example, drawing on the three P's in Figure 1) and ensure that technology integration is aligned to tasks and assessment (Joyes, 2005/2006; Salaberry, 2001).

Furthermore, Web 2.0 is part of a constellation of societal factors that include changing student expectations and demographics, lifelong learning, and institutional pressures for improved, innovative, and

cost-efficient modes of teaching. This implies that we must be alert to a range of factors that impact on pedagogical choice. There are already signs of optimism that existing Pedagogy 2.0 practices, by capitalizing on the three P's of personalization, participation, and productivity, will result in a learning landscape and a diverse range of educational experiences that are socially contextualized, engaging, and generative.

Early adopters of digital media opportunities involved the integration of new media modes, forms, and genres into learning activities. These have included wikis, blogs, video logs, text messaging, email, hypermedia, and more (Ganley, 2004). These representations have taken advantage of media-rich elements, interconnectivity, and social participation. Given the establishment of these new media uses, the challenge has now become the development of learners' skills and competencies in these expressive media forms and, more importantly, assisting them in becoming capable of choosing which of these media are relevant and for what contexts.

With the emergence and uptake of social networking tools comes the awareness that learning need not be confined to a single space or a single source. Multiple perspectives, resources, and environments for learning, both real and virtual, are available. It has been said that "technology has given us a communications toolkit that allows anyone to become a journalist at little cost and, in theory, with global reach. Nothing like this has ever been remotely possible before" (Gilmor, 2004, p. xii). In fact, the 2007 *Horizon Report* (New Media Consortium [NMC] & EDUCAUSE Learning Initiative [ELI], 2007) identified the Web 2.0-based areas of user-created content and social networking as two areas with a time to adoption of one year or less, with broader changes such as the emergence of new forms of scholarship and publication set to take place in the slightly longer term (i.e., over the next four to five years). However, obstacles and barriers still remain. Can teachers, whose traditional frame of reference is formality, understand how informal learning can take place through social networking and beyond the formal spaces of classrooms, libraries, and laboratories? Can we extend our classrooms to link with open communities that are sharing, revising, and creating new ideas? Can academia, with their established legacy of transmissive pedagogy, rise to the challenge and affect the kind of teaching revolution and changes that are both necessary and inevitable in the new age? The challenge is to facilitate learning, be less prescriptive, and be open to new media, tools, and strategies, while nurturing the skills of information evaluation as well as the blending, remixing, and recombination of ideas to reach creative solutions. This can be achieved by employing the social

software tools, resources, and opportunities that can leverage what our students do naturally – socialize, network, and collaborate.

## References

- Abrami, P. C., & Barrett, H. (Eds.). (2005). Special issue on electronic portfolios. *Canadian Journal of Learning Technology*, 31(3). Retrieved August 22, 2006, from <http://www.cjlt.ca/content/vol31.3/>
- Affordance. (2007). *Wikipedia*. Retrieved August 17, 2007, from <http://en.wikipedia.org/wiki/Affordance>
- Alexander, B. (2006). Web 2.0: A new wave of innovation for teaching and learning? *EDUCAUSE Review*, 41(2), 32–44. Retrieved January 20, 2007, from <http://www.educause.edu/ir/library/pdf/erm0621.pdf>
- Anderson, T. (2004). Toward a theory of online learning. In T. Anderson & F. Elloumi (Eds.), *Theory and practice of online learning* (pp. 33–60). Athabasca, Alberta, Canada: Athabasca University.
- Barsky, E., & Purdon, M. (2006). Introducing Web 2.0: Social networking and social bookmarking for health librarians. *Journal of the Canadian Health Libraries Association*, 27(3), 65–67.
- Beetham, H., & Sharpe, R. (2007). *Rethinking pedagogy for a digital age: Designing and delivering e-learning*. London, England: Routledge.
- Bereiter, C. (2002). *Education and mind in the knowledge age*. Hillsdale, NJ: Erlbaum.
- Berners-Lee, T. (2000). *Weaving the Web*. New York: HarperCollins.
- Berinstein, P. (2006). Wikipedia and Britannica: The kid's all right (and so's the old man). *Searcher*, 14(3), 16–26. Retrieved January 15, 2008, from [www.infotoday.com/searcher/mar06/berinstein.shtml](http://www.infotoday.com/searcher/mar06/berinstein.shtml)
- Beshars, F. M. (2005, October 4). Viewpoint: The economic case for creative commons textbooks. *Campus Technology*. Retrieved May 10, 2006, from <http://campustechnology.com/articles/40535/>
- Boettcher, J. V. (2006, February 28). The rise of student performance content. *Campus Technology*. Retrieved February 11, 2007, from <http://www.campustechnology/article.aspx?aid=40747>
- Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, 18(1), 32–42.
- Bryant, T. (2006). Social software in academia. *EDUCAUSE Quarterly*, 29(2), 61–64.
- Castells, M. (2004). Afterword: Why networks matter. In H. McCarthy, P. Miller, & P. Skidmore (Eds.), *Network logic: Who governs in an interconnected world?* London, England: Demos.

