IRRODL

THE INTERNATIONAL
REVIEW OF RESEARCH IN
OPEN AND DISTANCE LEARNING

Special Issue: Openness and the Future of Higher Education

Vol 10
No 5

November 2009

International Review of Research in Open and Distance Learning
Volume 10, Number 5. *ISSN: 1492-3831*

November – 2009

Editorial: Openness and the Future of Higher Education

David Wiley and **John Hilton III**
Special Issue Editors

Once considered to be mostly hype, the idea of open education has spread to hundreds of universities across the globe – including many of the world's most prestigious institutions. Open access to teaching and learning materials significantly empowers individuals who are not affiliated with formal educational programs and levels the playing field across competing institutions. These two occurrences – the empowering and leveling – portend significant changes in the structure and practice of higher education. The purpose of this special issue of IRRODL is to address various specific ways in which openness can affect the future of higher education.

In the opening article, Wiley and Hilton overview societal changes that decrease the alignment of higher education institutions with the supersystem in which they exist. Their paper argues that increasing institutional openness is a prerequisite to other critical changes required to keep higher education relevant in a quickly changing world.

The next two articles address potential barriers to the expanded use of OER and discuss how to address these barriers. Morgan and Carey explore how academic literacy in English can be a barrier to the use of many open educational resources. Their paper examines ways in which open courses can provide significant benefits to students of English as an Other Language. Lane identifies how technology and cultural barriers can impede the effective use of open educational resources. He proposes that the mediated use of open educational resources can help to reduce the diverse social and cultural digital divides within education.

Next, Baker, Thierstein, Fletcher, Kaur, and Emmons address how openness could impact the high prices of textbooks. They report how Rice University's Connexions and the Community College Open Textbook Project (CCOTP) have developed a proof-of-concept free and open textbook, and they identify lessons learned about open textbook use by students and faculty.

Two key issues relating to openness and higher education are credentialing and sustainability. Schmidt, Geith, Håklev, and Thierstein address the significant issue of the role higher education plays in providing credentials and certifications for learning. They discuss how social web technologies offer opportunities for learning, which build these skills and allow new ways to assess them. They make the case that a peer-based method of open assessment and recognition is a feasible option for accreditation purposes.

For openness to affect higher education, it needs to be sustainable. Friesen presents the results of an informal survey of active and inactive collections of online educational resources, emphasizing data related to collection longevity and the project attributes associated with it. He shows how OER initiatives are in danger of running aground of the same sustainability challenges that have claimed numerous learning object collection or repository projects in the past.

The last two articles address how learners interact with OER. Many OER are available, including open courses. Fini examines one such course, Connectivism and Connective Knowledge (2008), facilitated by George Siemens and Stephen Downes. He looks at the the technological dimensions of the course and its impact on the participants. Ultimately, for openness to impact higher education, learners need to be willing to use OER on a large-scale basis. How do everyday learners view open courses? In the final article, Arendt and Shelton examine how residents of the state of Utah (in the United States) view the incentives and disincentives for the use of open educational resources.

Overall, this special issue presents an excellent discussion of open education issues ranging from useful descriptions of successful projects to empirical data about user attitudes to thoughtful criticisms of present work. These criticisms are particularly valuable because so much of the extant literature about open education is almost uniformly positive in tone. We hope this special issue will help to begin a more balanced discourse about the benefits and very real challenges of open education.

International Review of Research in Open and Distance Learning
Volume 10, Number 5. *ISSN: 1492-3831*

November – 2009

Openness, Dynamic Specialization, and the Disaggregated Future of Higher Education

David Wiley and **John Hilton III**
Brigham Young University, USA

Abstract

Openness is a fundamental value underlying significant changes in society and is a prerequisite to changes institutions of higher education need to make in order to remain relevant to the society in which they exist. There are a number of ways institutions can be more open, including programs of open sharing of educational materials. Individual faculty can also choose to be more open without waiting for institutional programs. Increasing degrees of openness in society coupled with innovations in business strategy like dynamic specialization are enabling radical experiments in higher education and exerting increasing competitive pressure on conventional higher education institutions. No single response to the changes in the supersystem of higher education can successfully address every institution's situation. However, every institution must begin addressing openness as a core organizational value if it desires to both remain relevant to its learners and to contribute to the positive advancement of the field of higher education.

Keywords: Open education; online learning; distance learning; higher education

The Changing Context of Higher Education

Higher education is a dynamic, complex system embedded in an even more dynamic and complex supersystem – human society. Technological innovations have radically changed this supersystem in at least six ways that are critical for higher education to recognize and understand (Wiley, 2006). The degree of disconnection between higher education and its supersystem is even greater now than when Wiley first proposed these categories.

From Analog to Digital

The primary format of information capture and dissemination has changed from analog to digital. It is increasingly difficult to find music recorded on vinyl or movies recorded on VHS tapes because MP3s and DVDs have become the preferred formats for exchanging entertainment. Television stations in the US were recently required to abandon analog broadcasts in favor of

digital broadcasts. Printed newspapers are quickly losing ground to digital, online formats of news distribution, and some newspapers have even gone out of business (McIntyre, 2009).

From Tethered to Mobile

Activities that historically tied a person to a specific place have become more spatially accommodating. Mobile phones allow us to talk to colleagues, friends, and family without being tethered to a wall by a telephone cord. Wireless devices allow us to surf the Web, Facebook, and IM without being tethered to a wall by a network cable. Advances in battery technology allow us to talk on cell phones and use laptop computers without being tethered to a wall by a power cord.

From Isolated to Connected

The drive toward universal, real-time interconnectedness defines our time better, perhaps, than any other description. While reference lists at the end of research articles once provided a genealogy of ideas in a paper, hyperlinks now directly connect papers to the sources they cite. While TCP/IP and other protocols once allowed computers to make basic connections to one another, web services and APIs allow more sophisticated types of connections between computers. Where telegrams and letters once connected people to one another asynchronously, social networks (e.g., Facebook), VOIP services (e.g., Skype), texting, and mobile phones now connect people in real-time. People are more connected to people, content is more connected to content, and systems are more connected to other systems than ever before. And permutations of connectedness, such as people to content connections (e.g., the Web), systems to content connections (e.g., the semantic web), and people to systems connections (e.g., online package tracking), are also growing exponentially as well.

From Generic to Personal

Technology enables "mass customization" of goods and services in almost every area of life. When buying a new laptop, instead of purchasing a machine off the shelf, people commonly use an online service to pick a custom amount of RAM, a custom size hard drive, and a custom size display. Upon opening the made-to-order machine, many users select a custom wallpaper image. Likewise, when mobile phones ring in a crowded public area, each plays a different ring tone selected by its owner. Interactive websites let us customize the paint color and options on cars we're interested in purchasing. And Amazon.com, a store with literally millions of customers, makes individualized personal recommendations to each and every one of its users.

From Consumers to Creators

The tools and other means necessary to produce and distribute various cultural artifacts like books, movies, and music were once the expensive, exclusive province of the wealthy. The cost barrier to producing and distributing information and culture has almost disappeared. Word processors and print-on-demand publishing services allow anyone to publish a book and compete

with commercial publishers. Free blogging software and digital cameras commonly found in mobile phones allow anyone to become a reporter and compete with newspapers. Inexpensive video cameras and video hosting sites like YouTube allow anyone to distribute movies and compete with the big distribution houses. We no longer simply read and watch – we now write, record, and publish, too.

From Closed to Open

The economics of distributing information digitally, which make per unit distribution costs all but disappear, have enabled widespread, free sharing on a scale never before seen. The world of open source software provides users with completely free and legal replacements for the Windows operating system, Microsoft Office, Adobe Photoshop, SPSS, and other expensive software tools. Data that were once unavailable to the general public, like GIS or weather data, are now freely available in real-time or near real-time. And works that once cost hundreds or thousands of dollars, such as a set of encyclopedias or a comprehensive collection of great literature, are fully and freely available at no cost to anyone with an Internet connection.

While commercial industries have converted these technological advances into consumer benefits, thereby making customers happier and improving their own financial bottom lines, higher education has largely ignored these changes in its supersystem. In fact, rather than using headlines of "Then" and "Now," these changes can be accurately portrayed (as shown in Table 1) as the differences between higher education and the everyday lived experience of individuals in the supersystem in which higher education is embedded.

Table 1

The Differences between Higher Education and the Supersystem in which it is Embedded

Education		**Everyday**
Analog		Digital
Tethered		Mobile
Isolated		Connected
Generic		Personal
Consumers		Creators
Closed		Open

Consider the in-class experience of a typical undergraduate:

> After applying for admission to the university, registering for classes, and paying tuition (universities are *closed* unless you're approved to enter and you can afford to pay), Jay makes his way into a large, stadium seating-style room (he is *tethered* to that place and time if he wants to hear the lecture). Talking during the lecture is taboo and the professor has a strict "lids down" policy to help students focus on the course material (Jay is effectively *isolated* because even though he is surrounded by friends and peers, and wireless Internet is available across campus, he is forbidden from drawing on these resources during class). Having read his textbook and reviewed the assigned handouts (*analog* materials), Jay joins 150 other students in listening to a 50-minute lecture (every student is a *consumer* of the same *generic* information regardless of their academic preparation).

Now consider Jay's experience throughout the rest of his day:

> From his dorm room, the student center, a cafe, and a bus, Jay connects to the Internet via his laptop and mobile phone (he is *mobile*) in order to search Google for information (*digital* resources are *open* for him to freely access) relevant to tomorrow's test. Temporarily stymied, he chats with friends on the phone and by Instant Messaging (IM) to see if they can assist in his search (he is *connected* to other people). Finally finding a good source, he follows some links to explore related information (the content is *connected* to other content), ignoring material he has already mastered (reading only what is important to him *personally*). Later that evening at study group Jay shares his find with friends (*participating* in the teaching process).

The traditional distance education student suffers many of the same challenges. Consider the experience of Jane, a student at a large distance education institution.

> After applying for admission to the university, registering for classes, and paying tuition (the university is *closed* to her unless she's approved to enter and can afford to pay), Jane waits until she receives a password and permission to enroll in the university learning management system. She is not tethered in place (as she can access the course from wherever network connection is available), but she is *tethered* to a strict schedule to meet the pacing constraints of the institution. Jane remains *isolated* even from students in the same class who may live in her neighborhood (because privacy legislation doesn't allow the university to release location information to fellow students). Although some course content is available online, copyright restrictions insure that students must purchase materials encapsulated in *analog* textbooks. The course content has been prepared months or even years earlier, and even the tutor assigned to evaluate her work is not allowed to change or update the course content (every student is a *consumer* of the same *generic* information regardless of their academic preparation).

Like Jay, Jane's experience in her real life consists of access to many of the same networked resources. Despite the restrictions on access, she is able to find human and non-human resources on social networks, and by following connected links she can find updated content relevant to her course. Jane realizes she is learning material that is both interesting and relevant, but harbors a nagging fear that the material she is learning with will not be the exact knowledge that she will be tested upon on her final exam.

The Daily Divide

The well-known phrase "digital divide" describes the gulf between individuals who have access to information technology and individuals who do not have access to information technology. Like so many negative phenomena, the digital divide discriminates disproportionately against people of lower socioeconomic status.

We refer to the painful disconnection between Jay's lived experience in the real world and the artificial environment inside the classroom as the *daily divide*. Unlike the digital divide, the daily divide also discriminates against people of higher socioeconomic status. Individuals with abundant access to information and communication technologies who have habits of effective use of these technologies in information-seeking and problem-solving activities are unable to make effective use of these technologies in higher education settings like the class described above. They may, of course, choose to "go rogue" outside of class and draw upon modern technologies and their skills with the same in completing assignments outside of class, but this only serves to reinforce the feeling of disconnection and disorientation on in-class exams.

Monopoly No More

One may be tempted to respond, "Who cares about a daily divide? We're higher education! Without a college degree, they aren't going to get jobs. Whether we're responsive to changes in our environment or not, it's not like students are going to stop coming to our institutions." But higher education's historic monopoly is being challenged in each of its major functional areas: structuring and providing access to content, tutoring and learning support services, curating and providing access to research materials, acting as a hub for social activities, and awarding degrees and other credentials.

Structuring and providing access to content.

Universities once held a monopoly on access to expert faculty who selected appropriate content for a course of learning and structured a path through that content for learners. Since the advent of the Internet - and especially the popularization of open content - expert-selected and expert-structured content has become widely available to the public through sites like MIT's OpenCourseWare and Carnegie Mellon's Open Learning Initiative. Access to these materials, once the exclusive province of admitted, tuition-paying students is now available to everyone with Internet access. Other websites like Wikipedia and Connexions increase the amount of high

quality material available to the public. The university's monopoly on access to educational content is gone, and in many cases (like MIT and CMU) the universities have proactively undercut this monopoly themselves.

Tutoring and learning support services.

Universities once held a monopoly on access to teachers, tutors, and others who could answer student questions and support them academically in their learning. The advent of user-contributed websites and social media has drastically altered the equation. A student with a question can now turn to a number of free services like ChaCha, an SMS-based service to which people text their questions and receive answers. (ChaCha answered over 150,000,000 questions in its first eighteen months of service [ChaCha, 2009].) Other ways students can get answers include Yahoo! Answers, an online discussion forum where millions of people ask and answer questions, and Twitter and Facebook, where questions asked in status updates generate numerous answers in comments. Some education-specific sites provide students with the support and help they need as well. NoteCentric, NoteMesh, and ShareNotes.com help students share educational materials they create with each other (e.g., notes they take during class or while reading a book). RateMyProfessor helps students decide which professors they should take classes from, which programs they should major in, and which universities they should attend. Students' informal ratings in RateMyProfessor (more than 10,000,000 ratings as of September, 2009) have been shown to correlate significantly with the formal student evaluations completed within universities (Coladarci & Kornfield, 2007). Students do not need an academic advisor to tell them about a class – peer review can do this. The university's monopoly position in providing tutoring and other learning supports has vanished.

Curating and providing access to research materials.

The university library once held a monopoly position in collecting and providing access to high-quality research materials and guarded this access carefully by only permitting students and faculty access to its collections. Today there are high-quality research journals that publish all their papers online for anyone to read at no cost. For example, the fully open access *PLOS Biology* had the largest impact factor in its field for 2008, according to ISI. *PLOS Biology*'s impact factor for 2008 was 12.683, while the second place journal, *Biological Reviews*, had an impact factor of only 8.755. The increasing popularity of preprint archives like arXiv.org (which contains over 500,000 articles in physics, mathematics, computer science, and related areas) is also increasing individuals' free access to cutting-edge research. The university's monopoly status as provider of access to high-quality research has vanished (and in some cases, the universities themselves provide this open access to research).

Acting as a hub for social activities.

With the explosive popularity of social networks like Facebook and MySpace, little needs to be said about students' ability to find and connect with each other without a university campus acting as a mediator.

Assessing learning and awarding degrees.

Higher education once held a monopoly on the credentials that truly established a person as an expert in his field. Traditional higher education has a number of new competitors in both the online learning space (like University of Phoenix, Walden, Capella, and others) as well as in the no-tuition or very low tuition space (like University of the People, Peer to Peer University, and others). But the threat to the monopoly traditional higher education has held on degrees comes from other areas as well. In the computer science domain, for example, technical certifications from Cisco, RedHat, Microsoft, and others can prove more valuable to prospective employees than a bachelor's degree in computer science. The university's monopoly on certifying prospective employees has expired.

Traditional higher education no longer holds a *de facto* monopoly in any of its primary functional areas, as it once did. Viable alternatives exist in each and every service it provides. Worse yet for higher education, we find ourselves in a world economic climate where companies as large as General Motors and AIG are going bankrupt. And while the U.S. automotive, insurance, and banking industries have received billions of dollars in bailout funding, institutions of higher education in the U.S. have suffered double-digit budget cuts.

With no monopoly position and no bailout coming, is higher education so arrogant as to really believe itself immune to what is happening in its supersystem? Higher education is left with only one choice: innovate in order to stay relevant.

The Higher Education Response to Changes in its Supersystem

While information technology has not completely revolutionized higher education, as it has other fields, we cannot accurately claim that technology has not significantly improved parts of higher education. Administrative systems and processes have significantly improved in efficiency and effectiveness as university administrative units have moved to technology-mediated systems for processing student applications, managing course registrations, dealing with financial aid, and handling payroll and benefits.

Centrally directed administrative units can make decisions to adopt technology in order to improve services and decrease costs. However, because faculty claims academic freedom and refuses to be directed by university administration (or anyone else), teaching and learning practices on campus survive largely unscathed by changes in the supersystem.

One may be tempted to point to online classes or "e-learning" as teaching and learning's innovative response to the technological advances happening in the world outside higher education. Such a claim may have been valid in 1995 when e-learning was on the cutting edge of educational practice. However, a claim that e-learning is innovative in 2009 may be inappropriate.

As implied by phrases like "move my course online," online classes are commonly structured and conducted much like on-campus classes. Although online courses are *digital* and may be taken asynchronously from home or elsewhere (*mobile*), they are famously more *isolating* than on-campus courses, broadcast the same set of *generic* materials to all learners, who still act exclusively as *consumers*, and are *closed* behind passwords unless registration and payment demands are met. (Previous research has shown that faculty use learning management systems primarily to gain administrative efficiencies in the management of their classes and not as a means of improving teaching and learning [Mott, 2009].) While a few innovative exceptions exist, Table 2 shows that conventional online courses have only two of the six attributes we would expect from a comprehensive response to changes in higher education's supersystem.

Table 2

Characteristics of Online Classes

Online Classes		
Analog		*Digital*
Tethered		*Mobile*
Isolated		Connected
Generic		Personal
Consumers		Creators
Closed		Open

Toward a More Appropriate Response to Changes in Higher Education's Supersystem

An appropriate response to changes in higher education's supersystem should include increases in connectedness, personalization, participation, and openness. Of these four, a significant increase in openness is the most pressing priority for higher education because a culture of openness is a prerequisite to affordable, large-scale progress in the other three areas, as explained below.

Connecting and openness.

When a resource or service is closed it cannot be connected to. For example, if the student from our previous examples, Jay, wants to review material from an online course he took last semester, which is located in the university's course management system, he will be sorely disappointed. He cannot reconnect with that material because he is not registered this semester, so the course is closed to him. If Jay's professor depends on her students having learned something in the previous course and would like to link them back to that material for review before launching into a new topic in her course, she will also be sorely disappointed. The potential for connectedness within higher education is related to the degree of openness within higher education.

Personalizing and openness.

While the inability to connect without openness is a technical issue, the impediments to personalizing without openness are legal in nature. Editing, adapting, or otherwise changing educational materials to be more appropriate for a specific use is technically straightforward thanks to the variety of technologies currently available. However, as nations continue to strengthen their copyright laws, acquiring permission before making these changes to traditionally copyrighted materials becomes increasingly important. While an individual faculty member may claim that making such alterations for use within his own classroom is a "Fair Use," relying on this defense neither guarantees that the use is actually fair nor allows him to share the results of his revising effort outside his classroom. On the other hand, if the instructor starts with an openly licensed educational resource, his revisions are both legal and sharable to the wider world. The potential for personalization of educational materials, an entire course or a single resource, is directly proportional to the openness of the material's license.

Creating and openness.

After the search engines, most of the top 50 sites in Alexa's ranking of the most trafficked websites in the world are sites based on the act of sharing: sharing things like videos, status updates, photographs, personal information, files, blog posts, and other media. As recently as five years ago, very few people were producing video. And without an outlet for sharing their creative works, where was the motivation for making video? The recent emergence of YouTube, Blip.tv, and other sites open to users' contributions of videos has given individuals an opportunity to share – and therefore a motivation to create – these works. A March 2008 estimate by Wesch put the number of new videos uploaded to YouTube each day near 200,000. Just as few people produced video in the early 2000s, very few students currently produce educational materials for the classes they take. The faculty member isn't open to receiving or distributing these, and without an open outlet for these materials students have little incentive to do anything but remain passive receptacles of experts' knowledge. The degree to which people will create new works is related to the existence of open channels for the sharing of their works.

If, as we have argued, openness is the fundamental value underlying the other changes needed in institutions of higher education, the critical question becomes, "how can an institution be more open?"

Models of Openness in Higher Education[1]

A number of fledgling models of "more open" institutions of higher education exist. Perhaps the best known is MIT OpenCourseWare; this project relies on dozens of professional staff to support the openly licensed publication of primarily textual materials used in teaching MIT courses (see http://ocw.mit.edu/). While the project is grand in scale (1900 courses worth of materials have been published to date) and an inspiration to institutions and universities around the world, its exorbitant costs – $4,000,000 per year – make it a model that no other school can afford to emulate. Hundreds of other schools have begun down the OCW path, publishing a few dozen courses. Indeed, in the current economic climate we are forced to wonder about the sustainability of a $4,000,000 program that creates no revenue for the university and is targeted primarily at off-campus users.

A variety of other iterations of the MIT OCW model exist. For example, the Open Yale Courses (see http://oyc.yale.edu/) publishes video of Yale courses, accompanied by only minimal textual materials. Webcast.Berkeley (see http://webcast.berkeley.edu/), a University of California, Berkeley open education program, provides podcasts and webcasts exclusively, with no textual material at all.

A number of universities that have significant distance learning programs have begun to use a modified version of the MIT OCW model, in which materials from courses that are available for enrollment and completion at a distance are published with open licenses. The Open University of the UK, the Open University of the Netherlands, the University of California, Irvine, and Brigham Young University Independent Study all use their OCW collections to simultaneously provide a public service and market their for-pay online courses. While studies of the financial effectiveness of this model of openness are ongoing, preliminary data indicate that these projects may be financially self-sustaining (Wiley, 2009).

The Connexions project at Rice University takes a more participatory, Wikipedia-like approach. The Connexions website (see http://cnx.org/) contains openly licensed resources that can be contributed to or edited by anyone, making for a great breadth of materials available on the site (over 14,500 modules have been published). This distinguishes Connexions from other institutional initiatives as much of the content within the collection comes from outside Rice University. As with Wikipedia, concerns regarding quality have haunted the project; consequently, a new site function called *Lenses* was added, which allows users to make quality assertions about resources in the collection. Whether or not the Lenses functionality impacts user beliefs about the quality of resources in the site remains to be measured and reported.

The Carnegie Mellon Open Learning Initiative takes yet another approach. CMU OLI produces a small number of openly licensed, full online courses. These courses are highly designed and are

meant to facilitate effective learning experiences (as opposed to being simple publications of course materials). While these courses are extremely expensive to produce, they are also extremely effective in supporting student learning. A series of studies by Lovett, Meyer, and Thille (2008) demonstrated that students using the online OLI Statistics course "learned a full semester's worth of material in half as much time and performed as well or better than students learning from traditional instruction over a full semester" (p. 1). No studies yet report a comparison of potential resource savings to CMU (e.g., teaching twice as many students during a semester) with the cost of developing the courses. However, should other universities choose to use OLI courses a significant savings could be realized.

Individual faculty members who are interested in being more open do not have to wait for their institutions to launch formal initiatives. A practice known as "open teaching" is gaining ground among some faculty: see, for example, courses by Wiley (http://opencontent.org/wiki/index.php?title=Intro_Open_Ed_Syllabus), Siemens and Downes (http://ltc.umanitoba.ca/connectivism/), and Couros (http://eci831.wikispaces.com/). In open teaching, faculty publish their course materials online under an open license *before* the beginning of the course and invite others from outside their university to participate in the course together with the "official students" of the course. In many cases, all students (both tuition-paying and informal students) post their work to publicly accessible blogs for critique and discussion by the larger group. Fini and colleagues (2008), who were students in Wiley's 2007 course, provide a more detailed description of the course model and outcomes. Sometimes, course content and interaction is provided and mediated by wikis, sometimes blogs are used, and sometimes social networking sites like Ning or Facebook are used to host content and conversation.

In summary, a variety of models exist for both institutions and individual faculty to be dramatically more open in their teaching. The list presented above is by no means exhaustive. Because openness – properly construed – is a practice and not a project (Robertson, 2009), openness will manifest itself differently in different institutions as it becomes part of the core organizational culture.

Openness and the Disaggregated Future of Higher Education

We have argued above that openness is a critical attribute of the supersystem in which higher education is positioned and that higher education must therefore become more open to remain relevant to the society in which it exists. However, there are additional, tactical arguments to be made in favor of higher education becoming more open. Hagel and Brown (2005) argue that in the future successful businesses will rely on a strategy of "dynamic specialization."

> By dynamic specialization, we mean the commitment to eliminate resources and activities that no longer differentiate the firm and to concentrate on accelerating growth from the capabilities that truly distinguish the firm in the marketplace. Consequently, firms cannot simply focus on differentiation but must also shed nondifferentiating activities. (p. 54)

We have already posited that universities are comprised of at least five major functional areas, including structuring and providing access to content, tutoring and learning support services, curating and providing access to research materials, acting as a hub for social activities, and assessing learning and awarding degrees. According to Hegel and Brown, we should soon expect to see higher education institutions making difficult choices to focus on developing truly world-class expertise in one or two of these functions and outsourcing the others.

Western Governor's University (see http://wgu.edu/) is one institution that follows the path outlined by Hegel and Brown. WGU is a fully accredited university that offers no courses whatsoever; instead, it has chosen to focus on assessing learning and awarding degrees. It refers students to partner institutions when they need to take a formal course or to access library collections before taking their exams.

The Open High School of Utah (see http://openhighschool.org/), described by Wiley (2009), is another example of an educational institution that employs a version of dynamic specialization. According to the OHSU mantra of "focus on learning and outsource everything else," the school has shed its business management, HR, technology support (every student is given a laptop), learning management system hosting and support, and other functions in order to concentrate on developing its "strategic tutoring" model of teaching and its "open curriculum." School employees include only the principal, teachers, a curriculum developer, and a part-time secretary. Every individual employed by the school is focused on improving learning.