- Clark, D. (2003). *The Napsterisation of learning (P2P)*. Brighton, England: Epic Group.
- Conole, G., & Creanor, L. (2007). *In their own words: Exploring the learner's perspective on e-learning*. London, England: JISC. Retrieved October 30, 2007, from <http://www.jisc.ac.uk/media/documents/programmes/elearningpedagogy/iowfinal.pdf>
- Desharnais, R. A., & Limson, M. (2007). Designing and implementing virtual courseware to promote inquiry-based learning. *Journal of Online Learning and Teaching*, 3(1), 30-39. Retrieved October 11, 2007, from <http://jolt.merlot.org/vol3no1/desharnais.pdf>
- Downes, S. (2005, October). E-learning 2.0. *ELearn*. Retrieved January 11, 2006, from <http://www.elearnmag.org/subpage.cfm?section=articles&article=29-1>
- Dron, J. (2006). Social software and the emergence of control. *Proceedings of the Sixth International Conference on Advanced Learning Technologies*, New York, 904-908.
- Dron, J. (2007). *Control and constraint in e-learning: Choosing when to choose*. Hershey, PA: Information Science Publishing.
- Edelson, D. C., Gordin, D. N., & Pea, R. D. (1999). Addressing the challenges of inquiry-based learning through technology and curriculum design. *Journal of the Learning Sciences*, 8(3-4), 391-450.
- Encyclopædia Britannica Online*. (2007). Retrieved August 10, 2007, from <http://www.britannica.com/>
- Engeström, Y. (1987). *Learning by expanding*. Helsinki, Finland: Orienta-Konsultit Oy.
- Engeström, Y. (1999). Innovative learning in work teams: Analyzing cycles of knowledge creation in practice. In Y. Engeström, R. Miettinen, & R.-L. Punamäki (Eds.), *Perspectives on activity theory* (pp. 377-404). Cambridge, England: Cambridge University Press.
- Fazey, D. M., & Fazey, J. A. (2001). The potential for autonomy in learning: Perceptions of competence, motivation and locus of control in first-year undergraduate students. *Studies in Higher Education*, 26(3), 345-361.
- Fink, L. (2005, September 16). Making textbooks worthwhile. *Chronicle of Higher Education*. Retrieved March 11, 2007, from <http://chronicle.com/weekly/v52/i04/04b01201.htm>
- Frydenberg, M. (2008). Principles and pedagogy: The two P's of podcasting in the information technology classroom. *Information Systems Education Journal*, 6(6). Retrieved September 18, 2008, from <http://isedj.org/6/6>
- Ganley, B. (2004, October 11). Images, words and students finding their way [Weblog]. *Bgblogging*. Retrieved October 25, 2007, from [http://mt.middlebury.edu/midblogs/ganley/bgblogging/2004/10/images\\_words\\_and\\_students\\_find.html](http://mt.middlebury.edu/midblogs/ganley/bgblogging/2004/10/images_words_and_students_find.html)
- Gibson, J. J. (1977). The theory of affordances. In R. Shaw & J. Bransford (Eds.), *Perceiving, acting, and knowing: Toward an ecological psychology* (pp. 67-82). Hillsdale, NJ: Erlbaum.
- Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Houghton-Mifflin.
- Giles, J. (2005). Internet encyclopaedias go head to head. *Nature*, 438(7070), 900-901.
- Gilmor, D. (2004). *We the media*. Retrieved August 17, 2007, from <http://www.authorama.com/we-the-media-1.html>
- Green, H., Facer, K., Rudd, T., Dillon, P., & Humphreys, P. (2005). *Personalisation and digital technologies*. Bristol, England: Futurelab. Retrieved October 23, 2007, from [http://www.futurelab.org.uk/resources/documents/opening\\_education/Personalisation\\_report.pdf](http://www.futurelab.org.uk/resources/documents/opening_education/Personalisation_report.pdf)
- Hargreaves, D. H. (2004). Networks, knowledge and innovation. In H. McCarthy, P. Miller, & P. Skidmore (Eds.), *Network logic: Who governs in an interconnected world?* (pp. 79-88). London, England: Demos.
- Harris, B. (2007a). Midterm. *Art Survey: HA 112 at FIT*. Retrieved November 3, 2007, from [http://smarthistory.org/artsurvey/?page\\_id=13](http://smarthistory.org/artsurvey/?page_id=13)
- Harris, B. (2007b, October 25). Flickr in art history class. *smARThistory* [Weblog], October 25. Retrieved November 3, 2007, from <http://smarthistory.org/blog/88/flickr-in-art-history-class-how-fun/>
- Hase, S., & Kenyon, C. (2000). From andragogy to heutagogy. *ultiBASE*, 5(3). Retrieved September 25, 2007, from <http://ultibase.rmit.edu.au/Articles/dec00/hase1.pdf>
- Helms, D. (2007a). *Drug use and abuse*. Retrieved November 2, 2007, from <http://druguseandabuse.ning.com/>
- Helms, D. (2007b). *Group project*. Retrieved November 2, 2007, from [http://www.msjc.edu/hs/hs123\\_group\\_project.html](http://www.msjc.edu/hs/hs123_group_project.html)
- Jenkins, H. (2007). *Confronting the challenges of participatory culture: Media education for the 21st Century*. Chicago, IL: MacArthur Foundation. Retrieved January 4, 2007, from [http://www.digitallearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS\\_WHITE\\_PAPER.PDF](http://www.digitallearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS_WHITE_PAPER.PDF)
- Joyes, G. (2005/2006). When pedagogy leads technology. *The International Journal of Technology, Knowledge & Society*, 1(5), 107-113.
- Katz, I. R., & Macklin, A. S. (2007). Information and communication technology (ICT) literacy:

- Integration and assessment in higher education. *Systemics, Cybernetics and Informatics*, 5(4), 50-55. Retrieved November 17, 2007, from [http://www.iiisci.org/Journal/CV\\$/sci/pdfs/P890541.pdf](http://www.iiisci.org/Journal/CV$/sci/pdfs/P890541.pdf)
- Keen, A. (2007). *The cult of the amateur: How today's Internet is killing our culture*. New York: Doubleday.
- Kirschner, P. A. (2002). Can we support CSCL? Educational, social and technological affordances for learning. In P. A. Kirschner (Ed.), *Three worlds of CSCL: Can we support CSCL?* (pp. 7-47). Heerlen, The Netherlands: Open University of the Netherlands.
- Kolb, D. A. (1984). *Experiential learning*. Englewood Cliffs, NJ: Prentice Hall.
- Kolb, D. A., & Fry, R. (1975). Toward an applied theory of experiential learning. In C. L. Cooper (Ed.), *Theories of group process* (pp. 33-58). London: John Wiley.
- Kukulka-Hulme, A. (2005, May 11-12). *The mobile language learner – now and in the future* [Webcast]. Plenary session delivered at the Fran Vision till Praktik (From Vision to Practice) Language Learning Symposium, Umeå, Sweden. Retrieved February 3, 2006, from <http://www2.humlab.umu.se/video/Praktikvision/agnes.ram>
- Lamb, B. (2007). *Textologies: The changing spaces of reading and writing* [Weblog]. Retrieved January 10, 2008, from <http://weblogs.elearning.ubc.ca/textologies/>
- Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, England: Cambridge University Press.
- Leadbeater, C. (2006). *The ten habits of mass innovation*. London, England: NESTA. Retrieved November 3, 2007, from [http://www.nesta.org.uk/assets/pdf/ten\\_habits\\_of\\_mass\\_innovation\\_provocation\\_NESTA.pdf](http://www.nesta.org.uk/assets/pdf/ten_habits_of_mass_innovation_provocation_NESTA.pdf)
- Lee, M. J. W. (2005). New tools for online collaboration: Blogs, wikis, RSS and podcasting. *Training and Development in Australia*, 32(5), 17-20.
- Lee, M. J. W., Chan, A., & McLoughlin, C. (2006). Students as producers: Second year students' experiences as podcasters of content for first year undergraduates. In *Proceedings of the 7th Conference on Information Technology Based Higher Education and Training*. Sydney, New South Wales, Australia: 832-841.
- Lee, M. J. W., Eustace, K., Hay, L., & Fellows, G. (2005). Learning to collaborate, collaboratively: An online community building and knowledge construction approach to teaching computer supported collaborative work at an Australian university. In M. R. Simonson & M. Crawford (Eds.), *Proceedings of the 2005 AECT International Convention*. North Miami Beach, FL: Nova Southeastern University, 286-306.
- Leene, A. (2005, June). *Microcontent is everywhere!!!* Paper presented at the Microlearning 2006 conference, Innsbruck, Austria. Retrieved January 3, 2008, from <http://www.sivas.com/microcontent/articles/ML2006/MicroContent.pdf>
- Lindner, M. (2005). *Wild microcontent*. Retrieved December 12, 2006, from <http://phaidon.philo.at/martin/archives/000318.html>
- Lohnes, S., & Kinzer, C. (2007). Questioning assumptions about students' expectations for technology in college classrooms. *Innovate Journal of Online Education*, 3(5). Retrieved January 15, 2008, from <http://www.innovateonline.info/index.php?view=article&id=431&action=article>.
- Lorenzo, G., & Dziuban, C. (2006). *Ensuring the net generation is net savvy*. Washington, D.C.: EDUCUASE. Retrieved July 10, 2007, from <http://www.educause.edu/ir/library/pdf/ELI3006.pdf>
- Love, D., McKean, G., & Gathercoal, P. (2002). Portfolios to Webfolios and beyond: Levels of maturation. *EDUCAUSE Quarterly*, 25(2), 29-37.
- Massachusetts Institute of Technology. (2007). *MIT OpenCourseWare*. Retrieved July 4, 2007, from <http://ocw.mit.edu/>
- Mather, J. (2007). Panic over digital natives' IT mastery "premature." *Campus Review*, 17(26), 4.
- Mayer, R. E. (2001). *Multimedia learning*. Cambridge, England: Cambridge University Press.
- McCarty, S. (2005a). Spoken Internet to go: Popularization through podcasting. *The JALT CALL Journal*, 1(2), 67-74.
- McCarty, S. (2005b, September 1). Similar proverbs in Chinese, Japanese and English? [Weblog]. *Japancasting*. Retrieved March 10, 2007, from <http://stevemc.blogmatrix.com/entry:stevemc-2005-09-01-0000/>
- McCarty, S. (2006). *Japancasting*. Retrieved December 3, 2006, from <http://stevemc.blogmatrix.com>.
- McLoughlin, C., Brady, J., Lee, M. J. W., & Russell, R. (2007, November). Peer-to-peer: An e-mentoring approach to facilitating reflection on professional experience for novice teachers. Paper presented at the 2007 Australian Association for Research in Education Conference, Fremantle, WA.
- McLoughlin, C., Lee, M. J. W., & Chan, A. (2006). Using student generated podcasts to foster reflection and metacognition. *Australian Educational Computing*, 21(2), 34-40.
- Mejias, U. (2005). A nomad's guide to learning and social software. *The Knowledge Tree: An E-Journal of Learning Innovation*, 7. Retrieved