Both WGU and OHSU present potential challenges to conventional education institutions that internally bundle a number of business functions, as Hegel and Brown point out:

> By tightly bundling [many] businesses together, companies inevitably sub-optimze the performance of one or more of the businesses. The companies therefore become vulnerable to more-focused competitors that have chosen to focus tightly… More diversified companies that choose to retain these activities within their enterprise will face increasingly severe competition from companies that access these world-class capabilities from focused providers. (p. 55)

When world-class capabilities are not only provided but are provided freely and openly, the potential for innovation increases significantly. The increase in innovation is due to the decrease in transaction costs (specifically, bargaining costs) for those attempting to access these world-class capabilities because open licenses (like the Creative Commons licenses, see http://creativecommons.org/) specify the terms on which the services can be accessed and used (e.g., without cost). Lower transaction costs decrease the overall cost and risk of experimenting with various innovations, thereby increasing the number of actors capable and willing to innovate.

A number of organizations are already combining their particular business knowledge with openly available world-class educational material (like Carnegie Mellon's Open Learning Initiative courses, see http://cmu.edu/oli/) and with freely available world-class social interaction capabilities (like Facebook, see http://facebook.com/) in order to compete with traditional universities. Organizations such as Peer-to-Peer University (see http://p2pu.org/), the University of the People (see http://www.uopeople.org/), and Tech University of America (see http://www.techuofa.com/) each bring a different set of internal capabilities to their relationships with "open service providers." Open service providers are those individuals or organizations that provide access to world-class capabilities under open licenses and at lower transaction costs.

Because open service providers lower the cost and risk of educational experiments, they are a critical piece of the infrastructure necessary for enabling rapid educational innovation. It is in this sense that Wiley (2005, 2008) argued that "content is infrastructure," referring to the important role of open educational resources in enabling educational innovations. Educational experiments like the Open High School of Utah and the University of the People could not exist without a sufficiently broad, high-quality infrastructure of open educational resources to build upon. Put another way, they could not exist without open service providers like MIT OCW and CMU OLI.

Open service providers will be at the center of many future educational innovations due to their role in enabling rapid, inexpensive, low-risk experiments. Higher education must consider two issues in this regard. First, the availability of world-class capabilities from both open service providers and other organizations will create an increasingly fierce competitive climate for institutions of higher education, resulting in significant pressure on institutions to adopt a strategy of dynamic specialization. What Hegel and Brown call the "unbundling of corporations" (p. 60) we call the disaggregation of higher education. In order to resist this disassembling force, an institution will have to create and market a persuasive message about the value of learning at an institution that is, organizationally, entirely inward-looking.

Second, because open service providers will play central roles in facilitating future innovations, conventional universities and colleges must decide what role they desire to play in the evolution of higher education. (Ignoring this decision will significantly decrease their ability to proactively contribute to the conversation about the future of higher education.) If institutions want to exert a significant influence on the direction of higher education, they will likely need to become open service providers in order to maintain their central positions of influence. An institutional commitment to openness will be the ante necessary to sit at the innovation table. Institutions without some form of commitment to openness may be relegated to observer positions in which they cannot participate in creating significant innovations (because they have no meaningful open service to offer).

Conclusion

Openness is the fundamental value underlying significant changes in society and is a prerequisite to changes institutions of higher education need to make in order to remain relevant to the supersystem in which they exist. There are a number of ways institutions can be more open,

including programs of open sharing of educational materials. Individual faculty can also choose to be more open without waiting for institutional programs. Increasing degrees of openness in society coupled with innovations in business strategy like dynamic specialization are enabling radical experiments in higher education and exerting increasing competitive pressure on conventional higher education institutions.

No single response to the changes in the supersystem of higher education can successfully address every institution's situation. However, every institution must begin addressing openness as an organizational value if it desires to both remain relevant to its learners and to contribute to the positive advancement of the field of higher education.

References

ChaCha. (2009). *ChaCha answers 150 million questions in 18 months*. Retrieved from http://partners.chacha.com/2009/06/15/chacha-answers-150-million-questions-in-18-months/.

Coase, R. (1937). The nature of the firm. *Economica, 4*(16), 386-405.

Coladarci T., & Kornfield, I. (2007). RateMyProfessors.com versus formal in-class student evaluations of teaching. *Practical Assessment, Research and Evaluation, 12*(6). Retrieved from http://pareonline.net/getvn.asp?v=12&n=6.

d'Oliveira, C. (2009). *Why donate?* Retrieved from http://ocw.mit.edu/OcwWeb/web/donate/invest/index.htm.

Eysenbach, G. (2006). Citation advantage of open access articles. *PLoS Biol, 4*(5), 157. doi:10.1371/journal.pbio.0040157

Fini, A., Formiconi, A., Giorni, A., Pirruccello, N., Spadavecchia, E., & Zibordi, E. (2008). IntroOpenEd 2007: An experience on Open Education by a virtual community of teachers. *Journal of e-Learning and Knowledge Society, 4*(1), 231-239. Retrieved from http://www.je-lks.it/en/08_01/11Apfini_en.pdf.

Lovett, M., Meyer, O., & Thille, C. (2008). The Open Learning Initiative: Measuring the effectiveness of the OLI statistics course in accelerating student learning. *Journal of Interactive Media in Education.* Retrieved from http://jime.open.ac.uk/2008/14.

Mott, J. (2009, July 24). Deja vu all over again – Blackboard still stuck in the innovator's dilemma. [Web log post]. Retrieved from http://www.jonmott.com/blog/2009/07/deja-vu-all-over-again-blackboard-still-stuck-in-the-innovators-dilemma/.

Robertson, J. (2009, September 9). Open education: Project or process and practice? [Web log post] Retrieved from http://blogs.cetis.ac.uk/johnr/2009/09/09/open-education-project-or-process-and-practice/.

McIntyre, D. A. (2009, March). The 10 most endangered newspapers in America. *Time*. Retrieved from http://www.time.com/time/business/article/0,8599,1883785,00.html.

Wesch, M. (2008). *YouTube statistics*. Retrieved from http://mediatedcultures.net/ksudigg/?p=163.

Wiley, D. (2005, November 4). Content is infrastructure [Web log post]. Retrieved from http://opencontent.org/blog/archives/215.

Wiley, D. (2008, November 26). Content IS infrastructure (Welcome to the club, Chris) [Web log post]. Retrieved from http://opencontent.org/blog/archives/672.

Wiley, D. (2009, August 3). July BYU IS OCW update [Web log post]. Retrieved from http://opencontent.org/blog/archives/999.

1 Much has been written elsewhere about open access to research articles (e.g., Eysenbach, 2006). We mention this work for the sake of completeness, but the focus of this paper is on open access to educational resources.

International Review of Research in Open and Distance Learning
Volume 10, Number 5. *ISSN: 1492-3831*

November – 2009

The Impact of Openness on Bridging Educational Digital Divides

Andy Lane
The Open University, UK

Abstract

Openness has been a feature of higher education for many decades, particularly through the establishment of open universities, although there remain debates about what openness means in practice. Digital technologies, some based on open principles, and digital content, aided by open licences, have both contributed recently to an extension of what is deemed possible under the heading of openness. Nevertheless, while in principle there may be greater degrees of openness available in higher education it does not mean in practice that many people can still readily avail themselves of these new opportunities to learn, not just because they do not have access to digital technologies but personal circumstances mean they also lack the necessary skills and the confidence to use such technologies in general or for education in particular. In fact it can be argued that this new openness, characterised mainly through the open educational resources movement, may actually widen rather than bridge the digital and educational divides between groups, both within and across national boundaries, through the increasing sophistication in technologies and the competencies expected of learners. This paper reviews some of the evidence supporting these different areas of interest and attempts to provide a synthesis of them. It then argues that actions may be required by many inter-mediaries to help to reduce the diverse social and cultural digital divides within education, including through the mediated use of open educational resources between teachers and learners.

Keywords: Open learning; higher education; e-learning

The Origins of Openness in Higher Education

The discourse around the role of openness in higher education can be said to have seriously started with the inception of the United Kingdom Open University (UKOU) in 1969. While the use of distance teaching methodologies predates this by a century (e.g., the University of London's External degree programme), it was the UKOU that was first named an open university (Tait, 2008). While the choice of the title was a collective one, it was the UKOU's first chancellor, Lord Crowther, who first gave meaning to what openness might mean for the UK Open University (and possibly other open universities) when he said it would be open as to people, places, methods, and ideas in his inaugural speech. This is still reflected in its mission

(The Open University, 2009), although how these open universities and openness in general is interpreted in practice has changed and is changing further with the advent of open educational resources (OER). This is discussed briefly below and is described in more detail by Gourley and Lane (2009). However the plurality of possible meanings for openness implied in this one institutional case is still reflected today across the wider open and distance learning (ODL) movement (Anderson, 2009), with many attempts to define the essential characteristics of open learning, open schooling, or open education (but rarely it seems open teaching). In many cases, distance teaching universities are found wanting on many aspects of openness as defined by different authors.

While not repeating these debates in this article a notable trend amongst open universities and other universities employing distance teaching methodologies alongside campus-based teaching has been the move away from a discourse based on distance teaching or education to one of open and/or distance learning. In contrast, the principle of open access as a major aspect of openness ('open as to people'), whereby no previous educational qualifications are required before registering on an undergraduate course, and a central feature of the UKOU's operation, is by no means universally adopted by other open universities, despite some having been helped in their own establishment and development by the UKOU. A possible reason for this is that while the ideals of openness in higher education or learning have often been focused around the open universities, the latter have been very much state-led interventions as described in some detail by Tait (2008). Many of these state-led interventions have been intended to fit or not within the prevailing social and higher education systems in their respective countries, often raising particular issues of 'comparability' with campus-based educational institutions.

The New Openness for Higher Education in the 21st Century

Achieving openness in higher education can be difficult and is not helped by the fact that definitions and names can quickly multiply and become confusing. Open learning, distance learning, supported self-study, informal adult learning, home study, e-learning, lifelong learning and flexi study to name but a few have all been used in different ways to describe certain facets of the act of learning in higher education in the past 40 years. Whereas, as argued above, ideas of openness largely centred on ODL institutions in the late 20th century, since the beginning of the 21st century we have had the rise to prominence across all HE institutions (and beyond) of additional names and ideas to conjure with, such as open content (Wiley & Gurrell, 2009), open courseware (Carson, 2009), and open educational resources (Casserly & Smith, 2008; Caswell, Henson, Jensen, & Wiley 2008), all based upon open licensing (Bissell, 2009) and driven by the emergence and spread of digital technologies. And in contrast to open universities, these open movements have mostly not been state interventions but have arisen through the acts of institutions themselves and wider communities sponsored by philanthropic foundations, although some governments are beginning to take note of these movements (Kumar, 2009).

This diversity of old and new names involving openness reflects the diversity of provision and modes of study that are emerging, and at times debates solely about such names and definitions can become sterile. What is more important is to understand the *principles* upon which a more

open educational provision should be based, principles that seem to mainly address a fundamental right of access to education on the part of all, but that also examine the *practicalities* of providing more open systems, as addressed by many authors in Ilyoshi and Kumar (2008).

The Promise of Open Educational Resources

A good illustration of the tensions between principles and practicalities is shown by open educational resources (the most widely used term for the openly licensed content and tools being used specifically for educational purposes).

Openness, when looked at in terms of OER, is centrally concerned with freedoms as expressed in the open licences applied to them:

- freedom from paying any money to access and use the content for specified purposes,
- freedom to copy and make many more copies,
- freedom to take away and re-use without asking prior permission,
- freedom to make derivative works (but not necessarily freedom to make profits from them).

So, openness can be equated with freedoms, but the degrees of freedom available within a particular openness can vary (as seen in the spectrum of Creative Commons licences themselves) and can be influenced by many other factors beyond the licence and particularly how potential users perceive their openness. For example, the UKOU's work with the BBC has meant that educational radio and TV programmes associated initially with courses have been openly available (free to view at first then free to record when technology allowed) through terrestrial public service broadcasting in the UK ever since the Open University began teaching in 1971. Thus, people have had the freedom to access and to copy this particular copyrighted content using video recorders for personal use but not the freedom to use what they record for educational or public performance purposes without a licence or prior permission.

In attempting to cover both principles and implications for practicalities, Schaffert and Geser (2007) have set out four dimensions of openness for OER, which are heavily influenced by digital technologies and where they feel that all dimensions need to be present for maximum openness (Figure 1). For example, a document written with MicroSoft Word™ can easily be shared, copied, and altered if it has an open licence but it does mean that you as the author and others re-using it have to have purchased proprietary software to do so. It is still early in the OER movement, but the evidence to date points to a change in the dynamics of adult learning, between teachers and learners and between formal higher education and informal adult learning, as this new range of openness becomes more widespread (McAndrew et al., 2009). What is almost certain is that there are now more educational resources potentially available to many more people than there have ever been before.

Figure 1 illustrates the meaning of 'open' in open educational resources (Schaffert and Geser, 2008).

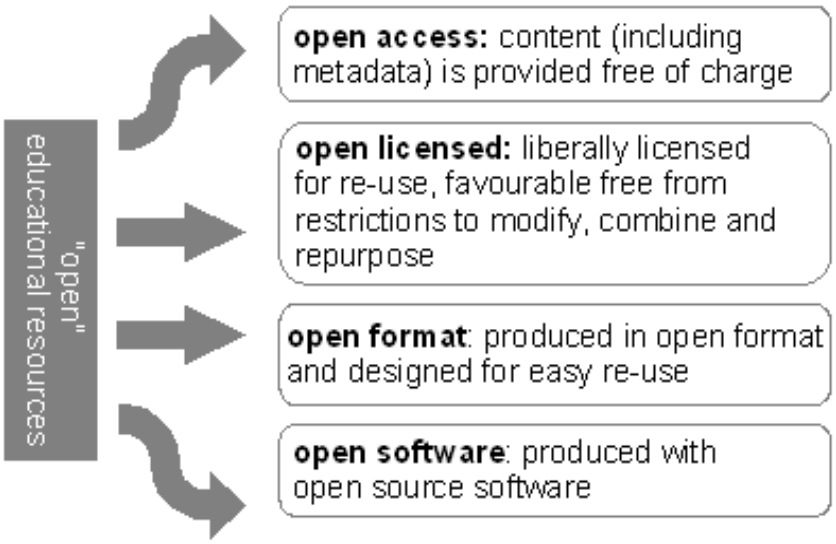

Figure 1. The meaning of *open* in open educational resources.

The Impact of Digital Technologies

This brief review of openness suggests that digital technologies, in the form of open content, open licences, open formats, and open software, are expanding the potential for addressing some of the barriers to education. And yet there is still considerable concern over a growing digital divide in terms of the availability and accessibility of the digital devices for using these developments for educational purposes.

The advent of digital technologies and their use within e-learning schemes has also opened up further possibilities for open learning by increasing the scope for much more non face-to-face, two-way interaction and collaboration between groups of learners and their teachers. At the same time the availability, affordability, accessibility, and acceptability of this mode of teaching and learning is extremely variable, with socially excluded groups or communities being those who do not have much access to such technologies, who may find few opportunities available to them in their circumstances, and who are worried that they cannot cope with these new technologies and ways of learning. In other words they do not feel included even when people are trying to reach out to them because they lack confidence in their competence to succeed – they feel disempowered.

Open educational resources on their own offer little respite to the barriers noted above. Yes, in principle, they are cost-free to the learner and do not require any prior qualifications. They may enable some to study materials on their own without any social or cultural pressures. But they often require computers and Internet access unless someone can produce low or no-cost hard copies instead, a problem that is often exacerbated in rural/remote locations.

Educational Divides and Excluded Communities

Before talking further about the role of digital technologies and the educational digital divide it is important to acknowledge the significant educational divide that already exists, especially for higher education. Certain societal groups or communities may be excluded from current educational provision for a variety of reasons. Within higher education some or all of the following may be barriers to particular groups and communities engaging with available provision (Lane, 2008a):

- Geographical remoteness, even in rural areas of small countries;
- Cultural norms, with some ethnic cultures not supporting the education of women in particular circumstances, for instance (Khokhar, 2008);
- Social norms, whereby some family groups or communities do not value education as highly as others, so discouraging engagement;
- Prior achievements, such as prior qualifications being used as a filter related to accessing a scarce resource or to maintaining an individual institution's social and cultural status;
- Individual or household income, where the relative cost of accessing higher education by certain groups is very high;
- Digital divide, in that although computers and the Web offer many freedoms, they still cost money to access, and people with less money may not easily afford such technology and may even find that the absolute cost to them is higher than to other groups because they are seen as a greater financial risk to a technology provider;
- Physical circumstances, whereby there may not be any easy places to undertake the learning due to lack of a home, space in a home, or having a particular type of home, such as a prison, and similarly, people with certain disabilities may need specialist equipment or support (Cooper, Lowe, & Taylor, 2008);
- Individual norms, where a person is constrained by social and cultural norms – attitudes and beliefs – that they are not capable or not good enough to study at this level, as may be the case with older people (Martin, 2009).

This is a formidable set of barriers, with possibly the last one being crucial as without the intent to learn at this level, the other barriers may be perceived rather than real. Indeed, Norris (2001) argued that the use of new technology can be understood as the product of resources (time and money), motivation (interest and confidence) and the structure of opportunities (such as social, cultural, and political networks). Many studies have investigated the complexity of how different groups in particular societies may use digital technologies (e.g., Van Dijk & Hacker, 2003), and it does not take much to imagine the plight of migrant or displaced people who may have to cope with different systems of provision, different expectations, and a different language to that of their home country.

Digital Skills, Digital Contexts, and the Digital Divide

Much of the digital divide debate concerns the fact that some groups or people in societies have differing access to new digital technologies, which is in effect an economic divide created by relative purchasing power. However, many have raised the issues of usability of the digital technologies and empowerment being other socially dividing factors (Norris, 2001; Van Dijk & Hacker, 2003; Nielsen, 2006), and others have looked at this specifically for education (Enoch & Soker, 2006).

The economic divide has mainly focused on access to personal computers, whether desktop or laptop machines. But with greater types of digital devices (particularly mobile devices) becoming available, with more computing power and accessibility to communication networks, and with the ever declining cost of computing and communication services, this is probably not the most pressing long-term issue for the educational divide. The growing availability, affordability, and accessibility of digital devices that can be used for educational purposes means that teachers can plan more confidently knowing that their students will not be so greatly disadvantaged and in some cases certain groups, such as the visually impaired, may be better served than with nondigital technologies (Cooper, Lowe, & Taylor, 2008).

The usability divide or usage gap refers to the technology being too complicated to use or requiring sophisticated skills and competencies to use for particular purposes. In other words, how adept are people at using the technology and conversely how simple has the technology been made to use by those creating it? This issue is often discussed through the topic of digital literacy (or fluency). The most quoted definition of digital literacy is that of Gilster (1997): "... the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers."

But as noted in Newrly and Veugelers (2009), Stayaert has expanded this to encompass instrumental skills (simple actions to control features and programmes on the digital device), structural skills (dealing with information being managed using the features and programmes), and strategic skills (applying the instrumental and structural skills in creative and reflective ways). A similar focus on skills within digital literacy is seen in this definition from Martin (2006):

> Digital literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse and synthesise digital resources, construct new knowledge, create media expressions, and communicate with others in the context of specific life situations, in order to enable constructive social action, and to reflect upon this process.

Much of this discussion about digital literacy revolves mainly around a modern day skill set that relies on digital technologies or tools, but does not specify the full nature of these skills nor their

role in relation to educational literacy or learning how to learn (Selwyn & Facer, 2007). To simplify, both self-communication (learning) and person(s) to person(s) communication involves the manipulation of words, numbers, sounds, 'symbols and pictures' mediated by the technologies being used (or not) as aids to the process. Words can be as speech or written text, and the skill of understanding (aka listening/reading) or manipulating them (speaking/writing) are known as articulacy and literacy. Similarly, symbols and pictures, static or dynamic, involve a skill set known as graphicacy.

Putting aside this terminology for a moment, the general issues around these skills are with being able to be a participant in society. It is being able to participate in everyday life and work either because you can understand/interpret/enjoy the communicative outputs of others and/or because you can make your own outputs that others can understand/interpret/enjoy. The most interesting developments for education are how technology defines and/or shapes which mode of ***acy is used and who is able to use it (effectively). Digital technologies are changing the ability to produce and share graphical representations such that they are becoming a serious area of research and activity (despite the practice being hampered by no agreed grammar for such outputs). Similarly, video use has been even more influenced by digital technology so that the skills of producing and interpreting such outputs are more widespread and more familiar than ever. The argument being made is that digital technologies are not only changing the medium and practice of communication but also the predominant form of expression within that medium. If so, how competent do we all need to be in these different ***acies and in the technologies that enable us to participate (if we want to) in that particular form of communication and collaboration? Such questions apply as much to teachers as to learners since both need to be equally comfortable with the technology and the practices it supports.

As noted previously, the advent of digital technologies and their use within e-learning or blended learning schemes has opened up further possibilities for open learning by increasing the scope for more non face-to-face, two-way interaction and for forms of collaboration between groups of learners and their teachers. At the same time the *availability* (physical access), *accessibility* (usability), and *acceptability* (social empowerment) of this mode of teaching and learning is extremely variable. Socially excluded groups or communities, who do not have much access to such technologies, may find few opportunities available to them in their circumstances and may worry that they cannot cope with these new technologies and ways of learning (Kirkwood, 2006a; 2006b). To reiterate, they do not feel included even when people are trying to reach out to them because they lack confidence in their competence to succeed.

This disempowerment can be viewed as excluded communities having few, if any, degrees of freedom to engage with open learning. The contrast here is between the discourse and practice of making educational materials, activities, and opportunities as open as possible by certain groups in societies and with the freedoms that are embodied within the different types of openness. One example is the practice of open access to undergraduate courses where no prior qualifications are needed to register – that is students have freedom from discrimination on the basis of prior achievement. However open access does not mean that the course is free of cost or that there are no constraints to the freedom of when the course can be studied and assignments submitted.

Another example is open educational resources where there is much greater freedom around cost (they are free to access although there may be costs to being online) and time of study (they can be studied at any time as long as they are available and accessible by the user, i.e., they can get online). These freedoms are made more possible with digital resources as they can be accessed simultaneously by many people and infinitely replicated. As noted earlier, both the relative abundance of and non-destructive through consumption attributes of a digital resource means that issues of physical scarcity no longer apply.

The Inter-Mediation of Teaching and Learning

Formal education is a structured set of activities where a key element is the interactions between teachers and learners and between fellow learners, interactions that are supported by educational content (e.g. textbooks, course notes, assignments) and learning resources (e.g. whiteboards, laboratory equipment, virtual learning environments). In this triangular relationship between teachers, learners, and resources, it is mainly teachers that select and/or develop the set of resources and activities that learners are expected to engage with. As argued by Lane (2008b), teachers attempt to mediate the interactions between the students and the resources (or inter-mediate), acting as an expert and/or a guide to the learning process. Of course this simple model ignores the wider and variable social and cultural settings for these activities, e.g., the other people who can be a part of the educational relationship, such as librarians, mentors in work-based settings, and technical support staff. Nevertheless, such inter-mediation in structured settings is dominated by a largely closed, face-to-face presence model rather than an open and distance mode, but it is still a feature of ODL systems. Openness rarely extends to offering completely unfettered choices to the learners on what to study, when, how, and where; although, there are some emerging community-based operations on the Web, such as Wikiversity and the Peer-to-Peer University (Thierstein, Schmidt, & Håklev, 2009).

Under this view of education, if learners are to effectively engage with formal educational opportunities then that process is normally mediated by the structuring of the educational resource by teachers, the learners' own capabilities, the inputs of fellow learners, and the interventions of professional teachers/support workers (Lane, McAndrew, & Santos, 2009; McAndrew et al., 2009). Openness, in the form of OER, may impact on not only this formal education but also much informal education. Firstly, digital resources and digital environments can substitute for physical resources and physical environments, but inevitably they are different and the need to learn and understand how to create, navigate, and use such resources must not be underestimated. The digital educational divide can mean that some learners are much more sophisticated users of digital technology for learning than their (subject-focussed) teachers, while such fluency (or not) with the technology can exacerbate the educational divide as modes of communication, collaboration, and computation multiply or become more sophisticated. Secondly, the very openness of an OER means that learners have much more access to structured content without the other structuring provided by intermediaries such as teachers. While such wide and free access may be good in principle, in practice it may be difficult for less sophisticated learners to make good use of them without direct support from intermediaries.

So, while openness within education and the use of open educational resources have the potential to reduce inequalities in the educational divide, the already existing digital divide may be exacerbated. In particular, the availability, accessibility, and acceptability of this mode of teaching and learning is extremely variable, with socially excluded groups or communities being those who do not have much access to such technologies, who may find few opportunities available to them in their circumstances, and who are worried that they cannot cope with these new technologies and ways of learning. In other words, it is the social and cultural factors that may be more important than the economic ones. In such cases of disempowerment, there must be appropriate social and cultural support for the prospective learner to help reduce or remove these disempowering conditions. As Wilson (2008), Selwyn, and Facer (2007) and McAndrew et al. (2009) argue, interventions need to recognise and draw upon existing networks within communities, using local champions to develop skills and confidence, and allow people to make an informed choice about their learning and their use of digital technologies for that learning.

Conclusions

Divisions between people arise through a combination of many factors – social, cultural, geographical, attitudinal, political, and economic. Digital divides and educational divides are no different. In terms of the educational digital divide, this article has argued that it is the teachers' and the learners' contexts, their motivations and fluency in digital and educational skills, and the support provided by intermediaries that matter most in bridging the gaps. Openness as a philosophy is also important but something being freely available (e.g., open access, open educational resources, etc.) is insufficient to enable many people to successfully engage with a more open educational provision. This article has also argued that it is how that openness is instantiated or structured to meet the particular needs of excluded groups that makes the difference, with mediation between the various actors in the teachers' and learners' contexts (that is third parties who support either or both) being a necessary element.

References

Anderson, T. (2009, January 15). On open, distance, e-learning and other name confusion [Web log post]. Retrieved from http://terrya.edublogs.org/2009/01/15/on-open-distance-e-learning-and-other-name-confusion/.

Bissell, A. N. (2009). Permission granted: Open licensing for educational resources. *Open Learning: The Journal of Open and Distance Learning, 24*(1), 97-106.

Carson, S. (2009). The unwalled garden: Growth of the OpenCourseWare Consortium, 2001-2009. *Open Learning: The Journal of Open and Distance Learning, 24*(1), 23-29.

Casserly, C., & Smith, M. (2008). Revolutionising education through innovation: Can openness transform teaching and Learning? In T. Ilyoshi & M.S. Vijay Kumar (Eds.), *Opening up education: The collective advancement of education through open technology, open content, and open knowledge* (pp. 261-276). Cambridge, MA: MIT Press.

Caswell, T., Henson, S., Jensen, M., & Wiley, D. (2008). Open educational resources: Enabling universal education. *The International Review of Research in Open and Distance Learning, 9*(1). Retrieved from http://www.irrodl.org/index.php/irrodl.

Cooper, M., Lowe, T., & Taylor, M. (2008). Access to mathematics in web resources for people with a visual impairment: Considerations and developments in an open and distance learning context. In K. Miesenbergeret et al. (Eds.), *ICCHP 2008, LNCS 5105* (pp. 926-933). Berlin: Germany: Springer-Verlag.

Enoch, Y., & Soker, Z. (2008). Age, gender, ethnicity and the digital divide: University students' use of web-based instruction. *Open Learning: The Journal of Open and Distance Learning, 21*(2), 99-110.

Gilster, P. (1997). *Digital literacy*. New York: John Wiley.

Gourley, B., & Lane, A. (2009). Re-invigorating openness at The Open University: The role of open educational resources. *Open Learning: The Journal of Open and Distance Learning, 24*(1), 57-65

Huijser, H., Bedford, T., & Bull, D (2008). OpenCourseWare, global access and the right to education: Real access or marketing ploy. *The International Review of Research in Open and Distance Learning, 9*(1). Retrieved from http://www.irrodl.org/index.php/irrodl.

Ilyoshi, T., & Vijay Kumar, M.S. (2008). *Opening up education: The collective advancement of education through open technology, open content, and open knowledge*. Cambridge, MA: MIT Press.

Khokhar, B. (2007, September). *Widening Participation: How can new technologies best be used to enhance learning and teaching and ensure educational inclusion and engagement for excluded groups?* Paper presented at the 12th Cambridge International Conference on Open and Distance Learning, Cambridge, UK. Retrieved from http://www2.open.ac.uk/r06/conference/.

Kirkwood, A. (2006a). Getting networked learning in context: are on-line students' technical and information literacy skills adequate and appropriate? *Learning, Media and Technology, 31*(2), 117-131.

Kirkwood, A. (2006b). Going outside the box: Skills development, cultural change and the use of on-line resources. *Computers & Education, 47*, 316-331.

Kumar, M.S. V. (2009). Open educational resources in India's national development. *Open Learning: The Journal of Open and Distance Learning, 24*(1), 77-84.

Lane, A.B. (2008a). Am I good enough? The mediated use of open educational resources to empower learners in excluded communities. *Proceedings of 5th Pan Commonwealth Forum on Open and Distance Learning*. Retrieved from http://www.wikieducator.org/PCF5/Governance_and_social_justice.

Lane, A.B. (2008b). Who puts the education into open educational content? In R. N. Katz, (Ed.), *The tower and the cloud: Higher education and information technology revisited* (pp. 158-168). Boulder, Colorado: Educause.

Lane A.B., McAndrew, P., & Santos, A. (2009). The networking effects of OER. *Proceedings of ICDE 2009 Conference*. Retrieved from http://www.ou.nl/Docs/Campagnes/ICDE2009/Papers/Final_Paper_279Lane.pdf.

Martin, A. (2009). Digital literacy for the third age: Sustaining identity in an uncertain world. *eLearning Papers, 12*. Retrieved from http://www.elearningpapers.eu/index.php?page=doc&doc_id=13518&doclng=6&vol=12.

McAndrew, P., Santos, A., Lane, A., Godwin. P., Okada, A., Wilson, T., Connolly, T., Ferreira, G., Buckingham-Shum, S., Bretts, J., & Webb, R. (2009). *OpenLearn research report (2006-2008)*. Retrieved from The Open University website: http://oro.open.ac.uk/17513/.

Nielsen, J. (2006). *Digital divide: The three stages*. Retrieved from http://www.useit.com/alertbox/digital-divide.html.

Norris, P. (2001) *Digital divide: Civic engagement, information poverty and the internet worldwide*. Cambridge, UK : Cambridge University Press.

Schaffert, S., & Geser, G. (2008). Open educational resources and practices. *eLearning Papers,*

7. Retrieved from http://www.elearningpapers.eu/index.php?page=doc&doc_id=11198&doclng=6&vol=7.

Selwyn, N., & Facer, K. (2007). *Beyond the digital divide - Rethinking digital inclusion for the 21st century*. Retrieved from Futurelab website: http://www.futurelab.org.uk/resources/documents/opening_education/Digital_Divide.pdf.

Tait, A. (2008). What are open universities for? *Open Learning: The Journal of Open and Distance Learning, 23*(2), 85-93.

The Open University (2009). *About the OU: Our mission*. Retrieved from http://www.open.ac.uk/about/ou/p2.shtml.

Thierstein, J., Schmodt, P., & Håklev, S. (2009, August). *P2P University: Beginning the journey*. Paper presented at the OpenEd 2009 Conference, Vancouver, Canada. Retrieved from http://openedconference.org/archives/414.

Van Dijk, J., & Hacker, K. (2003). The digital divide as a complex and dynamic phenomenon. *The Information Society, 19*(4), 315-326.

Veugelers, M., & Newrly, P. (2009). How to strengthen digital literacy? Practical examples of a European initiative "SpreaD." *eLearning Papers, 12*. Retrieved from http://www.elearningpapers.eu/index.php?page=doc&doc_id=13522&doclng=6&vol=12.

Wiley, D., & Gurrell, S. (2009). A decade of development. *Open Learning: The Journal of Open and Distance Learning, 24*(1), 11-21.

Wilson, T, (2008). New ways of mediating learning: Investigating the implications of adopting open educational resources for tertiary education at an institution in the United Kingdom as compared to one in South Africa. *The International Review of Research in Open and Distance Learning, 9*(1). Retrieved from http://www.irrodl.org/index.php/irrodl.

International Review of Research in Open and Distance Learning
Volume 10, Number 5. *ISSN: 1492-3831*

November – 2009

Open Textbook Proof-of-Concept via Connexions

Judy Baker
Foothill College, USA

Joel Thierstein
Rice University and Connexions, USA

Kathi Fletcher, **Manpreet Kaur**, and **Jonathan Emmons**
Connexions, USA

Abstract

To address the high cost of textbooks, Rice University's Connexions and the Community College Open Textbook Project (CCOTP) collaborated to develop a proof-of-concept free and open textbook. The proof-of-concept served to document a workflow process that would support adoption of open textbooks. Open textbooks provide faculty and students with a low cost alternative to traditional publishers' textbooks and can help to make higher education more affordable. Connexions provides a publishing platform for open textbook projects. The CCOTP acted as a liaison between community college faculty, open textbook authors, and Connexions. Challenges to the production and adoption of open textbooks include 1) faculty members' and students' expectations of high production quality and ancillaries for open textbooks, 2) methods for documenting and maintaining control over various versions, and 3) the process of converting existing open content to digital and accessible formats. Connexions holds promise as a means to overcome these challenges.

Connexions identified lessons learned about open textbook production, such as the importance of a style guide, the advantage of assembly-line workflow, and the importance of naming conventions and standard math authoring tools. Connexions also identified lessons learned about open textbook use by students and faculty, e.g., the value of availability and customizability, the importance of interactivity, the difference in how faculty and students view modularity, and the importance of textbook reading navigational aids. The authors note that the CCOTP recommends using Connexions as the common repository for open textbook content in an effort to provide greater national and international access.

Keywords: Open textbook; Connexions; open educational resources; OER; repository; community college

Open Textbooks

Community colleges educate 44% of the nation's undergraduates and 50% of the nation's teachers. For many of those students, affordability is critical. They may be the first generation in their family to attend college and often work while going to school. The high cost of textbooks presents a barrier to college for many of them. Solutions to this problem have been proposed and even legislated but no one solution will be adequate to fully address this complex issue. In the absence of meaningful solutions by colleges, some students are resorting to behaviors that undermine academic integrity (Young, 2008). Furthermore, some educators are frustrated by the tedious process of producing their own published textbooks as well as by copyright restrictions on content that is freely available via the Internet (Baker, 2005). They yearn for an easier way to customize learning content for their students (Buczynski, 2007). During 2008, the Community College Consortium for Open Educational Resources (CCCOER) collaborated with Rice University's Connexions to address the high cost and intractable nature of traditional textbooks with a proof-of-concept open textbook.

CCCOER was established by the Foothill-De Anza Community College District in July 2007 and its membership is now made up of 93 community colleges in the U.S. and one in Ontario, Canada. The primary goal of CCCOER is to identify, create, or repurpose existing open educational resources (OER) as open textbooks and to make them available for use by community college students and faculty. From 2007 through 2008, Foothill-De Anza Community College District conducted a nationwide survey of 1,203 faculty members (Baker, 2008). The study findings indicate a large gap between those willing to use open educational resources (OER) in their classes (91%) and those actively using OER (34%). The dual challenges of locating and inspiring the use of fully vetted, high-quality OER and open textbooks targeted for community college students and faculty contribute to this gap.

The Community College Open Textbook Project (CCOTP) was launched in March 2008 to address this gap between willingness and action. The CCOTP was funded by The William and Flora Hewlett Foundation as a one- year feasibility study in partnership with the Foothill-De Anza Community College District, the Monterey Institute for Technology and Education, Rice University's Connexions, University of California College Prep, Flat World Knowledge, California State University System's Digital Marketplace, the Institute for the Study of Knowledge Management in Education, the High Tech Center Training Unit, and the Student Public Information Research Group. The aim of the CCOTP was to identify and study sustainable models for promoting the development and use of open textbooks at community colleges, to document sustainable workflow approaches for producing, maintaining, and disseminating open textbooks, and to centralize critical open textbook information for use by community college professors and other interested parties.

Raising the awareness and knowledge of faculty, administrators, and staff about open textbooks and open educational resources presented a major challenge for the CCOTP, especially when the use of expensive traditional textbooks is deeply ingrained as normative in institutional processes. Existing processes at many colleges and universities assume that instructors prefer to adopt

publishers' traditional textbooks with the consequence that those who seek alternatives are not as well supported by the institution. By gaining administrators' buy-in to the CCCOER, institutional support for use of open textbooks is more likely. An outcome of the CCCOER and its CCOTP is increased awareness of viable alternatives to expensive traditional textbooks. And as the use of open textbooks becomes more normative and legitimized, colleges will find it easier to establish articulation agreements that honor transfer of courses that use open textbooks.

The CCOTP identified several challenges to the production and adoption of open textbooks: 1) faculty members' and students' expectations of high production quality and ancillaries for open textbooks, 2) methods for documenting and maintaining control over various versions, and 3) the process of converting existing open content to digital and accessible formats.

Often publishers' textbooks are inappropriate for use in community college courses because they contain far more information than is actually needed, or they contain generic information that lacks regional, local, or cultural relevance to diverse community college student populations. Faculty who have become familiar and comfortable with the idea of using open textbooks as a result of the CCOTP have the option of customizing the learning materials to best suit their own teaching style and any unique needs of their students. This means that students are only using the parts of a textbook that are relevant to their own studies.

Open textbooks are available in a variety of digital formats, which can lower educational costs for students without having a negative impact on learning (Annand, 2008). Additionally, open textbooks, by their very nature, can be vetted by the entire community of college faculty as well as by academics researching effective teaching materials. Making information available about open textbooks, however, requires new models. The CCOTP contributes to an efficient use of resources at college, district, region, and system levels by providing just such a trusted clearinghouse where community college faculty, staff, and administrators can find information related to open textbooks. This saves stakeholders the time and effort of culling through an ever-increasing list of websites that make questionable claims about providing high-quality free learning content.

In *Opening Up Education*, Casserly and Smith (2008) contend that in addition to free and open access, the capacity to reuse and remix open content distinguishes it from other content that is now readily available via the Internet. They state:

> Fully open educational resources provide a license that grants permission to users not only to read the material but also to download, modify, and post it for reuse. Users are empowered to change the materials to meet their own needs. They can mix and remix. The capacity and right to reuse materials is an important step in providing users all over the world the opportunity to actively participate in the open education resources teaching and learning processes. It creates the opportunity for the localization of the materials, where users tailor materials according to their

> language and culture, and for personalization, where materials can be adapted and modified for individual learners. Reuse also makes possible continuous cycles of improvement of educational materials as users quickly provide critical reactions and evaluations to developers of the quality and effectiveness of the materials. These fast feedback loops of users and developers create an environment for the improvement of content similar to the environment of open source software. (p. 262)

Key to successful and sustained use of open textbooks by educators is a viable tool for college educators to develop, customize, and disseminate learning content for use in the classroom. Connexions at Rice University provides an effective means for educators to contribute and to share open textbooks. Connexions distinguishes itself from other learning content repositories by providing authors with a way to copy, to customize, to share, and to disseminate open textbooks rather than merely providing access.

Connexions

Founded in 1999 at Rice University, the Connexions repository (see http://cnx.org) provides an effective means for educators to create, modify, share, and disseminate open textbooks under the Creative Commons Attribution license. Connexions repository is a globally accessible and permanent collection of openly available educational content. Use of content posted to Connexions is free for instructors or students to view, to repurpose, or to download as a PDF, including entire textbooks. Connexions provides a complete publishing platform for open textbook projects like CCOTP.

Connexions provides tools to authors for creating content that ranges from single-topic treatments to complete textbooks. Instructors can create integrated textbooks from any of the modular content already in the Connexions repository and from any content created or imported by the instructor. These integrated textbooks are available freely online to students. Connexions can also be used to produce a PDF of the integrated textbook that can be read off-line, sent to a local printer, or sent to Connexions' print-on-demand partner, QOOP. Use of content posted to Connexions in combination with QOOP's print-on-demand technology can produce a printed copy of the textbook at a fraction of the cost of a traditional textbook. The cost of the textbooks becomes independent of the number produced, rendering customized books more feasible. Also, Connexions provides a feature called a *lens*, which allows educators and organizations to vet and endorse content in the repository, much the way they do in the traditional print world.

Connexions is both a means to create textbooks and a globally accessibly, permanent, and highly searchable repository to house open textbooks, enabling faculty and students to easily locate open textbooks and relevant OER for use in their classes. Note that faculty are also able to customize and affordably print open educational materials on-demand, either via Connexions' print facility (QOOP) or locally. Connexions' material is stored in a semantic XML format that describes what something means rather than how it should be displayed. XML is the engine

behind the online, offline, and print versions of the book, and it accelerates the process for achieving compliance with the Americans with Disabilities Act for digital content. The licensing structure of Connexions allows information to be ported to other platforms for increased distribution pathways. In combination with QOOP's print-on-demand technology, students can also order an open textbook at a fraction of the cost of a traditional textbook.

Open Textbook Proof-of-Concept

Throughout 2008, CCCOER collaborated with Connexions to identify a workflow process that would support adoption of open textbooks. The role of Connexions in the CCOTP was to provide a publishing platform for open textbook projects. The CCCOER acted as a liaison between community college faculty, open textbook authors, and Connexions, and it hosted student focus groups to test the open textbook site. Prior to the collaboration between the CCOTP and Connexions in 2008, community college educators had marginal participation in the development of open textbooks. The collaboration between CCCOER and Connexions resulted in a proof-of-concept open textbook titled *Collaborative Statistics* (see http://cnx.org/content/col10522/latest/), available for students in introductory statistics courses to view online or to download for free. A teacher's guide is also available, along with a syllabus, practice exams, calculator instructions, and lecture videos. *Collaborative Statistics* is also available at low cost ($31.98) in a print (bound) version from QOOP, Inc.

At the time of the CCOTP's launch, a proof-of-concept opportunity presented itself with the purchase of rights to the *Collaborative Statistics* textbook by the Maxfield Foundation. The textbook was subsequently given open licensing with a Creative Common Attribution license and efforts were underway to make it available via Connexions. Then, Connexions staff converted *Collaborative Statistics* from a traditional textbook into an open, online textbook. Since the time *Collaborative Statistics* was posted, other statistics instructors have created versions modified from the original (derived works) with assistance from Connexions staff. The authors, Barbara Illowsky and Susan Dean, were motivated to make their *Collaborative Statistics* textbook available via an open license in Connexions in order to lower textbook costs for students and to provide more instructional options for teachers (see http://creativecommons.org/weblog/lessig-letters/2008/12/03/11112).

Part of the CCOTP one-year feasibility study involved determining a sustainable workflow for the development and use of open textbooks. The CCOTP staff carefully documented the workflow process and shared suggestions for improving the user interface. Recently, the CCOTP posted three additional math open textbooks to Connexions, *Elementary Algebra* (see http://cnx.org/content/col10614), and two others, which are in PDF format and await conversion to CNXML. During the fall 2008 semester, *Collaborative Statistics* was adopted by 15 instructors at five different colleges and universities. In the fall of 2008 and winter/spring of 2009 sessions combined, *Collaborative Statistics* was adopted for use in at least 43 course sections at 10 colleges in the United States and one high school in Ontario, Canada. Since fall 2008, 25 college and university instructors have adopted the *Collaborative Statistics* textbook.

CCOTP leaders secured the participation of faculty within the Foothill-De Anza Community College District, SUNY-Purchase, and Mesa College to pilot the *Collaborative Statistics* textbook during summer and fall of 2008. Two faculty members piloted the textbook during summer of 2008, and 11 faculty members used the textbook in their fall 2008 statistics classes. In winter/spring 2009, the CCOT Project estimates that *Collaborative Statistics* was adopted for use in at least 25 course sections including courses taught at Arkansas Tech University, De Anza College, Frederick Community College, Mesa College, Sacramento City College, University of Colorado, San Francisco State University, SUNY-Purchase, University of Toledo, and Virginia Tech University.

Collaborative Statistics

The *Collaborative Statistics* textbook emphasizes applications of statistical knowledge over the theory behind it. The textbook was written for students enrolled in introductory statistics courses at two- and four-year colleges, who are majoring in fields other than math or engineering. Peer reviews of *Collaborative Statistics* were conducted in 2009 and are available at http://www.collegeopentextbooks.org/mathreviews.html.

According to Illowsky, posting *Collaborative Statistics* on Connexions has improved the textbook: "Connexions has much improved our book with what they have done on the cnx.org site. They have broken down the content into modules that can be linked together and arranged in different ways" (Park, 2008).

An open statistics course developed by Illowsky and Dean, freely available from the open courseware Sofia website (see http://sofia.fhda.edu/gallery/statistics/index.html), is closely aligned with the *Collaborative Statistics* textbook. The open statistics course at Sofia includes lesson plans, videotaped lectures, suggested homework, quizzes, and exams.

The Connexions content team has finished its work on the Collaborative Statistics project. Three collections (246 modules) have been published: 1) *Collaborative Statistics* (textbook, see http://cnx.org/content/col10522/latest/); 2) *Collaborative Statistics Supplemental Course Materials* (Sofia content, see http://cnx.org/content/col10586/latest/); and 3) *Collaborative Statistics Teacher's Guide* (see http://cnx.org/content/col10547/latest/). CCOTP and Connexions developed a new Connexions module titled Adoption and Usage. This module (see http://cnx.org/content/m18261/latest/) tracks the various versions and derived copies of *Collaborative Statistics* and lists faculty adopters.

Several instructors have contributed additional content for the *Collaborative Statistics* textbook (e.g., Minitab instructions and homework problem sets); the latter will be edited for inclusion by the *Collaborative Statistics* textbook authors, Illowsky and Dean. Three versions of *Collaborative Statistics* have been derived from the original. One version by Terrie Teegarden, a statistics instructor at San Diego Mesa College, incorporates use of Minitab rather than a calculator. Roberta Bloom, a faculty member at De Anza College, modified *Collaborative Statistics* to create a customized version, which removed several labs and replaced them with her

own. In addition, she added new homework problems, practice exercises, and examples, and she revised the wording and introduced terminology for z-score.

A pilot-test of the workflow has been underway specific to the use of Connexions to provide *Collaborative Statistics* as an open textbook. CCOTP staff worked closely with Connexions staff and the textbook's authors throughout the process. Bloom and Dean provided textbook editing and corrections over the summer. CCOTP staff trained and assisted Teegarden extensively as she created her version of *Collaborative Statistics*, added Minitab labs, and edited the assignments. Another instructor, Miriam Masullo (SUNY-Purchase) has communicated with Illowsky and the CCOTP that she has plans to augment *Collaborative Statistics* with ANOVA videos and/or lesson plans.

The CCOTP modeled a workflow process for developing, identifying, reviewing, and disseminating open textbooks suitable for community college instruction using Connexions with one statistics and three mathematics textbooks as proof-of-concept. Over the course of about a year during 2008, Connexions, in collaboration with the Institute for the Study of Knowledge Management in Education, conducted a set of user data collection activities targeted at understanding the usage and adoption of the *Collaborative Statistics* textbook provided on the Connexions platform as part of the CCOTP project. These user research activities consisted of faculty interviews, student discussion groups, questionnaires, online surveys, and pluralistic walkthroughs of the Connexions reader site.

All the user research activities were approached more from the perspective of a design evaluation activity than an exhaustive data collection activity with statistical research goals. The main goal was to understand how well the current content structure and interface worked for the students and faculty who would be using such content. The research focused on identifying any differences in students' and faculty members' perceptions of using the *Collaborative Statistics* textbook as a printed version in a traditional classroom versus using it as part of a hybrid course and on students' and faculty members' perceptions of the availability of course materials digitally online and as downloadable and printable files. The student group activities focused on book usability and usage and how it integrates with other learning media but did not focus on traditional learning and research goals. In the group exercise, the interactions between the participants themselves, while important, were not the key research interest; their interaction with the study artifact mattered more.

The recruitment criteria for the user touch points were left vague purposefully so as to get a wide variety of participants from both the regular and hybrid sessions. The main criterion for inclusion in the focus group was students' experience with using the printed or online version of *Collaborative Statistics*. Selected for faculty interviews were faculty members who had taught with both the original printed version of the textbook and the open textbook available at Connexions.

In early 2009, the CCOTP invited 21 instructors from five different colleges and universities who had adopted the *Collaborative* Statistics open textbook to complete an online questionnaire about

their students' satisfaction with the textbook and how the textbook was accessed and used. Over one-third (8 of 21) of those surveyed responded. The results indicate that students' decisions about whether to use the online version of the textbook or to purchase a printed copy are strongly influenced by directions from their instructors. A majority of the instructors (66.7%) reported that their students were satisfied with the open textbook. Many of the respondents (62.5%) indicated that they adopted the open textbook due to the cost for students being lower than would be the case with a traditional textbook.

The CCOTP worked with Wade Ellis and Denny Burzynski, authors of *Elementary Algebra* and *Fundamentals of Mathematics*, to give their textbooks an open license and make them available for digitizing and posting on Connexions. In addition, the CCOTP worked with *Applied Finite Mathematics* textbook author Rupinder Sekhon to open license his textbook and post it to Connexions. In 2009, Connexions posted these three new open textbooks for mathematics.

Lessons Learned

Connexions identified lessons learned about open textbook production: 1) the importance of a style guide, 2) the advantage of assembly-line workflow, 3) the importance of naming conventions and standard math authoring tools, and 4) the importance of customizing print formatting based on the purpose of the material (e.g., chapter vs. homework or lab). Connexions also identified lessons learned about open textbook use by students and faculty: 1) the value of availability and customizability, 2) the importance of interactivity, 3) the difference in how faculty and students view modularity, 4) the importance of textbook reading navigational aids, and 5) the need for authoring interface improvements.

Lessons from Producing a Textbook

The process of converting *Collaborative Statistics* from a traditional textbook to a collection of modules in the Connexions format presented a number of challenges. In particular, the user interface for both authors and users required some redesign based on feedback obtained during the process. In addition, the content team assembled for this project was relatively new to Connexions, requiring rapid on-the-job training and familiarization with Connexions' features and the CNXML and MathML languages while simultaneously producing large numbers of new modules. Along the way, several important lessons were learned regarding best practices for large content projects involving multiple team members.

Importance of a style guide.

A style guide, or set of standards, is critical in order to effectively distribute content entry efforts among several team members, who must format the content consistently. Because the translation from presentation-oriented source materials to semantically oriented markup requires a combination of language familiarization and subjective interpretation, it is not uncommon for two

individuals to mark up the same content using two different methods. This can lead to stylistically disjointed modules.

A somewhat informal style guide was created for the *Collaborative Statistics* project with mixed success. While setting standards for module structures, mathematical representation, etc. helped to keep stylistic differences to a minimum, there were a number of circumstances in which team members were either unaware of a particular style decision or misunderstood the rules for applying those styles. This problem became more pronounced in the later phases of the project as new team members were brought on board without the benefits of project training and clarifications of stylistic standards. In addition, some standards evolved over time as project members became more familiar with the languages and the subtleties involved in content markup, resulting in a stylistic shift over the course of the book.