- December 10, 2006, from [http://knowledgetree.flexiblelearning.net.au/edition/07/download/la\\_mejias.pdf](http://knowledgetree.flexiblelearning.net.au/edition/07/download/la_mejias.pdf)
- MERLOT. (2006). *MERLOT – Multimedia Educational Resource for Learning and Online Teaching*. Retrieved February 11, 2007, from <http://www.merlot.org/>
- Miller, D. B. (2006, October 18). Podcasting at the University of Connecticut: Enhancing the educational experience. *Campus Technology*. Retrieved April 10, 2007, from [http://campustechnology.com/news\\_article.asp?id=19424&typeid=156](http://campustechnology.com/news_article.asp?id=19424&typeid=156)
- Miller, D. B. (2007). *iCube*. Retrieved April 10, 2007, from <http://icube.uconn.edu/>
- Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, 63(2), 81-97.
- Moore, J. W. (2003). Are textbooks dispensable? *Journal of Chemical Education*, 80(4), 359.
- Narciss, S., Proske, A., & Koerndle, H. (2007). Promoting self-regulated learning in web-based environments. *Computers in Human Behavior*, 23(3), 1126-1144.
- Norman, D. A. (1998). *The invisible computer: Why good products can fail, the PC is so complex, and information appliances the answer*. Cambridge, MA: MIT Press.
- Nesbit, J. C., & Winne, P. H. (2003). Self-regulated inquiry with networked resources. *Canadian Journal of Learning and Technology*, 29(3). Retrieved November 4, 2007, from [http://www.cjlt.ca/content/vol29.3/cjlt29-3\\_art5.html](http://www.cjlt.ca/content/vol29.3/cjlt29-3_art5.html)
- New Media Consortium. (2005). *A global imperative: The report of the 21st Century literacy summit*. Austin, TX: New Media Consortium. Retrieved March 18, 2007, from [http://www.nmc.org/pdf/Global\\_Imperative.pdf](http://www.nmc.org/pdf/Global_Imperative.pdf)
- New Media Consortium, & EDUCAUSE Learning Initiative. (2007). *The Horizon Report: 2007 edition*. Austin, TX: New Media Consortium. Retrieved August 5, 2007, from [http://www.nmc.org/pdf/2007\\_Horizon\\_Report.pdf](http://www.nmc.org/pdf/2007_Horizon_Report.pdf)
- Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. New York: Oxford University Press.
- Oblinger, D. G., & Oblinger, J. L. (Eds.). (2005). *Educating the Net Generation*. Washington, D.C.: EDUCAUSE.
- Online encyclopedia of criminal justice*. (2007). Retrieved March 10, 2007, from <http://cjencyclopedia.com/>
- O'Reilly, T. (2005). *What is Web 2.0: Design patterns and business models for the next generation of software*. Retrieved December 15, 2006, from <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>
- Owen, M. (2004). The myth of the digital native. Retrieved July 8, 2007, from [http://www.futurelab.org.uk/resources/publications\\_reports\\_articles/web\\_articles/Web\\_Article561](http://www.futurelab.org.uk/resources/publications_reports_articles/web_articles/Web_Article561)
- Paavola, S., & Hakkarainen, K. (2005). The knowledge creation metaphor – An emergent epistemological approach to learning. *Science and Education*, 14(6), 535-557.
- Pintrich, P. R. (Ed.). (1995). *Understanding self-regulated learning: Vol. 63. New directions for teaching and learning*. San Francisco: Josey-Bass.
- Pintrich, P. R., & Schunk, D. H. (1996). *Motivation in education: Theory, research, and application*. Upper Saddle River, NJ: Merrill.
- Premsky, M. (2001). Digital natives, digital immigrants. *On the Horizon*, 9(5), 1-6.
- Punie, Y., & Cabrera, M. (2006). *The future of ICT and learning in the knowledge society*. Luxembourg: European Communities. Retrieved May 3, 2007, from <http://www.eenet.org/upload/File/Vision%202015/ThefutureofIctandlearningintheknowledgesociety.pdf>
- Richardson, W. (2006). *Blogs, wikis, podcasts, and other powerful tools for classrooms*. Thousand Oaks, CA: Sage.
- Rosen, J. (2006). The people formerly known as the audience. *PressThink* [Weblog], June 27. Retrieved October 2, 2007, from [http://journalism.nyu.edu/pubzone/weblogs/pressthink/2006/06/27/ppl\\_frmr.html](http://journalism.nyu.edu/pubzone/weblogs/pressthink/2006/06/27/ppl_frmr.html)
- Rudd, T., Sutch, D., & Facer, K. (2006). *Towards new learning networks*. Bristol, England: Futurelab. Retrieved July 5, 2007, from [http://www.futurelab.org.uk/resources/documents/opening\\_education/Learning\\_Networks\\_report.pdf](http://www.futurelab.org.uk/resources/documents/opening_education/Learning_Networks_report.pdf)
- Salaberry, M. R. (2001). The use of technology for second language learning and teaching: A retrospective. *The Modern Language Journal*, 85(1), 39-56.
- Scardamalia, M., & Bereiter, C. (1994). Computer support for knowledge-building communities. *Journal of the Learning Sciences*, 3(3), 265-283.
- Sener, J. (2007a). *Podcasting student performances to develop EFL skills*. Retrieved March 10, 2007, from [http://www.sloan-c-wiki.org/wiki/index.php?title=Podcasting\\_Student\\_Performances\\_to\\_Develop\\_EFL\\_Skills](http://www.sloan-c-wiki.org/wiki/index.php?title=Podcasting_Student_Performances_to_Develop_EFL_Skills)
- Sener, J. (2007b). *University of North Carolina at Pembroke – cjencyclopedia.com: Online encyclopedia of Criminal Justice*. Retrieved March