While having a style guide in place was critical to the success of the project and proved to be an invaluable asset for coordinating individual efforts, a more rigorous and well-defined style guide would have helped to reduce the amount of work involved in reviewing and realigning older modules as well as those marked up by different team members. Perhaps most importantly, this guide must be maintained consistently throughout the lifespan of the projects, both to inform future team members of important stylistic choices (and the logic behind those decisions) and to protect against stylistic shifts over time. While style guides must remain somewhat flexible in order to accommodate the evolving needs of each project, any changes must be carefully considered and existing content retrofitted to reflect any adjustments made along the way.

Advantage of assembly-line workflow.

The conversion of content from traditional formats to CNXML modules is a complex process involving several discrete steps. In the early stages of the project, each team member was given a set of modules to be completed and each of these steps had to be completed prior to moving on to the next. As team members became more familiar with the process, it became obvious that certain steps were acting as bottlenecks in the workflow. Additionally, each member developed a particular set of strengths and weaknesses. For example, some team members had difficulty proofreading content for errors but could quickly and accurately translate mathematical expressions into MathML.

After a few chapters of dividing work by modules, the project team regrouped and adopted an assembly-line process for module creation. Simple, repetitive steps (e.g., module creation and metadata entry) could be completed more efficiently by assigning a single team member to complete the task for all modules at once, freeing up others to focus on more complex tasks, such as content entry. Those with more experience were assigned to more detail-oriented tasks, such as proofreading and editing the module to meet accessibility standards. Assignments were staggered in such a way as to ensure that each team member was not waiting on another to complete an assignment, allowing each member to complete his or her tasks and immediately move on to the next. In addition to reducing bottlenecks, this approach also limited the exposure of each team member to a specific set of tasks, improving the stylistic uniformity of the project

and reducing the learning curve for new team members to manageable levels. This assembly-line process greatly improved the speed and accuracy of the translation process, allowing a much more efficient workflow.

Importance of naming conventions and standard authoring tools.

Over the course of the project, different content team members used different MathML editors, each of which used its own format for presenting mathematical expressions. This inconsistency led to a number of issues, particularly when edits and corrections to existing content were required. Adopting a standard math editor for the project would have helped this situation, allowing each team member to understand what the others had done and how to work with the resulting code.

The use of module naming conventions was identified as crucial. It is difficult to strike a balance between being concise and descriptive, particularly when considering the ability to find the module within the repository. For this project, a standard naming convention was adopted, with the chapter name (e.g., Probability Topics) added before the module subtitle (e.g., Homework), which resulted in a module name (e.g., Probability Topics: Homework) that was descriptive, easy to locate, sortable by chapter in the workgroup, and sufficiently modular to be used in other contexts by other Connexions authors. To put this in perspective, consider for a moment that without such a standard there could easily have been 13 distinct modules titled Homework in the same workgroup, with no way to distinguish between them and no way to inform other authors who might otherwise use them what skills were being assessed. Connexions provides a convenient way to rename modules when they appear in a textbook, so it is straightforward to make sure the textbook's table of contents have simple names without the chapter title attached.

Having a clear, well-defined, and enforced set of standards is essential to the success of such a large project, particularly when several individuals are working towards a common goal. Modules are the fundamental building block in Connexions and they print uniformly within a collection to make the entire collection look consistent. When particular modules play a specific role within a book, however, special styling rules apply. Homework and labs, for instance, need to have problem numbering start over and need to have a page break before and after them. Prefaces and appendices need to be numbered in a particular way within the book, unlike modules being used within traditional chapters. Choices were added to modules and will be added to the collection structure so that all Connexions authors benefit from the enhancements made to the *Collaborative Statistics* book.

Lessons from Faculty and Students Using the Textbooks

Based on feedback obtained during the focus groups, students and faculty perceptions of online textbooks differed somewhat. Students value the ability for faculty to customize. Specifically, students find it disconcerting when instructors assign readings in an order that differs from their textbooks. Instructors and students both liked being able to access the material anywhere, and instructors mentioned the ability to link directly to a specific part of the book within their learning

management system. Students valued the pop-up, in-place glossary definitions and the show and hide exercises, but they wanted more interactivity. Students believed that the books would be even more useful if there were more problems, interactive simulations, and practice quizzes.

Instructors and students viewed modularity very differently. The instructors believed that the book was a bit too modularized and broke up the flow of their lessons. The students claimed the modularity as a benefit; they liked the fact that each concept was broken out and separated and commented that it was easier to consume the information in small chunks. The glossary was readily available from the web page they were reading, and they believed this feature enhanced their understanding of the concepts.

During the focus group interviews, students were observed as always keeping the table of contents open and needing navigation aids to keep track of their reading. The Connexions reader interface was modified to contain a clickable table of contents, checkmarks to show modules that had been read, and a feature that enabled saving content in "My Favorites," a new type of lens. The online display of chapters was made consistent with print since faculty and students must be able to find the same content online and in print.

The Connexions author interface is being redesigned to better fit the needs of authors who are creating textbooks, not just creating collections from Connexions modules. Connexions staff are also redesigning the interface to support large-scale edits and customizations to existing textbooks.

Conclusion

The CCOTP has identified the following challenges to the production and adoption of open textbooks: 1) faculty members' and students' expectations of high production quality and ancillaries for open textbooks, 2) methods for documenting and maintaining control over various versions, and 3) the process of converting existing open content to digital and accessible formats. Connexions holds promise as a means to overcome these challenges.

CCOTP recommends 1) using Connexions as the common repository for open textbook content in an effort to provide greater national and even international access; 2) using Connexions as the tool for sharing, reusing, customizing, and disseminating open textbook content; 3) considering corporate funding, in return for branding, to sponsor the development of content for specific disciplines; 4) approaching publishers to donate content that is going out of print; and 5) identifying the process for storyboarding the development of open textbooks. As a consequence of the collaboration with Connexions, the CCOTP plans to increase the number of open textbooks posted to Connexions, convert open textbooks to CNXML format for posting to the Connexions site, and adapt the print and web display tools to meet identified needs of community college faculty and students. Additionally, technical support must be provided to community college faculty and students.

Open educational resources must be leveraged to increase the quality, access, and affordability of higher education by identifying, producing, and using open textbooks in community colleges. Most community college faculty members are unfamiliar with the effective use of open and digital textbooks in their classes; they must be encouraged to learn about these new resources in order to enhance the quality and delivery of course materials, increase access for learners, and reduce the essential cost of curriculum materials. With the current global economic crisis, the need to minimize financial barriers to education has become increasingly salient. Open textbooks and community colleges both serve to increase access to education for students with limited means.

The CCOTP, through the Connexions platform, affords faculty the opportunity to reclaim greater control over their curriculum by making it convenient to explore feasible alternatives to high-cost publishers' textbooks. Additionally, with the use of open textbooks in Connexions, faculty are able to customize the content to best suit the regional or local needs of their students rather than having to adjust their own instruction to match publishers' textbooks. Students who take courses with open textbooks can benefit from the lower cost of learning materials, thereby giving them greater flexibility with their education budgets.

References

Annand, D. (2008). Learning efficacy and cost-effectiveness of print versus e-book instructional material in an introductory financial accounting course. *Journal of Interactive Online Learning*, *7*(2), 152-164.

Baker, D. (2005). *Are copyrights a textbook scam? Alternatives to financing textbook production in the 21st century*. Retrieved from Center for Economic and Policy Research website: http://www.cepr.net/documents/publications/textbook_2005_09.pdf.

Baker, J. (2008). Culture of shared knowledge: Developing a strategy for low-cost textbook alternatives. *New England Journal of Higher Education*, *21*(1), 30.

Buczynski, J. A. (2007). Faculty begin to replace textbooks with "freely" accessible online resources. *Internet Reference Services Quarterly*, *11*(4), 169-179.

Casserly, C.M., & Smith, M.S. (2008). Revolutionizing education through innovation: Can openness transform teaching and learning? In T. Iiyoshi & M.S.V. Kumar (Eds.), *Opening up education: The collective advancement of education through open technology, open content, and open knowledge* (pp. 262-3). Cambridge, MA: MIT Press.

Davy, T. (2007). E-textbooks: Opportunities, innovations, distractions and dilemmas. *Serials: The Journal for the Serials Community*, *20*(2), 98-102.

Hobbs, R., Jaszi, P., & Aufderheide, P. (2007, September). *Cost of copyright restrictions for media literacy*. Retrieved from Center for Social Media at American University School of Communication website: http://aladinrc.wrlc.org/dspace/bitstream/1961/4607/1/Final_CSM_copyright_report.pdf.

Park, J. (December, 2008). *Collaborative statistics—An open textbook model*. Retrieved from http://creativecommons.org/weblog/lessig-letters/2008/12/03/11112.

Young, J. (2008). Textbook piracy grows online, prompting a counterattack from publishers. *The Chronicle of Higher Education.* Retrieved from http://chronicle.com/article/Textbook-Piracy-Grows-Onlin/949/.

International Review of Research in Open and Distance Learning
Volume 10, Number 5. *ISSN: 1492-3831*

November – 2009

Peer-To-Peer Recognition of Learning in Open Education

Jan Philipp Schmidt
United Nations University MERIT

Christine Geith
Michigan State University

Stian Håklev
University of Toronto

Joel Thierstein
Rice University

Abstract

Recognition in education is the acknowledgment of learning achievements. Accreditation is certification of such recognition by an institution, an organization, a government, a community, etc. There are a number of assessment methods by which learning can be evaluated (exam, practicum, etc.) for the purpose of recognition and accreditation, and there are a number of different purposes for the accreditation itself (i.e., job, social recognition, membership in a group, etc). As our world moves from an industrial to a knowledge society, new skills are needed. Social web technologies offer opportunities for learning, which build these skills and allow new ways to assess them.

This paper makes the case for a peer-based method of assessment and recognition as a feasible option for accreditation purposes. The peer-based method would leverage online communities and tools, for example digital portfolios, digital trails, and aggregations of individual opinions and ratings into a reliable assessment of quality. Recognition by peers can have a similar function as formal accreditation, and pathways to turn peer recognition into formal credits are outlined. The authors conclude by presenting an open education assessment and accreditation scenario, which draws upon the attributes of open source software communities: trust, relevance, scalability, and transparency.

Keywords: Open education; assessment; accreditation; participatory learning

Background

Open education is the combination of open licensing and web-based social media. It brings some fundamental challenges to the way we think about higher education and the institutional arrangements in which it is organized (Katz, 2008; Liyoshi & Kumar, 2008).[1]

Enabled by widespread adoption of the Internet, large, self-organized, open innovation communities, such as open source software projects or Wikipedia (http://wikipedia.org/), have emerged. These projects are open to participation by anyone (within limits), regardless of background, location, or credentials. They challenge the notion that formally credentialed "experts" are the only producers of knowledge or the sole sources of innovation. Collaboration takes place in complex meritocratic arrangements, and social capital is accumulated in the form of recognition and reputation within the community.

Similar open approaches have successfully been implemented in education, creating new models for research publication, textbook development and publication, and teaching and learning. Open access journals are starting to show higher citation and survival rates than closed proprietary journals (Morrison, 2007; Crawford, 2006). Member institutions of the OpenCourseWare Consortium in over 30 countries have published more than 8,000 courses for free use, adaptation, and distribution (http://www.ocwconsortium.org/).[2] Connexions, an open educational resources repository, has nearly 15,000 modules, or learning objects, woven together in over 750 collections, which are used by over one million people per month in over 200 countries (http://cnx.org/). On WikiEducator (http://wikieducator.org/), teachers from many countries have come together to author over 16,000 course modules, and in South Africa, the Free Science Textbook Project has harnessed the power of volunteers to create high-quality free textbooks that are appropriate to the local curriculum (http://www.fhsst.org/). In addition to the publication of open educational resources, educators at Utah State University (http://opencontent.org/wiki), Otago Polytechnic (http://wikieducator.org/Facilitating_online_communities), and the University of Manitoba (http://ltc.umanitoba.ca/wiki/Connectivism) are successfully experimenting with opening access to their teaching beyond registered students and letting participants share in the design of course structure and content. And new projects like the Peer 2 Peer University (http://www.p2pu.org) are suggesting that web-based social software can enable peer learning outside of existing institutions.

As demonstrated above, the Internet, social networking applications, and evolving social norms enabled by technology have begun to change many aspects of the traditional education landscape. However, there are currently few mechanisms to recognize informal learning in a way that leads to individual accreditation. Some students who are enrolled in degree programmes have been able to negotiate credits for "open courses" on a case-by-case basis; and at least one institution has applied "course challenge" policies to users of its open courseware materials and awarded credit to learners able to meet faculty-determined performance measures[3]. Much work has been done in the field of prior learning assessment and recognition, which theoretically allows informal online learners to transition into formal education (Konrad, 2001). These existing opportunities are

attempts to tweak the current accreditation system, rather than fundamentally rethink the concept of accreditation within an open peer-production paradigm.

Scholars have considered the implications of open approaches for teaching and learning practices, for the development of course materials, and for the sustainability models for higher education institutions (Benkler 2008; Geith, 2008a, 2008c; Geith & Vignare, 2008; Katz, 2008; Liyoshi & Kumnar, 2008; Schmidt, 2008), but a comprehensive investigation of how an open model can provide new forms of formal accreditation, as well as allow pathways to formal credit, is missing. In this paper we discuss accreditation in the context of open peer-to-peer communities. We introduce the roles and functions that accreditation has historically performed for students and institutions, for example as a measure of human capital or an indication of group membership. We then describe forces that influence the role of accreditation, the need for new skills as we move from a service-based society to an information society, and the opportunities created by peer-to-peer learning in the social web. Finally, we describe existing pathways from reputation to formal credits, summarize the key characteristics of an open education accreditation model, and provide a learning scenario that highlights these features.

Definitions: Recognition, Accreditation, Academic Credit, and Assessment

The key concepts we use to develop our argument are recognition, accreditation, and assessment. In conversations outside of academia these are often not differentiated clearly, but even in the academic literature, they can have different connotations. For this reason, we briefly highlight how the terms are used in this paper.

Recognition is the acknowledgment of achievements and conveys approval by the person, group, or organization doing the recognizing. Recognition can be implicit (for example, use of the original work by another author/citation) or explicit (for example, in the form of gradually increasing responsibilities within a community, by attribution of contributions, or via a badge or other tangible form that communicates recognition). Recognition can be provided by members of a community itself, or by outsiders. Open source software communities are a good example of implicit and explicit recognition of achievements. Experienced and/or qualified contributors' opinions carry more weight in discussions, and contributions are explicitly acknowledged as signed software code that is accepted into the published version of a program.

Accreditation is formal certification by a third party or intermediary (institution, community of practice, guild, etc.). Accreditation implies that the receiver meets the standards of the accreditor. For learning systems, accreditation applies to individuals as well as to institutions and to programs, but with respect to students, the commonly used term is "certified" rather than "accredited." For individual learners accreditation provides formal credentials such as academic credit hours, a license, diploma, certificate, or degree. For institutions, such as colleges and universities, it provides endorsements, branding, and access to markets and resources through accreditation by governments, professional associations, and other accreditation bodies (Wellman & Thomas, 2003).

Assessment is the process of determining the characteristics of something or someone. In the case of learners, this means determining their individual knowledge, behaviors, and/or skills, and it provides a necessary basis for recognition or accreditation (Voorhees, 2001). There are a number of assessment methods by which learning can be determined, including observation, exam, and practicum, as well as impression and gut feeling, etc. Methods of assessment lead to formal judgement or classification. In education, assessment aims to be replicable and objective, and we distinguish between assessment *of* learning, *for* learning (summative), and *as* learning (formative) (Earl & Katz, 2006).

The Role of Accreditation

Accreditation of individuals has important economic, social, and political consequences. Not simply "units of knowledge," credentials represent trust and socio-political status. They are also part of the formal rules of organizations that allow access to certain positions through cultural assumptions of competence and loyalty (Brown, 2001). As open education evolves, it is important for the open education movement to reflect upon the role of accreditation, how it can be provided to individuals who need it, and how its valuable features can be preserved even when institutional arrangements are less clearly defined.

As societies become more complex, post-secondary institutions are called upon to train for traditional and emerging occupations, to sort out qualified job candidates, and to perform the role of examiner. "A university degree is a prerequisite for an increasing number of occupations in most societies. Indeed, academic certification is necessary for most positions of power, authority, and prestige in modern societies, which places immense power in the hands of universities" (Altbach, Berdahl, & Gumport, 1999, p. 22). Not only individuals but also institutions are accredited by the governments that charter them and by outside organizations, such as professional accreditation bodies, and this is critical to institutional operations and brand. Accredited institutions receive quality recognition among informed consumers, their students are eligible for state licensure (where required), and their students are eligible for government funding, such as federal financial aid, scholarships, loans, and work/study funds in the U.S.

There have been several critical perspectives on the function of educational accreditation in society. For example, Bills (1988) lists four main views: human capital, credentialism, screening, and cultural capital. Let us consider these four with a view to how they conceptualize education and accreditation and to how they could be applied to concepts of open education. Firstly, Becker (1964) introduced the concept of human capital and the idea that just as one could invest in infrastructure or better machines to increase productivity, investing in training and education of human resources would make workers more productive and would generate economic benefits to both the individual workers and to society as a whole. This idea, which rapidly gained currency, was an important factor in the dramatic expansion of higher education in North America and Europe during the last fifty years. Human capital theory fits into the functionalist framework, where the expansion of higher education is seen as responding to a real need for better trained people in the industry (Dornbusch, Glasgow, & Lin, 1996). Credentials signal skills and expertise

beneficial to the economy and reduce the transaction costs of having to review each worker's competencies individually.

The three other theories could be said to fit in under the conflict theory of education, where schools are arenas for power struggles between different groups in society. Credentialism, as propounded by Berg (1971) and Dore (1976), is the persistent social trend towards ever-increasing educational requirements for jobs, which is not connected to any rise in job complexity. This is often called credential inflation. Credentialism theorists agree with human capital theorists that credentials are beneficial to those who receive them and lead to higher salaries and better jobs, but according to Boylan (1993), the link between education and productivity is much weaker than the link between education and rewards; thus, diplomas entitle you to society's spoils, but you or the credentials are not necessarily responsible for producing them. In Boylan's view, expanding education should have little positive effect on overall wealth and may devalue credentials and increase inequality among groups. According to screening theory, people with high educational achievements really are more productive workers but not because of the "value added" from education. Rather, formal education is seen as an (expensive) method for sorting out those workers who have innate capabilities for working better or who are more receptive to on-the-job training (Tyler, 1982). Finally, cultural capital theorists like Collins (1979) and Bordieu (1973) believed that formal schooling's main function is to provide the "mainly non-cognitive 'cultural capital' that helps dominant groups maintain their status" (Bills, 1988, p. 440). Thus, the future leaders are taught to dress, to socialize, to speak, to take initiative, and to work independently; whereas, students in schools serving working class neighborhoods are more likely to be taught docility, punctuality, and obedience to authority.

The Need for New Skills and Abilities

Assessment and accreditation practices are always a reflection of their times – and so are the skills that are in demand at a certain point in history (Carnevale & Desrochers, 2001; Kohl & LaPidus, 2000). In the networked world that Yochai Benkler describes in *The Wealth of Networks* (2007), the tools to produce and process information – computers and networks – have become abundant. Richard Murnane and Frank Levy (2004) argue that new skills – *21st century skills* – are required to make use of these abundant technologies. Such skills are more procedural than factual and allow us to analyze complex data and to communicate effectively. George Siemens's (2005) connectivism theory of learning goes beyond traditional theories of learning (such as behaviorism, cognitivism, and constructivism) to include technology as a core element. He argues that factual knowledge becomes less important than mastering the use of networked connections between ever-changing specialized information. He suggests that "[o]ur ability to learn what we need for tomorrow is more important than what we know today." To those that resist such a fundamental rethinking of what skills are needed by future graduates, the authors of the PISA study (OECD, 2006) reply that the alternative to developing 21st century skills comes at the risk of educating a work force that is ill-prepared for the knowledge economy:

> ... if students learn merely to memorise and reproduce scientific knowledge and skills, they risk being prepared mainly for jobs

> that are disappearing from labour markets in many countries. In order to participate fully in today's global economy, students need to be able to solve problems for which there are no clear rule-based solutions and also to communicate complex scientific ideas clearly and persuasively. (p. 33, OECD, 2006)

Assessing these new competencies requires detailed understanding of the communities and scenarios in which they can be applied. Exams are not useful tools to evaluate a learner's ability to identify, organise, synthesize, and apply information from various sources on the Web. To be fair, there are various efforts to improve assessment in light of the changing demands of a knowledge economy, or to simply improve the current levels of efficiency and accuracy. The PISA study (OECD, 2006) makes useful suggestions regarding science assessment, and Earl and Katz (2006) describe how better assessment practices can improve classroom teaching. However, despite improvements in methodology, assessment practices have a tendency to focus on easily quantifiable measurements rather than contextualized behaviors, dispositions, and attitudes.

For our open education accreditation model, we are interested in retaining the goal in accreditation of accurately reflecting learning and skills to enable individuals and firms to negotiate employment arrangements efficiently. However, we also acknowledge that the skills needed in the 21st century are radically different from those tested and accredited in the past. Open education communities have certain unique characteristics that are ideally suited to the development and recognition of such new abilities in its individual members.

Open Education

One effect of the open education movement has been that some parts of the education package typically provided by institutions that drew value from scarcity have become abundant. For example, educational content for many subjects is now freely and openly available online. This has led some open education proponents to speak of the "disaggregation of education" (see blog posts Wiley 2008a, Wiley 2008b, and Norman 2008) and to speculate how other core services of the university might evolve as independent elements in an open education ecosystem. Such ecosystems are typically described as a combination of three areas: content, learning support, and accreditation (integrated with assessment). We will take a closer look at learning, assessment, and accreditation in open education (content holds no particular relevance in the context of accreditation).

Peer-to-Peer Learning in Open Education

Using an analogy from network technology, peer-to-peer learning, assessment, and accreditation are anchored in an understanding of learning as participatory, open, and community-based (van Gennip, Segers, Tillema, 2009). In the education literature, peers are often defined as members of a cohort or students with similar or complementary skills. We propose that peers can be of different ages and backgrounds, and we draw on the technical definition of peer-to-peer networking. The term *peer-to-peer* (P2P) refers to a network of equals (peers) in which two or

more individuals are able to spontaneously collaborate without necessarily needing central coordination (Schoder & Fischbach, 2003). In contrast to client/server networks, P2P networks promise improved scalability, lower cost of ownership, self-organized and decentralized coordination of previously underused or limited resources, greater fault tolerance, and better support for building ad hoc networks. In addition, P2P networks provide opportunities for new user scenarios that could scarcely be implemented using customary approaches (Schoder, Fischbach, & Schmitt, 2005).

Translating this understanding of computer networks to learning models leads us to participatory community-based learning groups, which stand in contrast to the instructor-led model that is akin to a client-server model. Atkins, Brown, and Hammond (2007) propose the development of an open participatory learning infrastructure (OPLI) to enable a global learning ecosystem, which includes a focus on peer-learning. Stephen Downes (2005) builds on the concept of a community of practice (Lave & Wenger, 1991) as a group "characterized by 'a shared domain of interest' where 'members interact and learn together' and 'develop a shared repertoire of resources.'"
Some of the technologies and opportunities that exist today are new, but the ideas and concepts have been around for much longer. Ivan Illich in his 1971 classic, *Deschooling Society*, envisages a future where obligatory schooling is abolished; rather, each person is given at birth a number of education tokens to be used at their leisure. There would be networks where people interested in the same book or movie could call a certain phone number then arrange to meet at a cafe for an intellectual discussion. Similarily, in today's peer-to-peer society, everyone would be able to teach and learn from each other in a distributed (peer-to-peer) fashion. People would begin contributing to the knowledge base at an early age, and "life-long learning" would be a reality.

Assessment in Open Education

As we have described above, the learning theories behind peer-to-peer learning are not new. The concepts behind collaborative learning, online communities, and distance education have been with us for many years. However, the social web has created new opportunities to collaboratively learn and to track such learning.

As users of the social web, more of what we do is collaborative, and sharing knowledge becomes a standard practice rather than the exception. Our identities, including educational identities, are increasingly digital and distributed across the Web. As a result, the boundaries and barriers between traditional education and informal learning are breaking down. Participating in online communities of practice can lead to significant learning, even though it does not happen within an education institution or program.

This new learning environment provides opportunities to leverage technology for assessment in various ways:

- *Digital portfolios*: Portfolios allow users to create their own learning stories, which could serve as the basis for recognition and accreditation. In such a portfolio the learner curates a selection of qualitative and quantitiative evidence and artifacts and testimonials to

represent expertise, experience, and reputation (Carraccio & Englander, 2004). Professional networking communities like LinkedIn (http://www.linkedin.com) are already providing many of the features that would be required for such a portfolio.

- *Digital trails*: The ability to evaluate the digital trails of our participation in communities. Beyond portfolios that are curated by the learner, more and more of our work is publicly accessible and can be considered for assessment. Blog posts we write, documents we create online, twitter messages (http://twitter.com) we send all contribute to an impression of who we are. These trails include our behaviour in electronic learning environments. Research on electronic learning is making progress with the evaluation of educational resources by tracking indicators of student's use and performance (Lovett, Meyer, & Thille, 2008; Dickson, 2005).
- *Aggregating individual opinions and ratings into a reliable assessment of quality*: News portals like digg (http://digg.com) or reddit (http://reddit.com) make use of aggregated opinions of their users. The articles that receive the highest numbers of votes are published on the front page. Social bookmarking services like Delicious (http://www.delicious.com) use similar mechanisms to filter popular web resources. The premise is that a web page that has been bookmarked by thousands of users is likely to contain more relevant information than a page that only one person selected. The same principles could be applied to everything we produce in the process of learning. Others already leave opinions about our work and expertise: Readers comment on our blogs and pictures; they edit our wiki entries, or they disagree with arguments we make on mailing lists. We need to find ways to aggregate these opinions. Reputation models that calculate levels of trust for each person can further improve the accuracy of such systems (Marti & Molina, 2006; Josan & Boyd, 2007).

Accreditation in Open Education

Scholars have begun to speculate about the institutional and individual models for accreditation in open education (see, for example, Keats & Schmidt, 2007; Downes, 2007; Geith, 2008b; Matkin, 2008; Wiley, 2008a). Keats and Schmidt (2007) argue that new institutions and organizations will start "competing with today's universities in any combination of higher education services, including research, teaching, and accreditation."

Jeff Young's recent article in the *Chronicle of Higher Education* (September 25, 2008) kicked off an animated conversation about the changes that have already taken place. Young asked "When Professors Print Their Own Diplomas, Who Needs Universities?" and used the example of David Wiley's "Open Edu 2008" course to make his point (http://opencontent.org/wiki/index.php?title=Intro_Open_Ed_Syllabus). Professor Wiley had offered to print certificates for anyone who participated and to provide evaluations for students at other institutions.

Existing pathways between peer-to-peer learning and formal education.

Pathways that allow students to move between informal learning and formal accreditation already exist. Geith (2008b) describes the range of options that exist for open education communities, including competency-based testing, prior learning assessment and recognition, and the passing of standard exams that are accepted for credit. In addition, experience in David Wiley's Open Edu 2008 course shows that students were able to arrange for credit in their home institutions even though the course was taught and assessed by someone at a different university. The majority of students who ended up receiving credit for the course were in fact not registered at Utah State University, where Wiley taught at the time.

Open education can take advantage of existing pathways to individual accreditation in the form of academic credit and credentials. It also has an opportunity to blaze a new trail using the data inherent in online peer communities, and the concept of community reputation, to assess and recognize learning in new ways. These new methods could prove useful for not only linking to existing credit paths but also for creating new measures designed to recognize learning outcomes in open online communities. The idea of a completely open and community-based assessment and recognition model is intriguing.

An open education assessment and accreditation scenario.

To broaden Jeff Young's original question and ask "what if anyone could print their own diplomas?" it is useful to identify the key characteristics of a functioning accreditation system that is relevant in today's context and then consider how they could be realized in an open education environment.[4] To do so, we draw on examples from open source software communities and then develop a brief open education accreditation scenario below.

- *Trust*: When accreditation needs to provide recognition beyond the community where it is expressed, its value is determined by the trust that is placed in the provider. There are different ways of expressing trust in open source projects, for example through their ability to attract and maintain participants or through the demonstrable quality of the project's output.
- *Relevance*: The assessment and accreditation mechanisms must be appropriate to evaluate and certify relevant learning and skills. Assessment must be an integral part of learning. In open source software, development and assessment are inseparable. The assessment of an individual's contribution is expressed by its acceptance into the actual software code.
- *Scalability*: The model must scale to the demands of the current education environment. A one-on-one system in which a trusted professor manually certifies a student does not scale well. A community-based reputation or voting system scales more easily, but outsiders might question its reliability. Open source software projects have demonstrated an ability to organically develop coordination, quality review, and feedback mechanisms that span communities of hundreds of participants.

- *Transparency*: The possibility to examine all elements of the accreditation system increases trust and quality. Accreditation providers that show how they accredit learners with different assessment results reduce the potential for bias and for subjective accreditations. Errors can be identified and corrected easily. Open systems are by definition transparent and encourage inspection and improvements, leading to high standards of accountability.

The following scenario provides an example of what an open education assessment and accreditation could look like. It is not universally applicable to all disciplines, topics, and students, but it serves to highlight the potential for innovation. It is just one example of many possible ones.

> A group of self-learners interested in behavioral economics agrees on a timeframe (6 weeks) and basic communication tools (email, aggregated blog posts, and a shared wiki workspace) to learn about the predictable irrationalities in human behavior. Each week the group members study the list of agreed readings and work through the tasks they have defined for themselves.
>
> Their work in the group leaves a digital trail. They find useful resources and add them to a social bookmarking service with a short description and rating; when they read a blog post by another group member, they use a web browser plug-in to leave a short rating as well; when they review each other's assignments, they leave notes and ratings that are intended for both the author and themselves as reminders of especially good work (or of pitfalls to avoid). Others who are not part of the initial group can comment and leave additional feedback, suggest additional readings, or extend the discussions on their own blogs.
>
> At the end of the course the group members each create their own personal portfolios in which they compile their best pieces of writing (or those that received positive feedback). They also leave testimonials for each other describing not only each other's mastery of the subject but also reflections on the experience of working together. In addition, a number of metrics are calculated automatically and included in the portfolio, such as the number of bookmarks that were stored, the number of ratings left, and the average rating received for their own work. There are also indicators of their level of engagement with the group and the particular roles they took on during the process, such as problem solving and peer review roles.
>
> One of the learners applies for a job that requires a basic understanding of consumer behavior. She submits a link to her portfolio along with her CV. The interviewer is impressed by her portfolio and by the fact that it was completely self-motivated and offers her a job. As she works on projects in her new job, she links the final versions to her e-portfolio. A year later she decides to enter a master's program in strategic decision making and submits the e-portfolio to the university. The Recognition of Prior Learning department reviews the portfolio, contacts some of the people who left testimonials for

references, and agrees to waive the required entry-level course. Another group member, who is based in the U.S., already has a number of college credits and is working towards a BSc degree. He contacts a private university that offers competency-based testing services, writes an exam, and is awarded college-level credits.

Conclusion

Accreditation plays an important role for individuals and society as a reflection of individual expertise and experience. As our world moves from an industrial to a knowledge society, new skills are needed. Social web technologies offer opportunities for learning, which build these skills and allow new ways to assess them. Peer-to-peer communities of learners can take advantage of pathways to formal academic credit; furthermore, new ways of open recognition are emerging.

These communities might provide new opportunities for non-traditional forms of learning, such as life-long learning and learning in areas that are not well served by existing institutions, as well as help to meet the increasing demand for education that cannot be provided by traditional learning venues.

This leads to exciting new opportunities for further research. For example, a better understanding of indicators for knowledge and skills in open education communities is needed. Such indicators would consider processes and describe types of communication and interaction as well as behaviors within a community of learners. In addition, we do not yet understand the motivations that might drive individuals to participate in community accredited learning opportunities, or the benefits they receive.

References

A selection of online resources, including many of the following articles and blog posts, have been tagged as "opencredit" in the diigo and del.icio.us bookmarking services.

Atkins, D.E., Brown, J.S., & Hammond, A.L. (2007). *A review of the open educational resources (OER) movement: Achievements, challenges, and new opportunities* (Report to the William and Flora Hewlett Foundation). Retrieved from http://www.oerderves.org/wp-content/uploads/2007/03/a-review-of-the-open-educational-resources-oer-movement_final.pdf.

Altbach, P.G., Berdahl, R. O., & Gumport, P. J. (Eds.) (1999). *American higher education in the twenty-first century: Social, political, and economic challenges.* Baltimore, MD: The Johns Hopkins University Press.

Becker, G.S. (1964). *Human capital*. New York, NY: National Bureau of Economic Research.

Benkler, Y. (2007). *The wealth of networks*. New Haven, CT: Yale University Press.

Benkler, Y. (2008). The university in the networked economy and society: Challenges and opportunities. In R. N. Katz (Ed.), *The tower and the cloud: Higher education in the age of cloud computing* (pp. 51-61). Washington, DC: Educause.

Berg, I. (1971). *Education and jobs: The great training robbery*. New York, NY: Prager Publishers.

Bills, D.B. (1988). Credentials and capacities: Employers' perceptions of the acquisition of skills. *The Sociological Quarterly, 29*(3), 439-449.

Bordieu, P. (1973). Cultural reproduction and social reproduction. In R. Brown (Ed.), *Knowledge, education, and cultural change* (pp. 71-112). London: Tavistock.

Boylan, D. (1993). The effect of the number of diplomas on their value. *Sociology of Education, 66*(3), 206-221.

Brown, D.K. (2001). The social sources of educational credentialism: Status cultures, labor markets, and organizations. *Sociology of Education, 74*, Extra issue: Currents of Thought: Sociology of Education at the Dawn of the 21st Century, 19-34.

Carnevale, A. P., & Desrochers, D. M. (2001). *Help wanted…credentials required: Community colleges in the knowledge economy*. Anapolis Junction, MD: Community College Press.

Carraccio, C., & Englander, R. (2004). Evaluating competence using a portfolio: A literature

review and web-based application to the ACGME competencies. *Teaching and Learning in Medicine*: *An International Journal*, *16*(4), 381-387.

Collins, R. (1979). *The credential Society: An historical sociology of education and stratification.* New York, NY: Academic Press.

Crawford, W. (2006). Pioneer OA journals: The arc of enthusiasm, five years later. *Cites & Insights*, *6*(12), 1-6.

Dickson, P. (2005, October). *Toward a deeper understanding of student performance in virtual high school courses*. Paper presented at the meeting of the North American Council for Online Learning, Denver, Colorado.

Dore, R. P. (1976). *The diploma disease*: *Education, qualification, and development*. Berkeley, CA: University of California Press.

Dornbusch, S. M., Glasgow, K. L., & Lin, I. (1996). The social structure of schooling. *Annual Review of Psychology, 47*, 401-429.

Downes, S. (2005). E-learning 2.0. *eLearn Magazine*. Retrieved from http://www.elearnmag.org/subpage.cfm?article=29-1&section=articles

Downes, S. (2007, June 6). Open source assessment [Web log post]. Retrieved from http://halfanhour.blogspot.com/2007/06/open-source-assessment.html.

Earl, L., & Katz, S. (2006). *Rethinking classroom assessment with purpose in mind. Assessment for learning, assessment as learning, assessment of learning*. Retrieved from Western and Northern Canadian Protocol for Collaboration in Education (WNCP) website: http://www.wncp.ca/media/40539/rethink.pdf.

Geith, C. (2008a). Teaching and learning unleashed with Web 2.0 and open educational resources. In R.N. Katz (Ed.), *The tower and the cloud: Higher education in the age of cloud computing*. Washington, DC: Educause. Retrieved from http://www.educause.edu/thetowerandthecloud.

Geith, C. (2008b). *OCWC concept discussion paper: Linking credit and OpenCourseWare*. Retrieved from http://docs.google.com/View?docid=df9f5w7f_3gwtcbwhf.

Geith, C. (2008c). *Can OER really impact higher education and human development?* Series of posts to the OSS and OER in Education Series in Terra Incognita blog archived at http://cnx.org/content/m19864/latest/.

Geith, C., & Vignare K. (2008d). Access to education with online learning and open educational

resources: Can they close the gap? *Journal of Asynchronous Learning Networks*, *12*(1). Retrieved from http://www.sloan-c.org/publications/jaln/v12n1/pdf/v12n1_geith.pdf.

Hirst, T. (2008, September 20). Time to build trust with an "open achievements API"? [Web log post]. Retrieved from http://ouseful.wordpress.com/2008/09/20/time-to-build-trust-with-an-open-achievements-api/.

Illich, I. (1971). *Deschooling society*. New York, NY: Harper & Row.

Josang, A., Ismail, R., & Boyd, C. (2007). A survey of trust and reputation systems for online service provision. *Decision Support Systems*, *43*(2), 618-644.

Katz, R. N. (2008). *The tower and the cloud: Higher education in the age of cloud computing*. Washington, DC: Educause.

Keats, D.W., & Schmidt J.P. (2007). The genesis and emergence of education 3.0 in higher education and its potential for Africa. *First Monday*, *12*(3). Retrieved from http://firstmonday.org/issues/issue12_3/keats/index.html.

Kohl, K. J., & LaPidus, J. B. (2000). *Postbaccalaureate futures: New markets, resources, credentials.* Series on Higher Education: American Council on Education. Phoenix: Oryx Press.

Konrad, J. (2001). *Accreditation of prior learning in the United Kingdom* (Working paper). Retrieved from http://www.leeds.ac.uk/educol/documents/00001831.htm.

Lave, J.C., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New York, NY: Cambridge University Press.

Liyoshi, T., & Kumar, M.S. V. (2008). *Opening up education: The collective advancement of education through open technology, open content, and open knowledge*. Cambridge: MIT Press.

Lovett, M., Meyer, O., & Thille, C. (2008). *The Open Learning Initiative: Measuring the effectiveness of the OLI statistics course in accelerating student learning*. Manuscript submitted for publication.

Marti, S., & Molina, H. G. (2006). Taxonomy of trust: Categorizing P2P reputation systems. *Computer Networks*, *50*(4), 472-484.

Matkin, G. W. (2008). *Opening the gate on learning pathways: The next frontier in the open educational resource movement*. Retrieved from http://unex.uci.edu/pdfs/dean/matkin_learningpathways.pdf.

Morrison, H. (2007, July 6). Are open access journals ten times more likely to survive? [Web log post]. Retrieved from http://poeticeconomics.blogspot.com/2007/07/are-open-access-journals-ten-times-more.html.

Murnane, R. J., & Levy, F. (2004). *The new division of labor: How computers are changing the way we work.* Princeton, NJ: Princeton University Press.

Norman, D. (2008, September 29). On the three parts of open education [Web log post]. Retrieved from http://www.darcynorman.net/2008/09/29/on-the-three-parts-of-open-education/.

OECD (2006). *PISA 2006 science competencies for tomorrow's world* (Vol. 1, Analysis). Paris: Organisation for Economic Cooperation and Development.

Schoder, D., & Fischbach, K. (2003). Peer-to-peer prospects. *Communications of the ACM, 46*(2), 27-29.

Schoder, D., Fischbach, K., & Schmidtt, C. (2005). Core concepts in peer-to-peer (P2P) networking. In R. Subramanian & B. Goodman (Eds.), *P2P computing: The evolution of a disruptive technology*. Hershey, PA: Idea Group Inc.

Schmidt, J.P. (2008). Open courseware as an example for user-centric innovation in higher education – towards a new social role of the university. *Proceedings of the 4th Barcelona Conference on Higher Education*. Barcelona: Global University Network for Innovation.

Schmidt, J.P., & Surman, M. (2007). *Open sourcing education: Learning and wisdom from iSummit 2007*. Retrieved from http://icommons.org/resources/open-sourcing-education-learning-and-wisdom-from-isummit-2007.

Siemens, G. (2005). *Connectivism: A learning theory for the digital age*. Retrieved from http://www.elearnspace.org/Articles/connectivism.htm.

Siemens, G. (2008). *History of open content*. Retrieved from University of Manitoba website: http://ltc.umanitoba.ca/connectivism/?p=156.

Tyler, W. (1982). Complexity and control: The organisational background of credentialism. *British Journal of Sociology of Education, 3*(2), 161-172.

van Gennip, N. A. E., Segers, M., & Tillema, H. H. (2009). Peer assessment for learning from a social perspective: The influence of interpersonal and structural features. *Learning and Instruction*. *4*(1), pp. 41-54.

Voorhees, R. A. (Ed.). (2001). *Measuring what matters: Competency-based learning models in*

higher education. New Directions for Institutional Research, No. 110. New York: John Wiley & Sons.

Wellman, J. V., & Ehrlich, T. (2003). *How the student credit hour shapes higher education. New directions in higher education, no. 122*. San Francisco: Jossey-Bass.

Wiley, D. (2008a, September 29). More on the three parts of open education [Web log post]. Retrieved from http://opencontent.org/blog/archives/580.

Wiley, D. (2008b, September 30). On open accreditation [Web log post]. Retrieved from http://opencontent.org/blog/archives/585.

Wolanin, T. R. (2003). The student credit hour: An international exploration. In J. V. Wellman & T. Ehrlich (Eds.), *How the student credit hour shapes higher education: New directions in higher education, no. 122* (pp. 100-103). San Francisco: Jossey-Bass.

Young, J. (2008, October 3). When professors print their own diplomas, who needs universities? *The Chronicle of Higher Education.*

1We use the term open to refer to participatory and collaborative practices, such as in open source software, rather than distance learning.
2Unpublished data from OpenCourseWare Consortium.
3See example at Utah State University above.
4Some of these ideas were inspired by blog posts and the comments that readers left in response to the posts. See Young (2008), Wiley (2008a, 2008b), Siemens (2008) as starting points.

International Review of Research in Open and Distance Learning
Volume 10, Number 5. *ISSN: 1492-3831*

November – 2009

Open Educational Resources: New Possibilities for Change and Sustainability[1]

Norm Friesen
Thomson Rivers University, Canada

Abstract

In an attempt to understand the potential of OER for change and sustainability, this paper presents the results of an informal survey of active and inactive collections of online educational resources, emphasizing data related to collection longevity and the project attributes associated with it. Through an analysis of the results of this survey, in combination with other surveys of OER stakeholders and projects, the paper comes to an initial conclusion: Despite differences in priorities and emphasis, OER initiatives are in danger of running aground of the same sustainability challenges that have claimed numerous learning object collection or repository projects in the past. OER projects suffer from the same incompatibilities with existing institutional cultures and priorities that have dogged learning object initiatives, and they face the concomitant challenge of gaining access to the operational funding support that experience shows is necessary for their survival. However, through a review of one of the most successful of OER projects to date, the MIT Open Courseware Initiative, the paper ends by augmenting this significant caveat with a second, more hopeful conclusion: OER projects, unlike learning object initiatives, can accrue tangible benefits to educational institutions, such as student recruitment and marketing. Highlighting these benefits, it is argued, provides an opportunity to link OER initiatives to core institutional priorities. In addition to providing a possible route to financial sustainability, this characteristic of OER may help to foster the significant changes in practice and culture long sought by promoters of both learning objects and OERs.

Keywords: E-learning; open courseware; project sustainability; learning objects

Background and Terminology

The term *open educational resources* was first adopted at the 2002 UNESCO Forum on the Impact of Open Courseware for Higher Education in Developing Countries, sponsored by The William and Flora Hewlett Foundation. The term was defined as "the open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for noncommercial purposes" (UNESCO, 2002, p.

[1] This paper was written with the support of the BC Centre for Open Learning.

24). This definition and its emphasis on open availability and noncommercial use remains central in the way the term is used today, and the implied understanding that open courseware represents a kind of OER is one shared by this paper, and by other texts like it. The notion of openness, for its part, has been given legal force and definition through the set of copyright licenses released by Creative Commons, also in 2002. In their final declaration, the forum participants expressed "their wish to develop together a universal educational resource available for the whole of humanity to be referred to henceforth as Open Educational Resources" (p. 6). They contextualized this ambitious aspiration by comparing their vision to UNESCO's existing program for the identification and preservation of "cultural and natural heritage around the world considered to be of outstanding value to humanity" (UNESCO 2009): "Following the example of the World Heritage of Humanity, preserved by UNESCO, [we] hope that this open resource for the future mobilizes the whole of the worldwide community of educators" (UNESCO, 2002, p. 28).

These far-reaching humanitarian goals and prospects are still very much relevant to the use of the term open educational resources (OERs) and to terms such as *open courseware* (OCW) and *open education* generally. But for the comparison with UNESCO heritage sites to hold, issues of preservation and sustainability must be taken very seriously. There is little use in establishing a "universal educational resource" – however effective for human and educational development it may be – if it is neglected or goes offline after a few years. Finally, it is also important to note that the original organizations sponsoring this first meeting, UNESCO and the Hewlett Foundation, remain important in their support of ongoing OER and OCW efforts.

An obvious question at this point concerns the relationship of OERs to *learning objects*. Although a consensual definition of the term learning object has proven notoriously elusive (e.g., Wiley, 2000), a look at even a few of the many divergent definitions is telling. For example, the learning object has been defined as "a modular building block for e-learning content" (Allan, 2008), as an instructional element "grounded in the object-orientated paradigm" (Wiley, 2000, p. 2), and as a "digital self-contained and reusable entity" (Chiappe, Segovia, & Rincon, 2007, p. 675). What is significant in each definition is precisely what is included and excluded: Each definition highlights (either directly or indirectly) *modularity* as a technological and design attribute for the object and its content, emphasizing the "self-contained," "building block" or "object-oriented" nature of the technology. This corresponds to a broader emphasis on technological solutions and standards that is evident in many learning object projects and publications. Mention of technical standards and of modular design, on the other hand, is conspicuously absent in discussion of OERs.[2] A second general difference separating learning objects from their open educational counterparts is indicated by the absence of any explicit reference to the openness or the open and noncommercial character of the resource. Over the course of the 10 or more years that the term

[2] Significant reservations about the emphasis on the technological and technical standards of learning objects have been expressed in recent reports on OERs. For example, the OLCOS Roadmap 2012 associates the technically demanding Learning Object Metadata standard (containing 76 data elements) with learning objects but identifies RSS feeds and social bookmarking (utilizing folksonomies and 12 or fewer data elements) with OERs (Geser, 2007, p. 47).

has been in use, learning objects have been associated with visions of "virtual market economies," "learning object economies," "digital rights protection management" technologies, and a variety of explicitly commercial models for project sustainability (Carey, 2003; Johnson, 2003; Downes et al., 2004).

Collections of Online Materials

Although OERs, learning objects, and other ways of defining educational content may be readily distinguished in theoretical and definitional terms, they are not so easily discriminated in practice. This is especially clear when the characteristics of repositories, databases, or collections of online educational resources are reviewed. Some of the longest-lived and thus most "successful" collections of resources have eschewed reference to learning objects, OERs, and other related nomenclature in facilitating and promoting the use of online educational resources. This suggests that some of the best examples available in practice are based on approaches not reducible to those of either of the OER or the learning object terms or categories. One could say that they have developed a vocabulary and self-understanding inductively from actual practices, rather than deriving them inductively from first principles. This includes the Multimedia Educational Resource for Learning and Online Teaching (MERLOT), which went online in 1997 and includes links to contents that are available both for free and for a fee. This also includes the collection of free online courses or course materials of the Massachusetts Institute of Technology (MIT). Announced with great fanfare in 2001, this project recently met its original ambitious goal of placing all of MIT's course content online by 2007. Additionally, this project effectively pioneered the notion of providing free access to course materials, and it also popularized the term open courseware. Correspondingly, it is one of the original inspirations for the "OER movement" (UNESCO, 2002, pp. 1-2), and it is significant for being one of the few early, high-profile online initiatives announced by a campus-based institution to survive to the present day.[3] At the same time, this project is also conspicuous in its emphasis on MITs own institutional products or *courses*, rather than on collecting smaller units of content from a range of sources. As such, it offers a model that is both robust and distinct from efforts that make available smaller components or units of online courseware.

Still, the number of online collections of educational resources that are active at the time of writing is considerable, large enough, in fact, to make an exhaustive listing impossible or at least unwieldy. Instead, the collections listed in the table below are intended to be representative of the wide range of collection emphases, policies, and histories. (A similar, selective listing is provided by Yuan, MacNeill, & Kraan, 2008.) The collections listed in Table 1 reflect the multiplicity of emphases and approaches in practice that confound neat attempts at compartmentalization. The data on the approximate number of resources in each collection, the indication of the subjects and educational domains addressed, and the type of copyright licensing implemented (if any) vary widely. A special effort was made to determine the source of funding for each collection or project as well as its start date, which is in most cases the year the collection first appeared online.

[3] Examples of conspicuous failures abound and include Cardean University, NYUonline, UNext, UK e-U, and Fathom (Columbia University).

To help support some of the points made below, the collections listed have been grouped by the level of inclusiveness of the subject-matter and resource types: Collections inclusive of *all* subjects and *all* levels of education are listed first; those focusing on specific types of resources (video clips, entire courses, or particular kinds of course units) follow; and finally, collections providing resources specific to one subject or a small collection of subjects are listed.

Table 1

Selected Educational Resources Collections Currently in Operation (January 2009)

Name/address	Primary sponsorship	Subject/level emphasis	Items, start date	Types of content	Copyright
A L L S U B J E C T S A N D R E S O U R C E T Y P E S					
Connexions http://cnx.org/	Hewlett, Rice University	All subjects, postsecondary	7000+ (1999)	Courses, books, reports, etc.; includes own content authoring system	Creative Commons
Curriki http://www.curriki.org/	Non profit; unknown	All subjects, all levels	15,000+ (2004)	All types, wiki-integrated	Creative Commons
GEM Gateway to Educational Materials http://thegateway.org/	National Education Association	All subjects, all levels	50,000+ (2001?)	All types	various
Intute http://www.intute.ac.uk/	UK Joint Info. Systems Committee (JISC)	All subjects, postsecondary	100,000 + (2007)	All types	various
MERLOT http://www.merlot.org/merlot/index.htm	Membership fees; gov't & commercial	All subjects, postsecondary	20,000+ (1999)	All types	Creative Commons
OER Commons http://www.oercommons.org	Hewlett Foundation	All subjects, all levels	20,000+ (2007?)	All types, including OCW, modules, etc.	Creative Commons
S P E C I F I C R E S O U R C E T Y P E S					
http://edutube.org/	Unknown	All subjects; all education levels	1000+ (2007?)	Video clips from YouTube	No info
MIT Open Courseware	Hewlett Foundation,	All subjects, postsecondary	2000+ (2001)	Courses, course components	Creative Commons

http://ocw.mit.edu	Mellon, MIT				
OCW Finder http://ocwfinder.com	OCW Initiative	All subjects, postsecondary	10,000+? (2005)	Courses	Creative Commons
Open Learn http://openlearn.open.ac.uk/	Institutional	All subjects, postsecondary	500+ units (2006)	Units for x hours of learning	Creative Commons
http://webcast.berkeley.edu/	Institutional	All subjects, postsecondary	1000's (2002)	Video/audio recordings of courses & events	Creative Commons starting 2007
Wikiversity http://en.wikiversity.org/wiki/Wikiversity:Main_Page	Wikimedia Foundation	All subjects, all levels	10,000+ (2006)	Various types; all wiki-integrated	Creative Commons
World Lecture Project http://www.world-lecture-project.org/	Unknown	All subjects, postsecondary	1000+ (2007?)	Video recordings of lectures	Various
S P E C I F I C E D U C A T I O N A L D O M A I N S					
Digital Library for Earth System Education (DLESE) http://dlese.org/library/index.jsp	National Science Foundation	Earth sciences, all levels	10,000+ (2001)	Websites	All rights reserved
Health Education Assets Library http://www.healcentral.org/	National Science Foundation	Health sciences, all levels	20,000+ (2003)	All types	Creative Commons
Maricopa Learning Exchange http://www.mcli.dist.maricopa.edu/mlx	Maricopa County colleges (Phoenix)	Emphasis on IT and skills	1500+ *packages* (2002)	Documents and other types	Creative Commons

There are a number of significant features or trends to be highlighted from this listing. First, the table indicates that many collections, including those established before the emergence of Creative Commons (e.g., Connexions and MERLOT), are now using Creative Commons licensing whereever possible. It is also worth noting that the funding for the operations of many of the projects is either provided by a parent institution (e.g., Rice University, Maricopa County Colleges), by a governmental organization (e.g., DLESE is supported by the National Science Foundation; JISC, which supports Intute, is funded by the UK National Lottery), or by a combination of these types of sources. Only MERLOT, which gains at least *some* of its support from institutional or consortial membership fees, has been able to approximate a kind of business model envisioned for many learning object projects.