- 10, 2007, from [http://www.sloan-c-wiki.org/wiki/index.php?title=University\\_of\\_North\\_Carolina\\_at\\_Pembroke\\_-\\_c\\_jencyclopedia.com:\\_Online\\_Encyclopedia\\_of\\_Criminal\\_Justice](http://www.sloan-c-wiki.org/wiki/index.php?title=University_of_North_Carolina_at_Pembroke_-_c_jencyclopedia.com:_Online_Encyclopedia_of_Criminal_Justice)
- Sfard, A. (1998). On two metaphors for learning and the dangers of choosing just one. *Educational Researcher*, 27(2), 4-13.
- Siemens, G. (2005). Connectivism: A learning theory for a digital age. *International Journal of Instructional Technology and Distance Learning*, 2(1). Retrieved December 11, 2005, from [http://www.itdl.org/Journal/Jan\\_05/article01.htm](http://www.itdl.org/Journal/Jan_05/article01.htm).
- Siemens, G. (2007a, April 15). PLEs – I acronym, therefore I exist [Weblog]. *elearnspace: Learning, networks, knowledge, technology, community*. Retrieved November 1, 2007, from <http://www.elearnspace.org/blog/archives/002884.html>.
- Siemens, G. (2007b, October 22). Digital natives and immigrants: a concept beyond its best before date [Weblog]. *Connectivism Blog*. Retrieved November 4, 2007, from [http://connectivism.ca/blog/2007/10/digital\\_natives\\_and\\_immigrants.html](http://connectivism.ca/blog/2007/10/digital_natives_and_immigrants.html)
- Surowiecki, K. (2004). *The wisdom of crowds*. New York: Doubleday.
- Tharp, R. G., & Gallimore, R. (1988). *Rousing minds to life: Teaching, learning, and schooling in social context*. Cambridge, England: Cambridge University Press.
- Trendwatching.com. (2005). *Generation C*. Retrieved June 28, 2006, from [http://www.trendwatching.com/trends/GENERATION\\_C.htm](http://www.trendwatching.com/trends/GENERATION_C.htm)
- Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Wenzloff, J. (2005). *Furl, furred, furling: Social on-line bookmarking for the masses*. Retrieved July 10, 2007, from [http://www.classroomhelp.com/workshop/Furl\\_Guide.pdf](http://www.classroomhelp.com/workshop/Furl_Guide.pdf)
- Wesch, M. (2007). *Digital ethnography of YouTube project*. Retrieved November 2, 2007, from <http://mediatedcultures.net/youtube.htm>
- Wikipedia. (2007). Retrieved August 10, 2007, from <http://www.wikipedia.org/>
- Windham, C. (2005). The student's perspective. In D. G. Oblinger & J. L. Oblinger (Eds.). *Educating the Net Generation* (pp. 5.1-5.16). Washington, D.C.: EDUCAUSE.
- Yew, J., Gibson, F. P., & Teasley, S. D. (2006). Learning by tagging: The role of social tagging in group knowledge formation. *Journal of Online Learning and Teaching*, 2(4), 275-285. Retrieved March 23, 2007, from <http://jolt.merlot.org/vol2no4/yew.pdf>