The estimated start dates for the collections listed in the table are also significant, with dates clustering around 2000 and also around the second half of the current decade. (There are seven repositories with start dates of 1999-2002, five with start dates from 2006-2007, and only two with dates falling between 2003 and 2005.) What this table does not indicate, of course, is the many projects that have fallen inactive or been discontinued. Only by looking at approaches that have met with longer-term success and longevity and also at those that have met with less desirable fates is it possible to understand the nature and the enormity of the sustainability challenge online educational resource collections face.

The Sustainability Challenge

The collections listed in Table 1 that are seven years old or older can be seen as having addressed the sustainability challenges that this paper argues are of paramount importance. Those projects that have gone online only in the last two or three years, one can surmise, may yet need to overcome sustainability challenges that have resulted in the discontinuation of many similar projects. Unsurprisingly, the question of sustainability and longevity of learning resource collections is one that is structurally excluded from surveys and other forms of research: The failure of a project's sustainability or its business model is by definition not the subject of research for that project; and there is little incentive for research and reporting to focus on the many projects and models that have run aground of sustainability challenges. But knowledge of the success and *also* of the failure of educational resource projects is indispensable for recent and up-coming projects. Open educational resource projects, in this sense, can learn a great deal from previous learning object initiatives and collection projects, regardless of their ultimate fate.

The timeline presented in Figure 1 indicates the lifespan of a number of repository projects over a 10-year period. Again, the intention is to be illustrative rather than exhaustive, with most dates being estimated and approximate rather than confirmed and exact. With only a few exceptions, the initiatives included in the timeline diagram are those that deliberately chose the "learning object" label to be associated with their efforts, invoking with it the attendant emphases on technological solutions and content modularity. Those shown on the top of the shaded timeline bar are Canadian collections, and those at the bottom are the result of American, European, or international efforts.

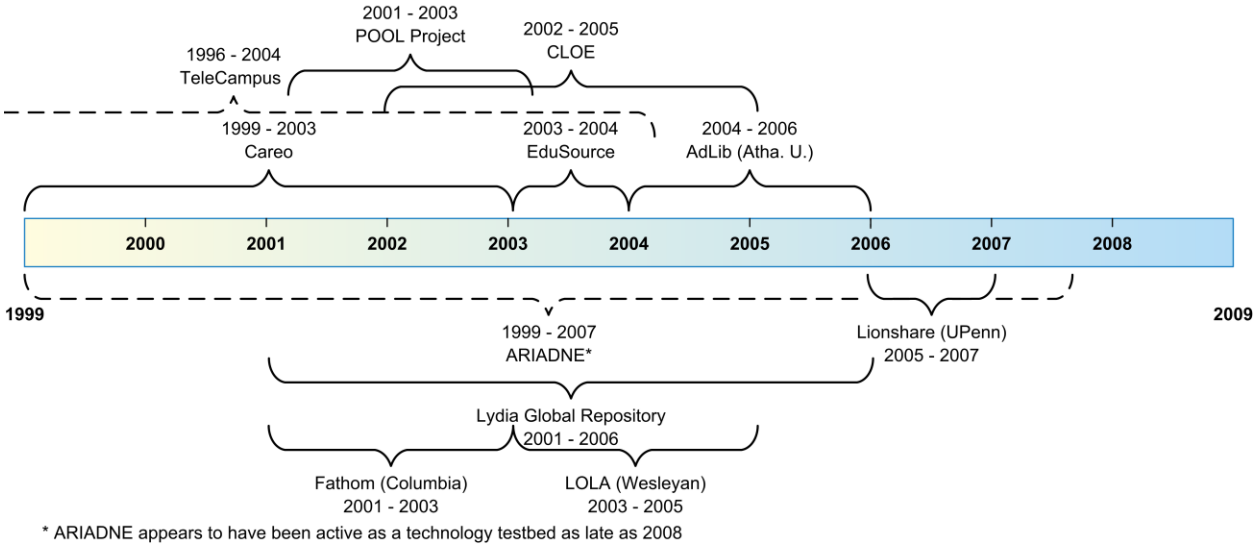

Figure 1. Inactive or discontinued collection projects over the last 10 years.

The projects listed vary in their approaches to both technology and sustainability. For example, the initiatives listed include a number of different technical architectures, with the Careo and Lydia projects using a centralized server, the EduSource and CLOE initiatives taking a distributed approach, and POOL and Lionshare projects focusing on a peer-to-peer model. Different approaches to collection policy sustainability are also illustrated, including a "virtual economy" model adopted in the CLOE project, a collaborative, consortial model developed for Fathom, and a more explicitly commercial model associated with the Lydia Global Repository.

It is important to note that without exception the projects included in this timeline share at least two common characteristics:

- First, even though most projects began *after* MIT's initiative in open courseware, none prioritized the collection of contents that were in the public domain or that were subject to Creative Commons licensing.
- Second, their collection mandates were not limited to a specific subject area or to a particular community of subject specialists; instead, all of the projects shown included *all* educational subjects and topics.
- Third, half of the projects shown began between 2001 and 2003.

This last observation goes some way to explaining the relative lack of active projects in Table 1 with start dates in this range and lends some credence to the claim that substantial sustainability challenges come relatively early in a collection's lifetime. As a related observation, it is worth noting that there are only two projects included on this chart whose lifespan exceeds five years: the TeleCampus project, which began before the term learning objects or repositories were in use and received support from a local government source, and ARIADNE, which received funding from the European Union and which in the last few years has served (largely) as a testbed for the

development of different technologies related to the searching and administration of learning objects. Outside of these two projects, the average lifetime of the repositories included above is less than three years. It is not surprising that this number correlates broadly to the timescales typical for funding research and development projects. Consequently, it is disquieting to read in a recent report on open educational resources that "the majority of OER development" is also "undertaken on a project basis" (D'Antoni, 2008, p. 18). The clear sustainability lesson from both this listing of inactive projects and the earlier listing of active efforts is the importance of ongoing, operational institutional or consortial funding for educational resource collections and the difficulty of realizing alternative funding models. Online educational resource initiatives of this kind, one can conclude, need to be seen as processes or services rather than as products that persist of their own accord.

If this could be labeled as the first lesson of sustainability, the importance of community is the second lesson that can be derived from Table 1 and Figure 1. Only projects that are large-scale, well-funded, and able to benefit from a first-mover advantage (i.e., being one of the first of their kind) seem to have any chance of developing collections whose scope extends to *all* educational subjects. There are many collections catering to the needs of a single subject specialist community (or a small, interrelated subset of such communities) that provide evidence of sustainability. Three of the active collections with specific subject emphases listed earlier, for example, have outlived the "sustainability crunch" that seems to come in the third year of so many projects. Finally, it is also worth noting that at least two of the larger, subject-inclusive repositories in Table 1 (MERLOT and Intute) represent *aggregations* of smaller, subject-specific collections that serve clearly-defined subject specialist communities. Speaking of subject specialization and the scope of project collections, one could conclude that groups of subject specialists can provide ready-made communities of practice for repositories, and that the *scope* of any collection must be matched by its *scale*.

These general observations are commensurate with a survey report recently released by UNESCO as a follow-up to the Forum on the Impact of Open Courseware mentioned at the outset. Entitled *Open Educational Resources: The Way Forward*, the document ranked 15 of the top concerns of the "OER international community of interest" (D'Antoni, 2008). The issue of sustainability of OER projects, unsurprisingly, was one of the top concerns (4th out of 15). The top three challenges or issues speak clearly to issues implied in the sustainability challenge:

1. awareness raising and promotion;
2. communities and networking of creators and users; and
3. capacity development, specifically as it relates to the development and pedagogical application of OERs.

These concerns share a number of characteristics in common: None are related to technology or to technological solutions (the need for technical tools ranked 12th). None raise issues such as ease of use or cost-savings – two concerns receiving considerable attention in the literature associated with learning objects (e.g. Weller, 2004). Instead, these top concerns, as the report's author explains, are of a "community focused" and "decentralized" nature (D'Antoni, 2008, p.

17). They underscore incompatibilities between pedagogical and community cultures, on the one hand, and the practices and priories associated with developing, sharing, and utilizing online instructional content, on the other. This echoes concerns that have been voiced for years by those involved in the promotion of learning objects. One survey of faculty from 2003 shows that a lack of knowledge, a lack of technical ability, and a lack of pedagogical skills were among the top factors impeding "the adoption of learning objects" at one research-intensive university (Griffith, 2003, p.8). Other articles in the learning objects literature underscore "the importance of taking …context and culture into account when developing and implementing technological solutions in complex social systems" (Casey, Proven, & Dripps, 2006, p. 2; see also Friesen, 2003). "The current situation," as another article from the same time-period observes, "can be best described as high-level ambitions with poor implementation" (van der Klink & Jochems, 2004, p. 151; as cited in Casey, Proven, & Dripps, 2006, p. 3) The problem, however, is that cultures, policy, and procedure are not designed and implemented; they evolve – often with excruciating slowness.

Possibilities for Change

The situation outlined in surveys of stakeholders and educators, whether of local faculty in 2003 or globally in 2007, reveal a vicious circle of "chicken and egg." The necessary *preconditions for viability* – awareness, capacity, community, cultural change – are identical with what would be the *results of success*. However, a closer look at one of the small number of successful, pathbreaking projects listed above points to other possibilities. This is the MIT OpenCourseWare project, which has been responsible for catalyzing broader developments specifically in OCW and OER. A 2005 *Program Evaluation Findings Report* for the MIT OCW highlights a range of factors associated with the success of this project. Some of these factors and findings have been widely celebrated and others surprisingly ignored.

1. First, a widely recognized finding is the fact that MIT courses and course contents are benefitting users globally. The majority of use takes place outside of the United States itself, with a substantial minority of users coming from outside of OECD-member (or developed) nations (MIT OCW, 2005). The humanitarian, assistive, and ameliorative potential of open courseware, in other words, is clear: the majority of its use is from nations with less developed university infrastructures than the USA.
2. A further important finding is that the majority of the use of MIT courses is for self-directed, informal learning, namely to "improve" or "enhance *personal* knowledge" or to "explore areas *outside* [one's] professional field" (MIT OCW, 2005, pp. 28, 32; MIT OCW, 2009; emphases added). In other words, the majority of the use of this material not only takes place outside of the USA, it also occurs outside in the context of reuse and adaptation by teachers or instructional designers. Together, the first and second factors explain a kind of contradiction apparent in the MIT initiative: it is educationally valuable without detracting from the educational value of the face-to-face activities on which the collected content is based.
3. A correlative finding is that the MIT resources, despite the ambiguity of terms like educational resources or courseware, are actually being used and followed as *courses*, within the context of the syllabi and other course structures and conventions.

A fourth and final finding (or rather, set of findings) is connected to the relationship of the project to MIT itself as an institution. This finding provides clear evidence of multiple areas of significant benefit accruing to MIT the institution from the open courseware project, and it provides a positive illustration of important possibilities for change. The report states that "OCW use is centered on subjects for which MIT is recognized leader," with areas in technology and science accounting for 62% of traffic (MIT OCW, 2005, p. 2). Majorities of students and faculty at MIT, moreover, use the site to support their study and teaching, and 32% of faculty say that putting materials online has improved their teaching (MIT OCW, 2005, pp. 2-4). Finally, the role of the project in student recruitment is significant: 16% of the student users employ the MIT courses to "plan a course of study," and "35 percent of freshmen who were aware of OCW prior to deciding to attend MIT indicate the site was a significant or very significant influence on their choice of school" (cited in Wiley, 2006, p. 6). Significantly, this percentage of students more than quadrupled from the year before. Commenting on this rapidly growing awareness of student recruits, David Wiley presents a conclusion that may be of the utmost significance for OER: "The time will come when an OpenCourseWare or similar collection of open access educational materials will be as fully expected from every higher education institution as an informational website is now" (2006, p. 6).

Therein lies one of the most powerful drivers of adoption of OERs and of boader change sought by the advocates of their adoption and use. Simply put, this is enlightened institutional self-interest. Wiley makes the case in connection with institutional service and recruitment, but MIT has benefited in many other ways from its early and daring investment in open courseware. Although MIT is able to leverage an already existing global reputation and first-mover advantage, many of the benefits it has been able to realize would apply to smaller institutions as well. This includes student recruitment, the potential for improving teaching and for better supporting learning, and a kind of viral marketing of the quality of teaching and learning in areas of strategic institutional interest. Institutions looking at following in MIT's footsteps enjoy the advantage that effective licensing, consortia, and growing awareness are all in place. They need not risk financial and cultural capital on creating yet another collection or repository, but instead can invest it in the quality and accessibility of their course offerings. This is enabled through the Open CourseWare Consortium and its OCW finder, which combines and centralizes offerings from "more than 200 higher education institutions and associated organizations from around the world" to create "a broad and deep body of open educational content using a shared model" (OCW Consortium, 2009). It is worth noting that the OCW Consortium, which appears to have obtained many of its most prestigious members only after 2005 (the publication year of the report cited above), essentially provides other institutions with the means of applying the MIT model to a subset of their courses. It only asks of its members a contribution of 12 courses to its growing collection of over 10,000 courses. This low barrier to entry, as well as the example provided by an expanding number of reputable member institutions, has resulted in the kind of exponential growth shown in the graph below.

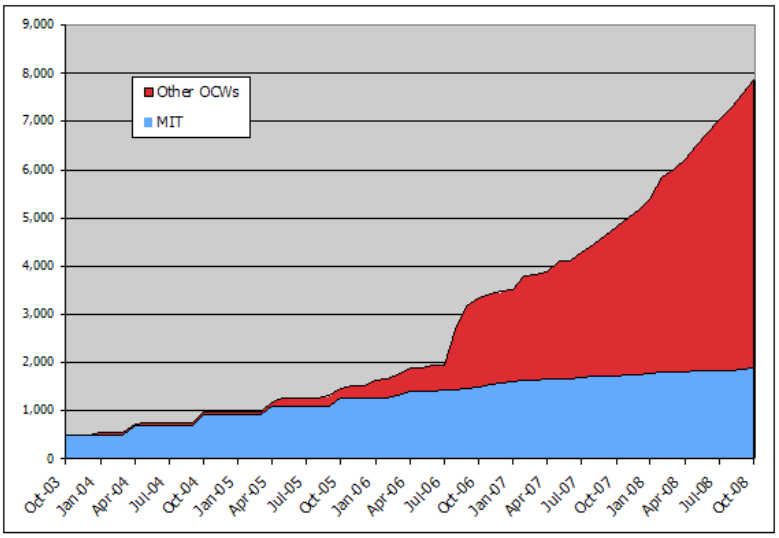

Figure 2. Open courseware production in the Open Courseware Consortium (Caulfield, 2008; used with permission).

The hope is that examples, evidence, and arguments of the kind provided in the MIT report and the graph in Figure 2 – targeted at existing institutional priorities and interests – will lead to action and investment whose effects ultimately extend well beyond present institutional interests. The point, as Wiley explains, is that "this strategy of openness" holds out the promise of "catalyzing further innovations" (2006). And such innovations, above all in practice, community, and policy, have the potential of fomenting the necessarily gradual, cultural sea change sought by the OECD and others to meet their lofty but laudable goals.

References

Allan, K. (2008). *A primer on e-learning*. Retrieved from http://www.futurelab.org.uk/resources/publications-reports-articles/web-articles/Web-Article948.

Carey, T. (2003). *About CLOE*. Retrieved from http://learnware.uwaterloo.ca/projects/CCCO/cloe_about_find.html.

Casey, J., Proven, J., & Dripps, D. (2006). *Geronimo's cadillac: Lessons for learning object repositories*. Retrieved from http://www.csfic.ecs.soton.ac.uk/Casey.doc.

Chiappe, A., Segovia, Y., & Rincon, Y. (2007). Toward an instructional design model based on learning objects. E*ducational Technology Research and Development*, *55*(6), 671-681.

Caulfield, M. (2008). *OCW production in the OCWC, 2003 to present (w/ chart).* Retrieved from http://ocwblog.org/2008/11/18/ocw-production-in-the-ocwc-2003-to-present-w-chart/.

D'Antoni, S. (2008). *Open educational resources: The way forward deliberations of an international community of interest*. Retrieved from http://oerwiki.iiep-unesco.org/images/4/46/OER_Way_Forward.pdf.

Downes, S., Babin, G., Belliveau, L., Blanchard, R., Levy, G., Bernard, P., Paquette, G., & Plourde S., (2004). *Distributed digital rights management: The EduSource approach to DRM*. Retrieved from http://www.downes.ca/files/DDRM_14April2004.pdf.

Friesen, N. (2004). Three objections to learning objects. In R. McGreal (Ed.), *Online education using learning objects* (pp. 59-70). London: Routledge. Draft available at http://www.learningspaces.org/n/papers/objections.html.

Geser, G. (2007). *Open educational practices and resources: OLCOS roadmap 2012*. Salzburg Research EduMedia Group. Retrieved from http://www.olcos.org/cms/upload/docs/olcos_roadmap.pdf.

Holzinger, A., & Ebner, M. (2003). Interaction and usability of simulations & animations: A case study of the Flash technology. *Proceedings of IFIP INTERACT03: Human-Computer Interaction* (p. 777). Zurich, Switzerland.

Johnson, L.F. (2003). *Elusive vision: Challenges impeding the learning object economy*. Retrieved from http://download.macromedia.com/pub/solutions/downloads/elearning/elusive_vision.pdf.

MIT OCW (2005). *MIT OpenCourseWare 2005 program evaluation findings*. Retrieved from http://ocw.mit.edu/ans7870/global/05_Prog_Eval_Report_Final.pdf.

MIT OCW (2009). *Site statistics*. Retrieved from http://ocw.mit.edu/OcwWeb/web/about/stats/.

OCW Consortium. (2009). *OCW Consortium: About us*. Retrieved from http://www.ocwconsortium.org/about-us/about-us.html.

Griffith, R. (2003). *Learning objects in higher education*. Retrieved from http://www.academiccolab.org/resources/webct_learningobjects.pdf.

UNESCO (2002). *Forum on the impact of Open Courseware for higher education in developing countries final report*. Retrieved from http://unesdoc.unesco.org/images/0012/001285/128515e.pdf.

UNESCO (2009). *About World Heritage*. Retrieved from http://whc.unesco.org/en/about/.

Van der Klink, M., & Jochems, W. (2004). Management and organization of integrated e-learning. In W. van Merriënboer & R. Koper (Eds.), *Integrated e-learning: Implications for pedagogy, technology and organization* (pp. 151-163). London: Routledge & Falmer.

Weller, M. (2004). Learning objects and the e-learning cost dilemma. *Open Learning, 19*(3), 293-302.

Wiley, D. A. (2000). Connecting learning objects to instructional design theory: A definition, a metaphor, and a taxonomy. In D. A. Wiley (Ed.), *The instructional use of learning objects: Online version*. Retrieved from http://reusability.org/read/chapters/wiley.doc.

Wiley, D. A. (2006). Testimony to the Secretary of Education's Commission on the Future of Higher Education. Retrieved from http://www.ed.gov/about/bdscomm/list/hiedfuture/3rd-meeting/wiley.pdf.

Yuan, L., MacNeill, S., & Kraan, W. (2008). *Open educational resources—Opportunities and challenges for higher education*. Retrieved from http://learn.creativecommons.org/wpcontent/uploads/2008/09/oer_briefing_paper.pdf.

International Review of Research in Open and Distance Learning
Volume 10, Number 5. *ISSN: 1492-3831*

November – 2009

The Technological Dimension of a Massive Open Online Course: The Case of the CCK08 Course Tools

Antonio Fini
University of Florence, Italy

Abstract

In 2008, a new term emerged in the already crowded e-learning landscape: MOOC, or massive open online course. Lifelong learners can now use various tools to build and manage their own learning networks, and MOOCs may provide opportunities to test such networks. This paper focuses on the technological aspects of one MOOC, the Connectivism and Connective Knowledge (CCK08) course, in order to investigate lifelong learners' attitudes towards learning network technologies. The research framework is represented by three perspectives: (a) lifelong learning in relation to open education, with a focus on the effective use of learning tools; (b) the more recent personal knowledge management (PKM) skills approach; and (c) the usability of web-based learning tools.

Findings from a survey of CCK08 participants show that the course attracted adult, informal learners, who were not concerned about course completion. Time constraints, language barriers, and ICT skills affected the participants' choice of tools; for example, learners favoured the passive, time-saving mailing list over interactive, time-consuming discussions forums. Some recommendations for future MOOCs include highlighting the purpose of the tools (e.g., skill-building) and stating clearly that the learners can choose their preferred tools. Further research on sustainability and facilitator workload should be conducted to determine the cost and effectiveness of MOOCs. Investigation is also necessary to understand MOOC participant profiles as they relate to course outcomes and retention and whether terms such as *course* and *attrition* are appropriate in this context.

Keywords: Open learning; online learning; massive open online course; MOOC; learning environments; personal knowledge management; usability

Connectivism and Connective Knowledge Course

Multi-tool learning environments are gaining momentum. From the criticism of VLEs and other institution-managed platforms (Wilson, 2005) through the debate about personal learning environments (PLEs) (Attwell, 2007) to the concept of "loosely coupled teaching" (Leslie, 2007),

there has been a shift from centralized, specialized, institutionally owned systems (VLE, LMS) towards distributed, general-purpose, user-centered, and user-owned systems, such as social software tools. In the context of informal education, the integration of multiple and heterogeneous environments and tools may represent the starting point of a learner's knowledge construction quest. Many people are using blogs, wikis, social networks, messaging systems, etc. The underlying idea is that people are comfortable with tools they consider to be their own, and they may wish to continue to use them when engaged in learning activities. Therefore it becomes important to understand the extent to which multi-tool environments are effective in supporting education and learning and to derive some guidelines on their integration in order to optimize their effectiveness for learning.

This paper focuses on the course Connectivism and Connective Knowledge (CCK08), facilitated by George Siemens and Stephen Downes in the fall of 2008 (Siemens & Downes, 2008). The CCK08 was an online course offered both formally through the University of Manitoba and also informally with enrollment open to anybody in the world (at no cost). As the terms *course* and *informal* might seem to be in conflict, we should clarify the meaning of *formal* and *informal* in this context. Formal refers to participants earning credit from the University of Manitoba and for that reason having to complete the course and obtain positive grading of assignments. Informal refers to participants attending the course and undertaking the activities at their own pace without receiving any type of academic certification or grading from the facilitators. Hybrid ways of attending were also possible in the course: According to Siemens (2009), one student enrolled in the course but was evaluated by her own institution.

The CCK08 course was also characterized by a variety of technological tools available to the students. Some were selected and proposed by the facilitators, and others were suggested by the participants. Even though the course assignments required only the use of a personal blog and a tool to build concept maps, during the course more than 12 different tools and technological environments were used, from LMSs (Moodle) to 3D environments (Second Life).

This paper reports the results of a survey conducted among the CCK08 attendants. The aim was to analyze learners' views about the multi-tool environments adopted in the course and to give some suggestions for setting up multi-tool course environments.

Background

The CCK08 course can be situated in the framework of open and distance learning (ODL) initiatives that are offered by institutions and single teachers around the world. The background is the open education movement, whose different aspects have been well illustrated by Iiyoshi and Kumar (2008). In their book, three main themes are covered: open technology, mainly related to open source software for education; open content, with reflections on some open educational resources (OER) initiatives, and open knowledge, with practical suggestions for sharing educational practices and considerations about institutional points of view on openness in education.

Furthermore, after years of online learning practiced mostly by replicating traditional online activities and methods (but with more flexibility due to fewer time and space constraints), recent research trends are shaping a specific online learning theory. For example, Anderson (2008) proposes a model in which the "affordances of the net" play a key role and where it is possible to include the many different forms of teaching and learning supported by present web technologies, with an outlook for future semantic web capabilities.