---

CATHERINE McLOUGHLIN, Ph.D., is an associate professor with the School of Education at the Australian Catholic University, Canberra. She also serves as the coordinator of the Australian Capital Territory branch of the Research Center for Science, Information Technology, and Mathematics Education for Rural and Regional Australia (SiMERR). With over 20 years experience in higher education in Europe, South East Asia, the Middle East, and Australia, Dr. McLoughlin has experience and expertise in a variety of educational settings, with diverse students and across a wide range of cultural contexts. Her publications attest to extensive research and development in e-learning and innovative pedagogy in higher education. She is editor of the Australasian Journal of Educational Technology and an editorial board member of a several leading journals, including the British Journal of Educational Technology.

MARK J. W. LEE is an adjunct senior lecturer with the School of Education, Charles Sturt University (CSU), Wagga Wagga, Australia, and an honorary research fellow with the School of Information Technology and Mathematical Sciences, University of Ballarat, Australia. He was previously a full-time lecturer in Information Technology (IT) in the School of Information Studies, Charles Sturt University. Prior to joining CSU, Mr. Lee was Head of the IT Faculty within the vocational education division of Study Group, Australia's largest private education provider, and national IT and e-commerce coordinator for the La Trobe University and Oxford Brookes University programs delivered by the Australian Campus Network in Sydney, Brisbane, and Perth. He is presently chair of the New South Wales Chapter of the Institute of Electrical and Electronics Engineers (IEEE) Education Society, and serves on the editorial boards of a number of international journals in the area of educational technology and e-learning.

APPENDIX A  
Exemplars of Pedagogy 2.0

Institution/ Country	Reference(s)/ Author(s)	Learner Tasks	Manifestation of Pedagogy 2.0	Web 2.0 Technologies Used
University of Connecticut, USA	Miller (2006, 2007)	Students studying a General Psychology course participate in informal discussions about the course material following each week's lectures. These discussions are recorded and distributed to the rest of the class as part of a podcast series entitled <i>iCube (Issues In Intro)</i> . The students also download and listen to two additional types of instructor-created podcasts: <ul style="list-style-type: none"> <li>• <i>Precasts</i> – Short enhanced podcasts previewing material prior to each lecture;</li> <li>• <i>Postcasts</i> – Short post-lecture podcasts containing re-explanations of selected concepts.</li> </ul>	The instructor hosts/facilitates and participates in the iCube discussions, as well as producing the precasts and postcasts before and after each lecture, respectively.	<ul style="list-style-type: none"> <li>• Podcasting</li> </ul>
Bentley College, USA	Frydenberg (2008)	Students in an introductory information technology class work in pairs or groups and produce vodcasts to teach topics based on the course lecture materials to their peers.	The instructor supplies the set of course topics for the students choose from. He also provides basic instruction on video recording and editing techniques, and sets up the RSS feed for sharing the vodcasts.	<ul style="list-style-type: none"> <li>• Vodcasting</li> </ul>
Charles Sturt University, Australia	Lee, Chan, and McLoughlin (2006); McLoughlin, Lee, and Chan (2006)	Second year undergraduate students take charge of producing talkback radio-style podcasts to assist first year students undertaking a unit of study that the former group previously completed. The entire podcast production process, from inception and scriptwriting through to the final recording, is driven by the student-producers, with minimal instructor intervention.	The instructor facilitates group discussions and reminds the students of their overall goals and objectives. In general, he provides minimal input but is available to offer general guidance and assistance to the students on request. During the recording of podcasts, the instructor is also occasionally brought in as a "guest" or interviewee, to offer insight into, or clarification of, the more difficult or complex issues and topics.	<ul style="list-style-type: none"> <li>• Podcasting</li> </ul>
Australian Catholic University, Australia	McLoughlin, Brady, Lee, and Russell (2007)	Pre-service teachers studying secondary teaching courses use podcasting and blogs to engage in peer mentoring with their classmates while undertaking their teaching practicum, during which they are assigned to geographically dispersed schools throughout the Australian Capital Territory. They share experiences, stories and anecdotes, as well as offering support, feedback and encouragement to one another.	The instructors set up the Web 2.0-based technology infrastructure within the university's learning management system, and outline the parameters for the activity to encourage student interaction and promote reflection on practice. They also participate in and provide input into the discussion, so that both instructors and students are producers and consumers ("prosumers") in the online community.	<ul style="list-style-type: none"> <li>• Podcasting</li> <li>• Blogs</li> </ul>
University of North Carolina at Pembroke, USA	Sener (2007b)	Students use a wiki to create a web-based encyclopedia containing entries on a variety of subjects related to law, criminal justice, sociology, and criminology. In addition to generating and entering initial content, students also edit, revise, and organize the content.	The instructor supplies the technology framework and assesses the students' work, providing constructive feedback about their encyclopedia entries and the content therein.	<ul style="list-style-type: none"> <li>• Wikis</li> </ul>



Institution/ Country	Reference(s)/ Author(s)	Learner Tasks	Manifestation of Pedagogy 2.0	Web 2.0 Technologies Used
Macomb Independent School District, Michigan, USA	Wenzloff (2005); Richardson (2006)	Student teachers use the social bookmarking site Furl to bookmark and tag web sites and share them with their instructor and peers.	The instructor uses the export feature of Furl to quickly and easily generate online or paper handouts of the resources he has bookmarked for the class. He also subscribes to the RSS feeds of his students' Furl sites, to examine the sites they are reading as well as the comments they have written about the sites.	<ul style="list-style-type: none"> <li>• Social bookmarking</li> <li>• Tag-based folksonomies</li> <li>• RSS</li> </ul>
Open University, United Kingdom	Kukulka-Hulme (2005)	Students attending German and Spanish summer schools use digital voice recorders and mini-camcorders to record interviews with other students and with native speakers, as well as to create audio-visual tours for sharing with their peers via the web.	The instructors supply the recording equipment and provide guidance to the students in completing the various activities, for example, by providing sample topics/questions for the student-led interviews.	<ul style="list-style-type: none"> <li>• Media/file sharing</li> </ul>
Osaka Jogakuin College, Japan	McCarty (2005a, 2006); Sener (2007a)	Students are interviewed by their instructor, perform roles, and/or present their own creations, in contribution to the instructor's bilingual podcast feed and blog targeted to those studying Japanese or English as a foreign language. The podcast episodes cover Japanese culture, history, folklore, and comparative religions as well as contemporary social issues such as the education system and the rights of minorities in Japan.	The instructor maintains the podcast feed and blog, adding his own content as well as soliciting contributions from students.	<ul style="list-style-type: none"> <li>• Blogs</li> <li>• Podcasting</li> </ul>
Matsuyama Shinonome College, Japan	McCarty (2005b); Sener (2007a)	As part of an intensive course on translation, students from two East Asian cultures (Chinese and Japanese) participate in a recorded discussion in which they are asked to explain five proverbs in English as well as in their native language.	The instructor provides stimulus questions to trigger thought and discussion, and oversees the operation of the recording hardware and software. He assists the students in publishing the recording as a podcast.	<ul style="list-style-type: none"> <li>• Podcasting</li> </ul>
Kansas State University, USA	Wesch (2007)	As part of their exploration of how digital technology impacts human interaction, cultural anthropology undergraduates create "digital ethnographies" of <i>YouTube</i> through a process of participant observation. Although they work closely with one another, each student in the team is ultimately responsible for their own three to five minute video ethnography of some aspect of the <i>YouTube</i> community.	The instructor provides coaching, modeling, and facilitation, while introducing the skills of research methods	<ul style="list-style-type: none"> <li>• Media sharing (video – <i>YouTube</i>)</li> <li>• Vlogs (video blogs)</li> </ul>