The CCK08 is not the first open online course (OOC). For example, in 2007/08 the Social Media Open Education course by Alec Couros and the Introduction to Open Education course by David Wiley had international relevance (Fini et al., 2008). Open online courses may be considered to be a special type of OER, which solves the problem of the lack of interaction that is typical of most OER initiatives. While OERs are merely content, OOCs are live courses, which include direct participation of teachers and rich and valuable interaction among participants. As Siemens (2009) says, they are examples of shifting from a content-centered model towards "socialization as information objects." An OOC can be attended potentially by a large number of students, all over the world, provided that there are sustainability plans for the instructors. For example, it is unreasonable to think that a teacher is able to evaluate hundreds or thousands of blog posts weekly. Thus the real potential of an OOC is to be found in the emergence of learning networks among participants in a many-to-many relationship, rather than the traditional one-to-many model of interactions between a teacher and his or her students. Even this type of relationship can assume new forms, with significant changes in the role of instructors. The CCK08 is a particular case of this phenomenon. According to Downes (2009), 2200 people signed up, and hundreds of people from around the world participated in the CCK08 course, each with different behaviors, outcomes, and levels of involvement. These figures inspired the massive open online course (MOOC) definition (Siemens, 2008).

In the literature, there are studies (for example, Liu et al., 2009) and guidelines for the effective use of VLEs (Weller, 2007) as well as comprehensive reviews of technology uses for education (for example, Mason & Rennie, 2007). The UK JISC published a study on the effective use of social software to support student learning and engagement (JISC, 2009) in which many benefits and challenges related to institutions, educators, and students were noted. In particular, Clarebout and Elen (2006) carried out a meta-analysis of research about the use of different tools in computer-based learning. Some studies in their review showed that students had difficulty making choices about which tools to use. Furthermore, they found several authors stressing the importance of metacognitive skills in making adequate decisions.

More recently, the idea of a "networked lifelong learner" is offered by studies on personal knowledge management (PKM). Recent literature connects learning-to-learn competencies with technologies under the umbrella of this term (Cigognini et al., 2009) and identifies the related required skills as a multi-faceted set of abilities (Martin, 2006), including digital literacy, information literacy, and the ability to effectively use social software to build one's own learning environment (Pettenati et al., 2009). Social and relational aspects of the knowing knowledge attitude in the connectivistic framework (Siemens 2004, 2006) inevitably highlight that mastering technology is but one among many complex skills.

When dealing with technologies, it is important to refer also to usability and, more generally, to human-computer interaction. Usability is a well-known term that is related to quality. According to Shackel (1991), a usable system can "be used by humans easily and effectively." Nielsen (1999) provides a popular standard for the usability of websites. When applying usability concepts to web learning tools, it is crucial that the tools are particularly easy to use in order to avoid construct irrelevant cognitive load, which can distract the learner by requiring his/her attention for the mere use of the tool. This is the remarkable concept (although not limited to learning tools) of "zero learning time" (Nielsen, 2000). General usability rules are still valid for websites, even if not always followed, as Nielsen (2007) reports. For example, some sites use excessive graphics. Specific studies related to the usability of virtual learning environments (Ardito et al., 2006) and usability issues in learning-oriented applications (Rigutti et al., 2008) are also available.

Method

The survey consisted of three sections (the full version is available on the Internet at http://lte-unifi.net/file/CCK08_tools_survey.pdf):

1) Personal information: gender, age, nationality, mother tongue, level of proficiency in English, level of technological skills, profession;
2) General information about the CCK08 course: motivation, attendance type, completion, opinions about certification;
2a) General opinions about the toolset used in the course (most and least useful tools, level of comfort with the global toolset);
3) Detailed questions on each tool used in the course (frequency of use during the course, relevance, and comments). In some cases, questions were added.

The survey included a number of open-ended questions in order to gather detailed comments and opinions.

In this paper, a tag cloud visualization is used to represent the variety of answers received. Tag clouds have been realized with the wordle.net online tool (www.wordle.net). Unless specified otherwise, tag clouds include all the words used except common words (articles, prepositions, numbers etc.). The majority of the open-ended answers have also been categorized for better statistical processing.

The survey was managed online through a website based on LimeSurvey, an open source survey application. An invitation was emailed to 415 people. As a public and complete list of participants was not available, it was not possible to randomly select the sample. Thus, email addresses were collected from the CCK08 user profiles, which were accessible to people enrolled in the CCK08 Moodle environment and also from users' blogs. Furthermore, an announcement of the survey was published on Facebook, Linkedin, and as a post in the author's own blog. The online survey was active from December 1, 2008 to January 5, 2009.

Results and Discussion

Section 1: Personal Information

Eighty-three people completed the survey (49 males, 34 females). The overall age range of respondents was 28 to 69 years old (M = 48 yrs, *SD* = 9.75, *N* = 83). This is important evidence indicating that the course generated a special interest among adult learners.

Tables 1 and 2 illustrate the profile of the respondents, according to nationality and mother tongue.

Table 1

Nationality (N = 81)

Canada	14
Italy	8
Australia	7
UK	4
Argentina	3
The Netherlands	3
Venezuela	3
Spain	3
New Zealand	3
Other	17

Table 2

Mother Tongue (N = 83)

English	45
Italian	8
Spanish	8
Dutch	3
Portuguese	3
German	3
Other	13

As the course was taught in English, it was helpful to know the English proficiency level of the participants. As shown in Figure 1, more than 80% had a good level of English proficiency (mother tongue and advanced).

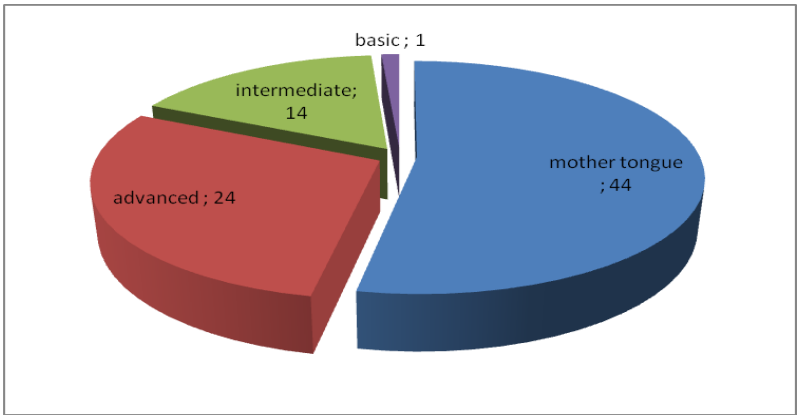

Figure 1. English proficiency level (*N* = 83).

The situation regarding technological skills was very similar (*N* = 83): 24 were experts/ICT professionals, 41 were power users, 18 were normal users, and no one self-identified as a beginner.

OOCs claim to be open; nonetheless, there are at least two barriers to access. Participants are required to have some basic competencies, specifically ICT skills and a good level of English proficiency. While it is obvious that learners willing to attend an online course should have adequate ICT skills, language is also an issue because OOCs have been provided in English generally. It is worth noting that CCK08 had multiple language translations (made by local groups), but these translations were limited mainly to course content. Nonetheless, interactions took place in English, so it is reasonable to consider English proficiency as a necessary skill for effective participation. Moreover, it is likely that if an institution offers a MOOC, it is probably in English, which is presently the international *lingua franca*.

Figure 2 shows the tag cloud of the jobs of the respondents (*N* = 82). The educational professions comprised the vast majority; for example, the word *teacher* occurs 24 times (Table 3 shows the participants' occupations).

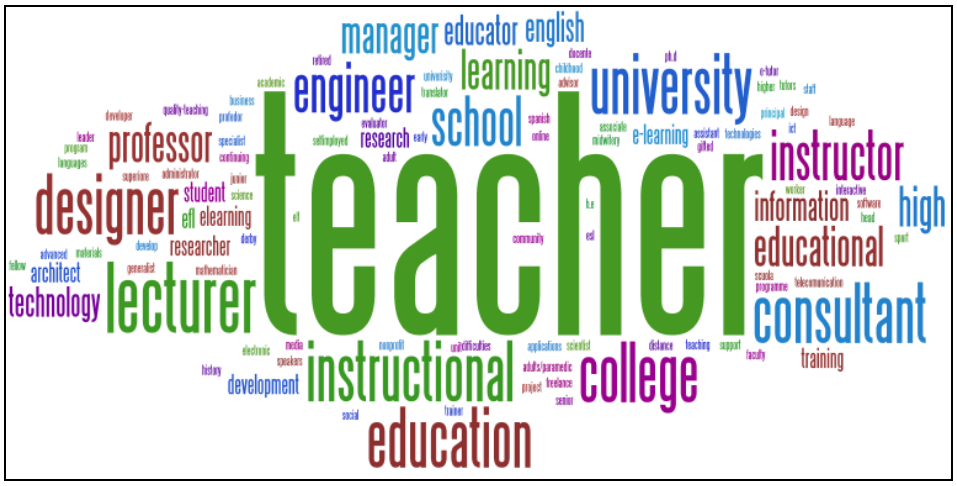

Figure 2. The jobs tag cloud.

Table 3

The Most Common Occupations

Teacher	24
Lecturer	7
Consultant	6
Designer	6
Engineer	5
Instructor	5
Professor	4
Manager	4
Educator	3
Researcher	2

Section 2: The CCK08 Course

Items in section 2 concern the respondents' attitudes towards the CCK08 course, from motivation to opinions about the course outcomes and the tools used.

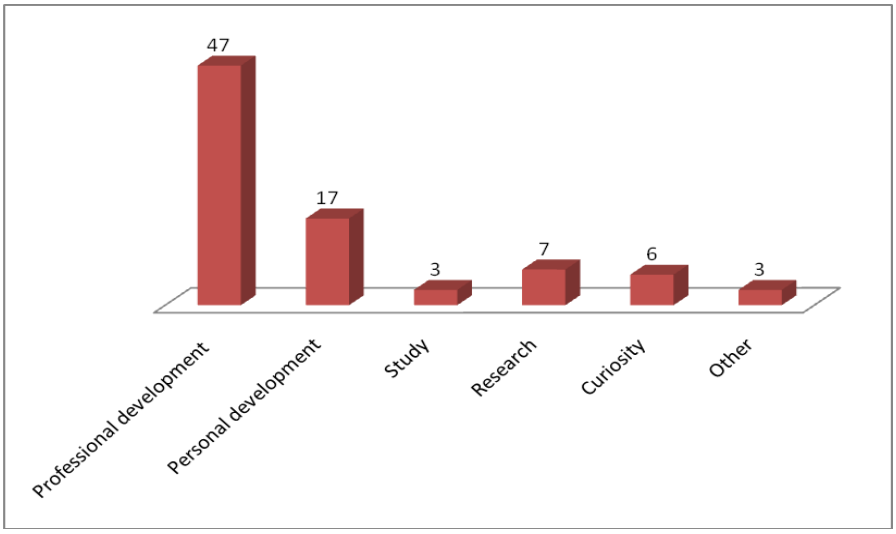

Figure 3. Motivation for attending CCK08 course (*N* = 83).

Seventy out of 83 respondents declared that they attended the course informally; 12 attended for credit at the University of Manitoba; and one attended formally for credit at another institution. The vast majority of respondents were informal learners, attending the course for professional and/or personal development. This fact fits with the age profile of the respondents (mostly adults).

As regards completion (N = 80), only 15 have completed the entire course, while 44 indicated a completion percentage lower than 50; specifically, 20 wrote all of the required blog posts, 17 made the concept maps and wrote the required papers, and 16 completed the final project (N = 83).

Table 4 reveals that formal students committed themselves to completing assignments more than informal students did. This is better highlighted by Figure 4, which shows the incidence of completion. Only four out of 70 informal students completed the course, compared to 11 out of 13 formal students.

Table 4

Completion of the Course and Assignments according to Attendance Type

Attendance	n	Course completed	All posts	All maps	All papers	Final project
Formal	13	11	10	9	12	10
Informal	70	4	10	8	5	6

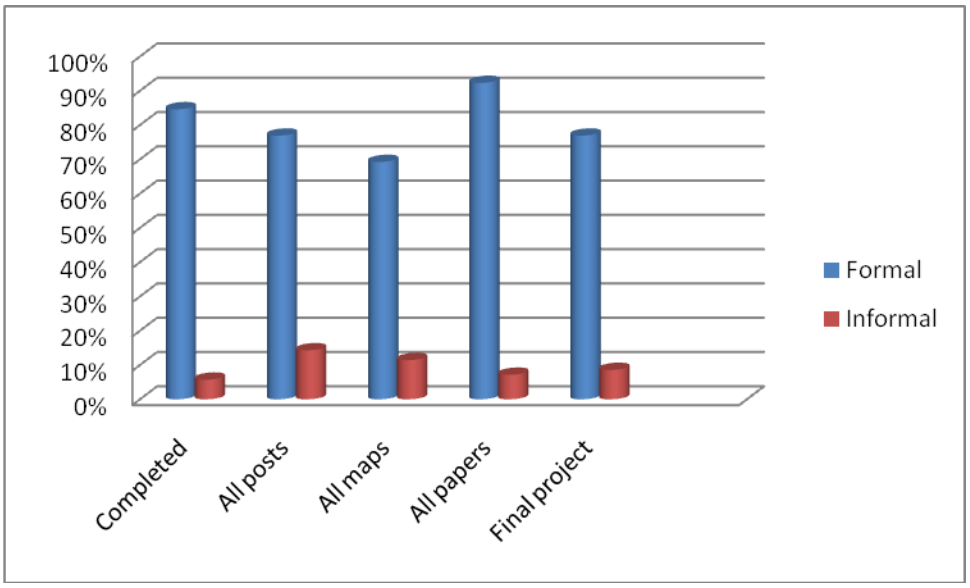

Figure 4. Completion of the course and assignments by attendance type (in percentage).

Although formal attendance seemed to be the main driver for completing assignments and the course, the main reason for not completing the course was a lack of time, as shown in Figure 5. Since this reason was reported mostly by informal students (it was selected by only one formal student who did not complete the course; the others reported that they obtained an extension), it seems that informal learning experiences such as the CCK08 course compete with other activities for personal time allotment. Learners, in the absence of a stronger motivation, attend only partially. A significant comment (under Other), was "Recession, took extra job:" S/he had little or no time for studying. Literature on engagement in distance higher education is mainly related to

formal courses (for example, Angelino & Natvig, 2009). Nash (2005) quotes several studies in which authors emphasize the impact of factors external to the academic environment to explain distance learners' drop-out rates. Ostman and Wagner (as cited in Nash, 2005) reported as early as 1987 a "lack of time" as the most commonly quoted reason by distance learners for course noncompletion. In the CCK08 case, it seems that the impact of technology was low since time still appears as the most important factor. Other authors, such as Miller, Rainer, and Corely (as cited in Nash, 2005), have analyzed the relationship between time and computer literacy in student attrition. However, in the case of voluntary students, e.g., the CCK08 informal participants, terms such as attrition and drop-out may be inappropriate because students attend the course without expecting a certificate, and they do it based on personal motivation only (see Figure 3). So it is reasonable to assume that one might be interested not in the course as a whole but, for instance, only in the first part (for example, to gain an overview of connectivism) or in a single topic. Informal learning does not imply structures like courses, thus participants might feel free to learn only what they really need to at that moment. Nor can we consider participants who did not complete the course to be drop-outs. Because they have different aims and motivations, perhaps they do not consider course incompletion to be a defeat. Further investigation would be necessary to better understand if the very notion of a *course* really fits open course initiatives.

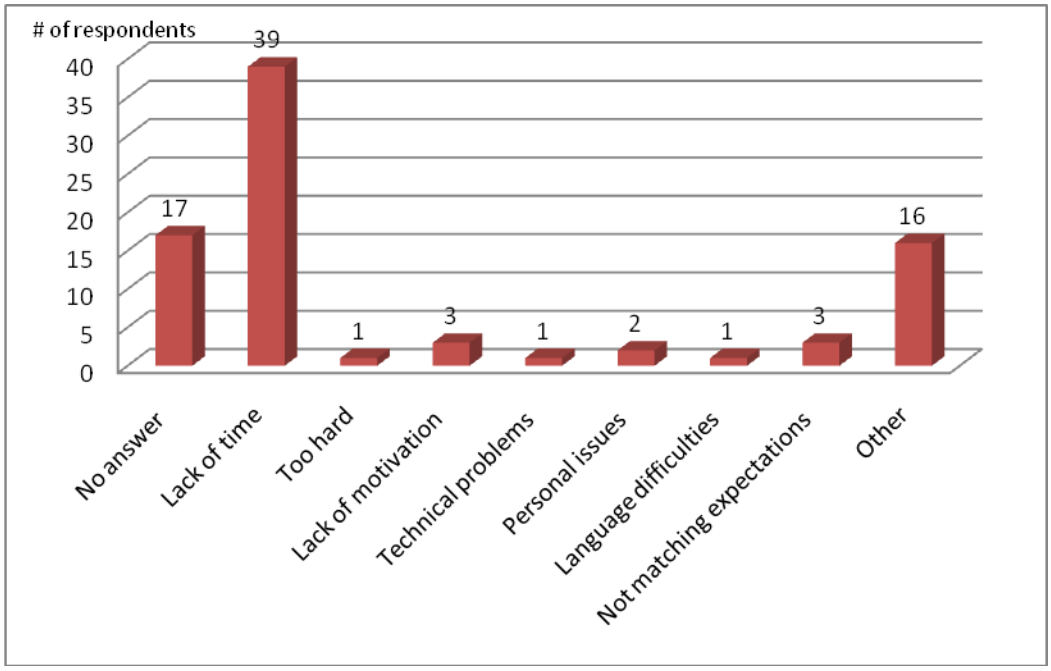

Figure 5. Reasons for not having completed the course (*N* = 83).

Furthermore, a "hand-made" or "hacked" certificate issued by the instructor (not by the institution) (Young, 2008) only partially affects the motivation to finish the course: Thirty-nine out of 83 respondents said that this would not be a sufficient reason for completing. This fact could be interpreted as a persistent dichotomy in the way people view education: strictly formal on the one side or completely informal on the other side. Maybe the time is not yet ripe for "contaminations" like "edupunk" initiatives or, as noted above, maybe structured courses do not always need to be completed, as in the case of informal learners.

Finally, a question about participation in communities not promoted by the instructors was asked in order to investigate the level of the participants' self-organization skills. Perhaps the question was not clearly formulated since many people answered "I read and comment on blogs," "I posted in the Moodle forum," and so on. However, some answers pointed out the emergence of national communities (mainly Spanish and Italian), which were a disadvantage at times ("yes I browsed through the Spanish connectivitas and the Italian group. Got an overload of information").

Section 2A: Opinions about the Course Toolset

In section 2a, opinions and views about the course toolset as a whole were investigated. Figure 6 shows the results from the item asking for the overall opinion on the toolset (N = 83, more than one answer possible).

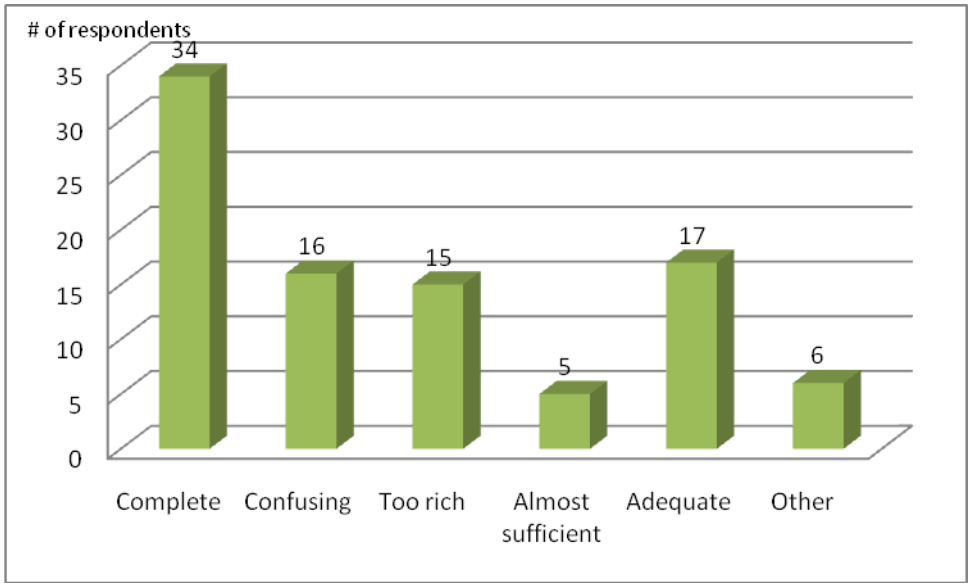

Figure 6. Opinions on the course toolset.

A commonly used adjective was *complete* (34), but *confusing* and *too rich* (31 in total) were also used (only two people chose both indicators). This dichotomy is reinforced by the responses to the item about the overall informational architecture of the course, shown in Figure 7 (N = 83, more than one response possible).

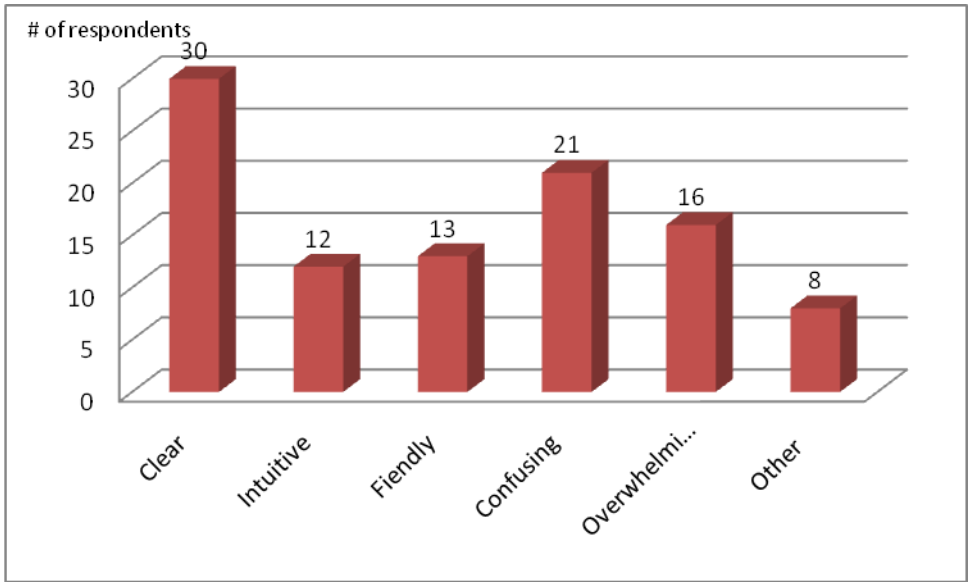

Figure 7. Opinion on the informational architecture of the course.

Fifty-five respondents indicated that the information architecture of the course was *clear*, *intuitive*, and *friendly* (only one respondent chose all three indicators), but the number of respondents who indicated *confusing* and *overwhelming* was 37 (only two people chose both indicators).

Table 5 shows the results concerning the most useful tool (*N* = 73). The preferences converge on the most paradigmatic tools: the Daily (the "good old" mailing list) is at the top, followed by Moodle (a "traditional" LMS), and the wiki and Elluminate (a web conferencing system). It is quite surprising that a Web 1.0 tool, a mailing list, is the most preferred instrument. Some excerpts from the comments on the Daily can help us to better understand this preference: "gives a broad vision of the course," "was a useful filter," "gave me guidance," "a good starting point to locate relevant information and viewpoints," "concise and practical," "useful for rapid update." This tool seems to have high relevance for adult learners who are worried about time and information-filtering. In a MOOC, it is nearly impossible to read all of the posts and the contributions, so many participants choose to delegate effective filtering to the instructor. The Daily provided the "highlights" of the course by email, without any further intervention. In this case, the instructor performed the role of an information broker, not producing content but collecting, selecting, and proposing relevant (in his/her opinion) resources.

Table 5

The Most Useful Tools

Daily	27
Moodle	16
Wiki	11
Elluminate	10

Blog	8
OPML	1

Figure 8 shows the tag cloud of comments on the Daily. There is also some criticism of this tool; for example, some people commented, "it's the instructor's list of the course," "the prejudices of the editor(s) were sometimes evident," "steering only to certain sources," and "it led to a kind of 'gold star' mentality."

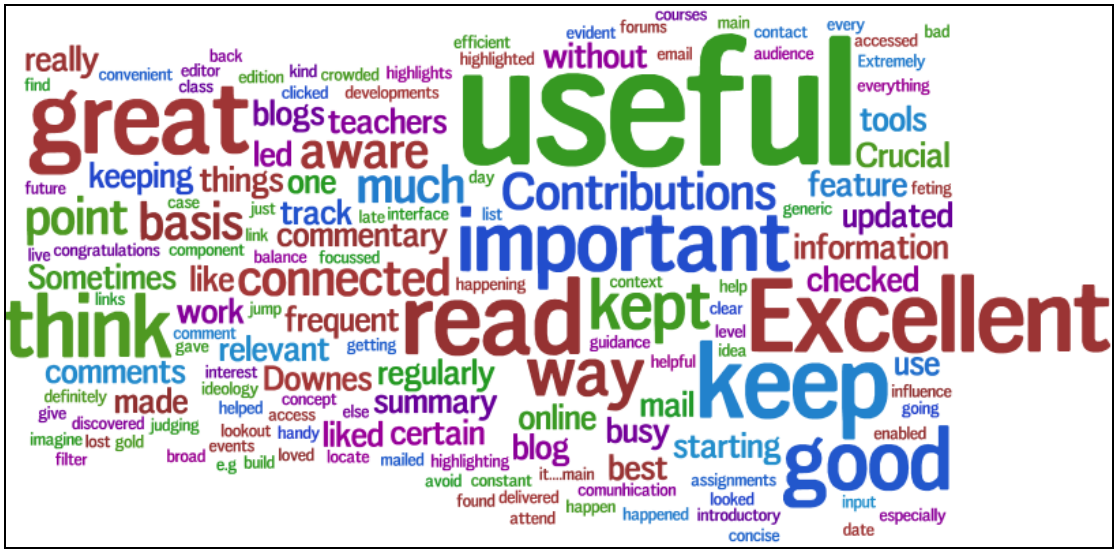

Figure 8. The tag cloud from comments on the Daily.