Institution/ Country	Reference(s)/ Author(s)	Learner Tasks	Manifestation of Pedagogy 2.0	Web 2.0 Technologies Used
Fashion Institute of Technology, USA	Harris (2007a, 2007b)	Students studying an art history class visit the Metropolitan Museum of Art, where they take photos of exhibits using their mobile phones, upload them to <i>Flickr</i> , and use the site's tools to tag, annotate and write descriptions and comments about the photos. They participate in a "Scavenger Hunt" in which the objective is to locate and photograph works of art that pertain to a number of vocabulary words and terms they have studied in class (to be used as tags for their uploaded photos).	The instructor organizes the field trip to the museum and provides scaffolding for the activity by establishing the technology infrastructure ( <i>Flickr</i> group) and supplying the keywords for the Scavenger Hunt. She also evaluates the students' work as part of their mid-term assessment.	<ul style="list-style-type: none"> <li>• Media sharing (photographs – <i>Flickr</i>)</li> <li>• Tag-based folksonomies</li> </ul>
Mt. San Jacinto College, USA	Helms (2007); D. Helms, personal communication	Health Sciences students use the social networking site <i>Ning</i> to create Web 2.0-based web sites to teach others about the dangers associated with drug use and abuse. Working in groups, they each take on one of four roles: Web Designer, Multimedia Designer, Researcher, and Copyrighter. <i>Ning</i> allows the students to integrate various forms of multimedia by drawing on the vast resources already published on the Web, for example in image libraries and on media sharing sites such as <i>YouTube</i> , without the need to learn complex web authoring and programming techniques. The students also use the blogging and threaded discussion features of <i>Ning</i> to engage in constructive and reflective discourse about the content they have produced.	The instructor assigns each group with a specific drug to research and provides "job descriptions" for each of the four roles. He also practices a form of modeling by producing a sample <i>Ning</i> site for students to view as an example of the possibilities of the medium.	<ul style="list-style-type: none"> <li>• Social networking sites (<i>Ning</i>)</li> <li>• Blogs</li> <li>• Media sharing</li> </ul>
University of Michigan, USA	Yew, Gibson, and Teasley (2006)	Students in a database and information class use blogs and RSS as a means by which to converse, interact, and share knowledge with one another and with their instructor. The posts on their individual blogs are aggregated on a central "Class Remix" site, where they are encouraged to improve upon, change and/or integrate the group's knowledge contributions. Students tag their posts openly and in a collaboratively manner to facilitate the organization, sharing, and coordination of the group's knowledge artifacts.	The instructor teaches regular face-to-face classes and encourages students to share relevant questions, answers and observations of the material taught in the classes via the individual and class blogs.	<ul style="list-style-type: none"> <li>• Blogs</li> <li>• RSS</li> <li>• Tag-based folksonomies</li> </ul>
University of British Columbia, Canada	NMC & ELI (2007); Lamb (2007)	A masters-level course entitled <i>Text technologies: the changing spaces of reading and writing</i> uses a course blog in conjunction with RSS to aggregate and present a list of relevant Web-based resources. The feeds and resources are compiled collaboratively through the use of social bookmarking tools.	The instructor sets up the course blog and provides assistance to students on the use of the various RSS and social bookmarking tools. He also contributes resources to the collection in collaboration with his students.	<ul style="list-style-type: none"> <li>• Blogs</li> <li>• RSS</li> <li>• Social bookmarking</li> </ul>