Table 6 illustrates the opinions of the least useful tool (N = 70). In this case, there is a wider range of responses, although the majority of respondents converge on the first three tools. It is odd to find Moodle (the second most useful tool) at the top and, also, that 12 respondents do not have a clear opinion. In the case of Moodle, most of the respondents added that the discussion forum was not useful for them.

It is interesting to note that the Daily, the other popular tool, is placed at the bottom. As well, there is clearly pro-Moodle and anti-Moodle opinion among the respondents. Pageflakes, which is equally at the top, is highly criticized because of its low usability and unclear interface. Some comments about it include the following: "an unnecessary mess," "too much information, not relevant," "didn't really understand, I looked at the page but it felt like a disorganised mess," "very confusing, there were a lot of duplicated and irrelevant flakes."

These comments confirm the need for increased attention to usability since users do not want to deal with confusing interfaces. Interface problems can not be solved by selecting only well-designed tools and services because the concept of usability is only partially related to the user interface. The case of Pageflakes is instructive. Despite being a service based on a rich and engaging graphical interface, its specific use in the course (attempting to aggregate a high number of RSS feeds in one page) resulted in a "disorganised mess." Thus it is necessary to better

evaluate the tools from the overall usability point of view, particularly in situations, such as MOOCs, where the "number of participants" variable can impact usability.

Ustream might be viewed as a redundant copy of Elluminate, which is a possible explanation for its presence among the least useful tools.

Table 6

The Least Useful Tools

Pageflakes	13
Moodle	12
No opinion	12
Ustream	5
Blog	6
Second Life	4
Elluminate	3
Facebook	3
GoogleGroups	3
Wiki	2
GoogleAlerts	2
Maps	1
Netvibes	1
Chat	1
Daily	1

Overall, respondents said that they were comfortable with the toolset. Figure 9 shows the distribution of the responses (N = 81), with a rating scale of 1-5 (from low comfort to high).

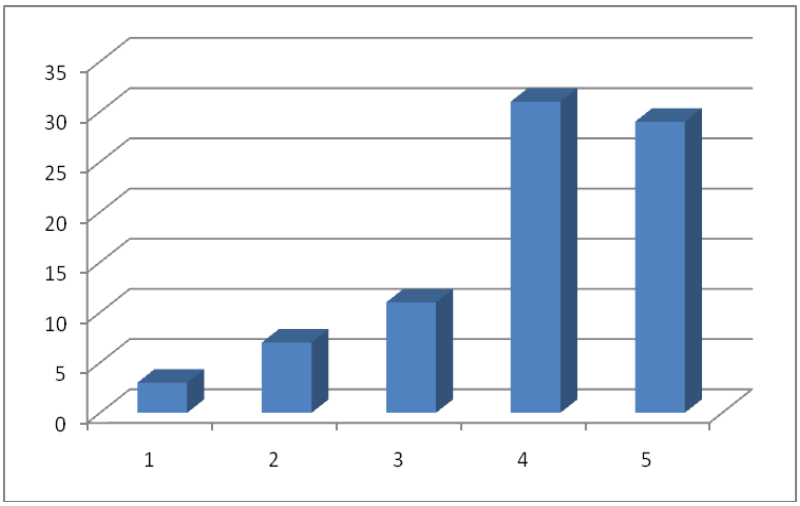

Figure 9. The level of comfort with the toolset (1:lowest – 5:highest).

One item explicitly asked if the toolset may have influenced the outcomes of the course. The answers (*N*= 68) have been grouped in two main categories (Yes and No). The Yes group has been further divided into negative and positive influence.

Table 7 shows the results. Twenty-one out of 68 respondents answered that there was some sort of influence, and 11 said that it was negative. Some excerpts from the comments may help us to understand the reason for this: "the huge variety of tools has made it very difficult to actually follow the discussion, as it was just all over the place," "tools were too many and some were completely unknown to me," "I was very interested in this initiative. VERY early I felt lost about the overall technical environment," "felt like a techno-idiot in this course."

Among the No or positive influence comments were the following: "I've become familiar with many tools I was not before. I have profited using them;" "I think the toolset was great because I had choices. I could use the tools I was comfortable with and disregard the others;" "No, lack of time was the main issue not the toolset."

Table 7

Influence of the Toolset

No		36
N/A		11
Yes		21
Negative	11	
Positive	7	
N/A	3	

Finally, 56 out of 72 answered that they will use one or more of the tools in their future work, or they are already using them. Blogs, wikis and Moodle are indicated as the preferred tools to be used in the future.

Section 3: Specific Tools

This section contains a number of items, grouped by each tool used during the course. Tools include Moodle, blogs, Facebook, Linkedin, Twine, Twitter, Ning, Elluminate, Ustream, Pageflakes, the Daily, SecondLife, RSS, conceptual maps, social bookmarking, and Flickr (see the glossary of tools at the end of the paper).

Each group includes similar questions and in particular a rating-scale question about the importance of the tool within the course (1:low – 5:high). The results have been grouped by adding levels 1 and 2 (low group), 3 (neutral group) , 4 and 5 (high group). Missing answers have been marked as "N/A."

Figure 10 shows the frequency of low scores, while Figure 11 shows the frequency of high scores and Figure 12 shows neutral ranking plus N/A.

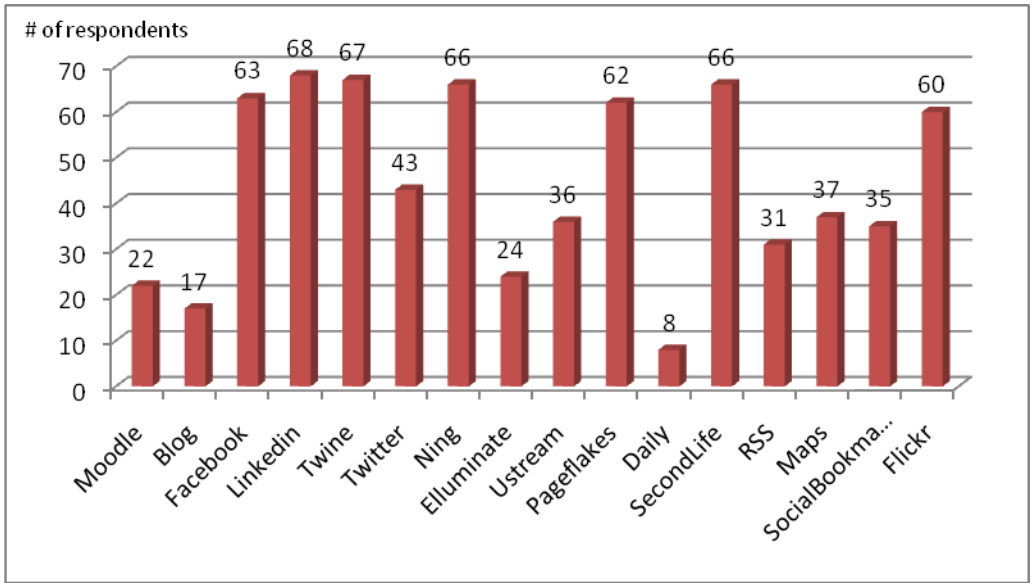

Figure 10. Frequency of low relevance (*N* = 83).

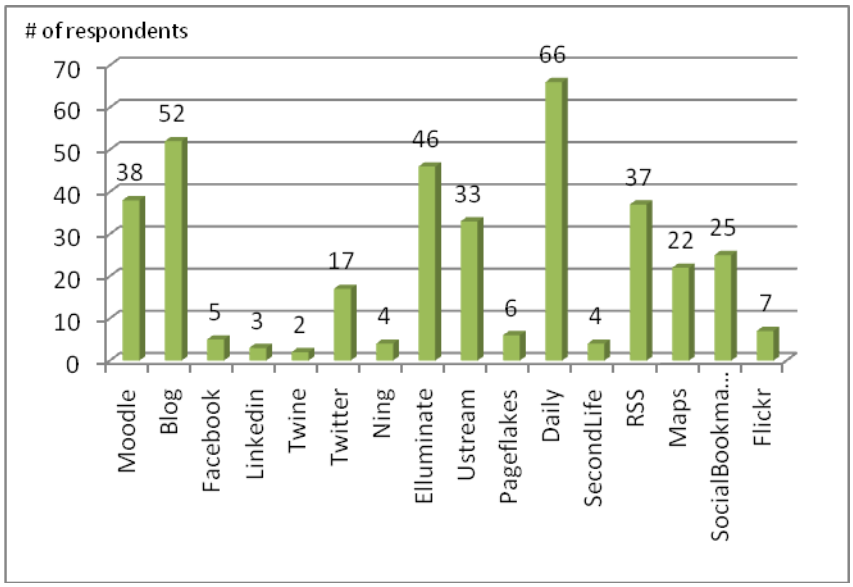

Figure 11. Frequency of high relevance (*N* = 83).

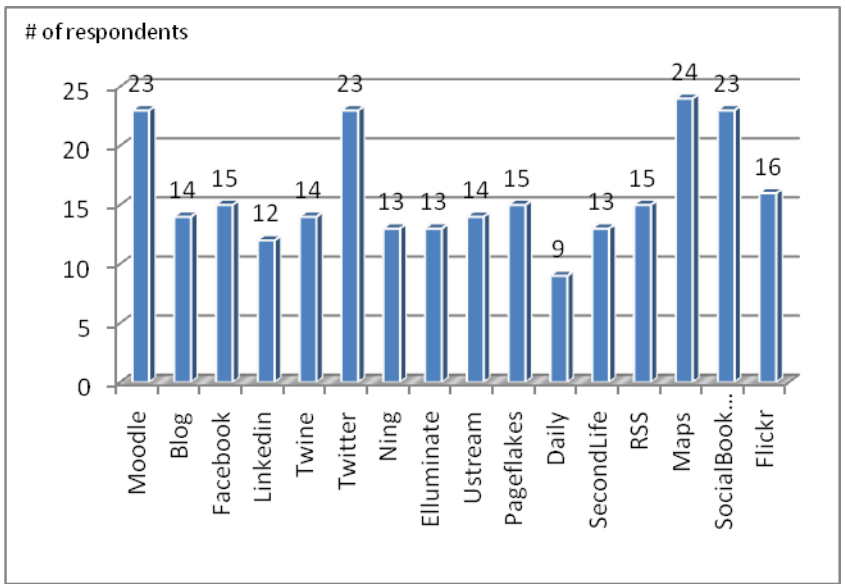

Figure 12. Frequency of neutral or N/A.

According to these results, it is possibile to place the tools in three categories:

1) Definitely useful, relevant, significant: the Daily is the only tool that seems to obtain large agreement on its usefulness (66 high, 8 low, 9 neutral or N/A).
2) Definitely not useful, not relevant, not significant: This category includes Facebook, Linkedin, Twine, Ning, Pageflakes, SecondLife and Flickr. It seems that the majority of social networks and tools were considered less useful for this course. This is strange since the course subject was very close to the basic ideas underpinning web 2.0 and social networks (Figure 13).
3) Controversial tools: this category includes Moodle, blogs, Twitter, Elluminate, UStream, RSS, maps, and social bookmarking sites. In this case some people said that these tools were useful, but roughly the same number of people said that they were not useful, or that they were indifferent to them. As shown in Figure 14, it is also possible to distinguish between controversial tools with a majority of high scores (Moodle, blogs, Elluminate), tools with a majority of low scores (Twitter, maps, and social bookmarking), and a few disputed tools (Ustream and RSS), which have very low differences among scores.

These highly controversial results show that participants have very different opinions about the tools, probably due to their various learning styles, personal objectives, time availability, etc. This is an important finding that seems to conform to the facilitators' goal of distributing learning across multiple platforms through the use of "a wide array of technologies – under the control of course participants" (Siemens, 2009). This also aligns, for example, with the fundamental idea of a PLE, in which each student is free to organize his/her own set of tools, rather than having to adapt to the institution's VLE. However, some respondents reported that they felt overwhelmed by the tools. This could be caused by their lack of skills related to the organization of an effective multi-tool personal knowledge environment (PKM skills, according to Pettenati et al., 2009).

Moreover, since the majority of infomal participants do not care about course completion, it is reasonable that each participant might consider using only a subset of tools. For example, those interested in a single topic of the course could join in the related live session, or if they have more time they could take part in a discussion in a blog post or in Moodle's web forum. In this respect, the richness of tools seems to have a positive role, enabling a personal choice of the "best tools for me."

Finally it can be observed that, particularly at the beginning of the course, it was not clear to the participants that they did not have to use every service/environment. This perceived lack of choice might have induced the sense of overload and confusion that clearly emerged from the answers of some respondents.

A first suggestion for future MOOCs is to highlight the purpose of the wide range of tools and clearly state that it is not mandatory to use all of them. Alternatively, a clearer description of the pedagogical aim of each tool could be provided in order to avoid confusing and overwhelming students.

Since time seems to have been the most important variable, these informal adult students were mainly interested in learning as much as possible with the least possible effort, regardless of the variety of tools and the chance to build networks. They seemed to have a low interest in a "I want to organize my personal view on content and relationships using the tools" approach (which is more related to PKM skills) because it was perceived as time-consuming. For this kind of learner, the importance of "mediated/filtered views" of course content (the Daily) was very high, even though there was some criticism of the "only one voice" results of this method. For future editions of the course perhaps a multi-filtered approach based on a wider, collaborative board of "Daily-makers" could help to better respond to the expectation of plurality. It may be a good idea to make the underlying instructional design principles related to the plurality of technical environments more explicit.

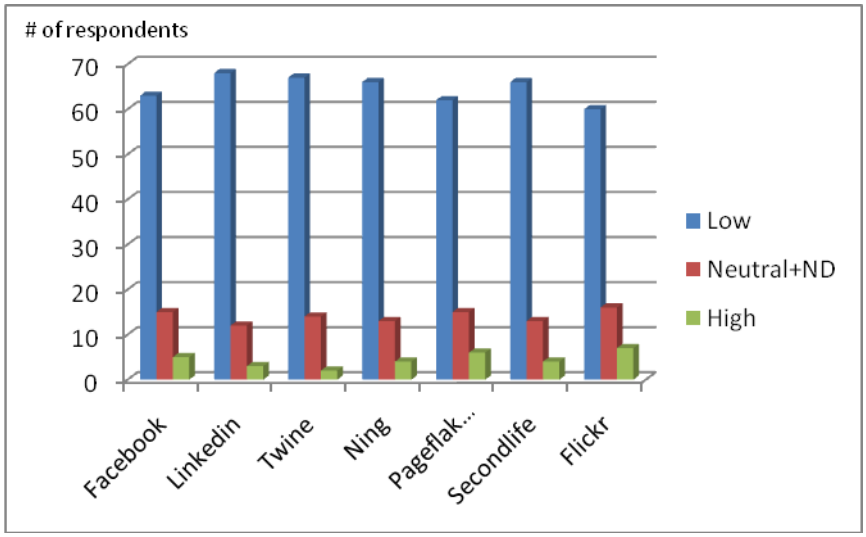

Figure 13. Less relevant tools.

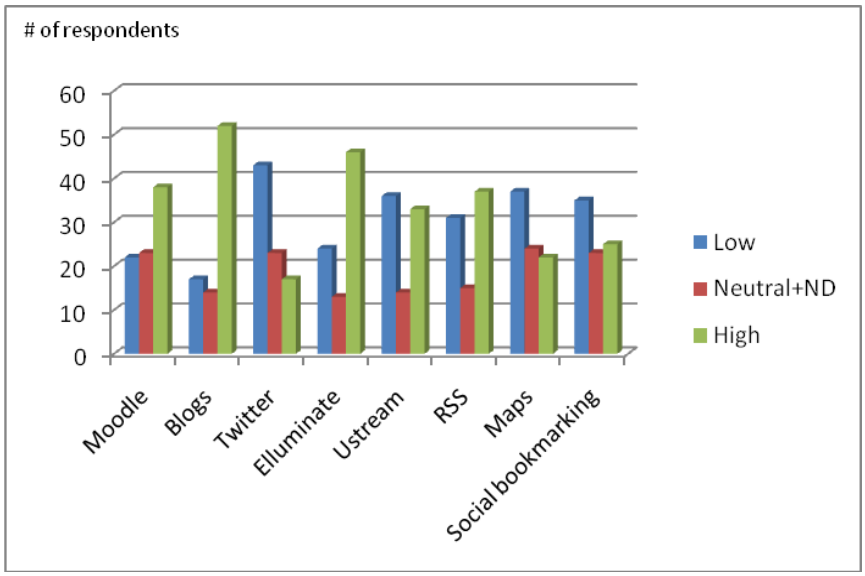

Figure 14. Controversial tools.

Personal blogs played an important part in the course as participants were requested to post their messages in the blog as an assignment. Some interesting elements emerged from the specific questions *(N* = 83): Thirty-four learners used a generic personal blog, while 39 used a blog specifically dedicated to the course, and 36 started a new blog for the course.

Commenting and cross-blogging was mostly reported as medium-low intensity (61 out of 83 said level 1-3 on a scale of 5), and only 15 reported high activity (level 4-5). Indeed these are time-consuming activities, and time issues seem to have been overwhelming for most participants.

In relation to the real use of the tools, Moodle was the most used (only 2 out 83 people said "never used it"), followed by the Daily (only 3 people said "not subscribed") and blogs (13 people said "never used it"). Less used tools were Flickr (58 "never used"), Pageflakes (54), and Twitter (45).

The Daily was the only tool constantly used throughout the course (77 out of 83), while Moodle (32), Pageflakes (20), and blogs (18) were used only in the first phase. For example, many users registered on the Moodle site in the beginning then stopped using it. Pageflakes could have been abandonded because of its low usability. Some participants started to blog but eventually discontinued. The Daily, perhaps due to its passive, time-efficient nature, continued to be used.

Results from the questions about RSS are surprising (*N* = 83): Twenty-five people did not use RSS at all, and only 21 people used the provided OPML file. This fits with existing evidence that the use of RSS technology is not popular. According to Rubel (2008), who reports research by Forrester, RSS adoption among general Internet users in the USA is 11%.

Social networks were not used by the majority of participants, as shown in Figure 15. Among them, only Facebook seems to have been popular.

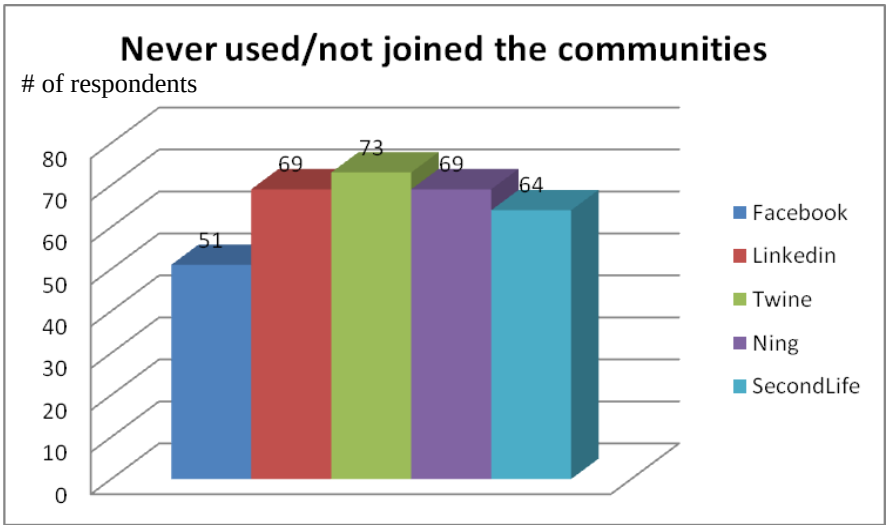

Figure 15. Social networks never used (*N* = 83).

Some specific evidence emerged from the items related to web conferencing tools. In the case of Elluminate 44 out of 79 state that they attended fewer than three sessions, while 10 out of 79 attended more than eight sessions. Most people affirmed that they had no time to attend (51), but also time zone differences (34) and language (10) were reported as issues to be considered (*N* = 79, more than one answer possible). Ustream had roughly the same responses, with some differences; for example time zone and language were more troublesome in Elluminate, while technical issues affected Ustream sessions. It is worth noting that 10 out of 15 people who declared a lower level in English proficiency (14 intermediate and 1 basic) also said they had language difficulties in Elluminate. Web conferencing seems to be a further barrier for people who are not confident in their language abilities.

Different time zones is a relevant issue, so the use of synchronous tools should be carefully planned in a MOOC.

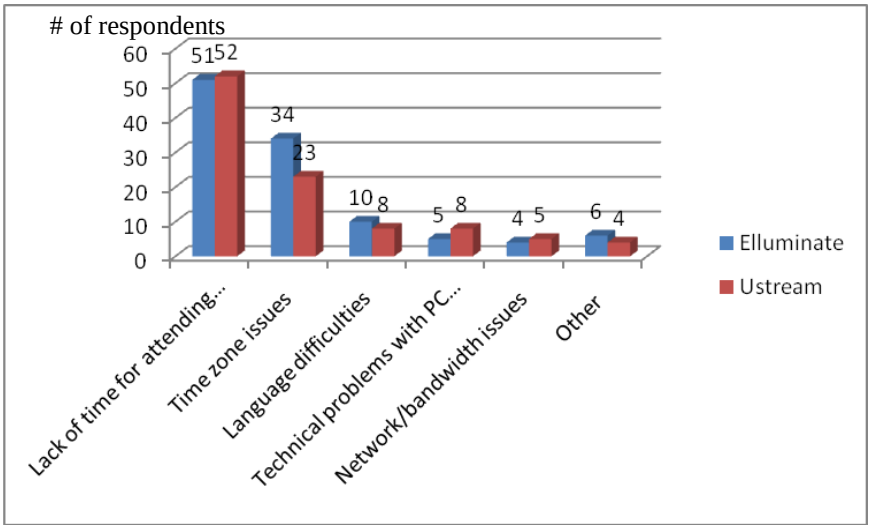

Figure 16. Problems during Elluminate and Ustream sessions.

Figures 10, 11, and 12 (reinforced by Figure 15) show that pre-structured social networks were considered largely unuseful. The social network in CCK08 seems to have been based on Moodle, the blogosphere, and the web conferencing environments.

Clusterization

To calculate some correlations, a few variables have been identified:

Demographics: GENDER; AGE, coded 1-4 according to the quartile distribution; ADVENG, Advanced English, a dichotomous value grouping intermediate and basic (0), advanced and mother tongue (1); ADVICT, Advanced ICT skills, a dichotomous value grouping users (0), power users and professionals (1); FORMAL (0 for informal, 1 for formal); MOODLEY (1 for people who said Moodle was the most useful tool, 0 for the others); MOODLEN (1 for people who said Moodle was the least useful tool, 0 for the others); TOOLNEG (1 for those who said the toolset had negative influence on their outcomes); ELLUMENG (1 for people who reported language difficulties in web conferencing sessions, 0 for the others).

Since data are not parametric, the Kruskall-Wallis ANOVA has been used. The chi-square analysis shows only one high significant difference: ELLUMENG vs ADVENG has a chi-square of 29.4473 ($p < 0.001$) confirming that there are strong language issues that influence the participation in web conferences. Age, gender, formal/informal attendance, and ICT level do not affect the preference for any of the tools.

Conclusion

Altough this study has some limitations, specifically the relatively low number of respondents involved in the survey, some significant findings have emerged as well as some controversial issues, which deserve to be better analysed in further research.

First, participants in CCK08 have varying opinions about the tools. As noted above, there may be several reasons. People participated in the course in a number of ways, according to learning styles, personal objectives, and time availability. The choice of the right tool is probably related to the specific user's needs, purposes, and self-organization skills. Regarding participants' awareness of the effectiveness of different learning tools, the findings show that users are able to make selective choices, abandoning, for example, tools with low usability (e.g., Pageflakes) or not using the most popular social networks if they are not considered relevant to the course.

The use of generic social networks that were external to the course (even if it is possible to create ad hoc communities, for example in Facebook or Ning) was perceived as unnecessary because the actual social network was built around a small group of "major tools" (Moodle, Elluminate, blogs). This point is worth further reflection and research because it seems to disagree partly with Anderson (2005), who describes the role of learning communities using educational social software as a key mitigating factor against the isolation of self-paced learners. The national communities (particularly the Spanish) were an exception that may have played a special support role, even if respondents did not view language as a real barrier (with the exception of the web conferencing tools).

Some respondents showed a high level of reflection about the organization of their learning (and knowledge) technological environments, both for themselves and for their students (since most respondents were teachers). This is denoted by comments such as, "The integration is what is interesting, not the tools themselves. The course encourages integration of available tools. But... would be hard for many teachers to implement," or "The combination of Moodle, a wiki and personal blogs is a powerful learning tool and I think I will use it with 16-19 year-old students," and "I use them for personal learning network and with students to help them build personal learning networks."

Overall, despite the abundance of tools that were proposed by the instructors as a metaphor for the course itself and as opportunities for building networks (Siemens, 2009), it seems that a more traditional approach is preferred. In general, people seem to be torn between the time-saving advantage offered by the "Daily" solution and the multi-faceted, time-consuming alternative represented by direct access to unfiltered information. The "massive" character of the CCK08 course makes these alternatives difficult to balance.

Further research might also overcome the limitations of this study to better investigate the profile of the participants of OOCs, especially as they relate to course outcomes and retention. Moreover, issues related to sustainability and the workload of instructors should be studied in depth in order to better understand the cost and effectiveness of these initiatives.

Glossary of Tools

The Daily: a mailing list managed by Stephen Downes, one of the facilitators. He sent to subscribers a daily message with a summary of the key topics of the existing conversation, such as the most interesting posts, usually with comments.

Moodle (http://moodle.org): an open source course management system, generally used by institutions for managing online courses. In CCK08 it was used mainly for discussions in web forums.

Elluminate (http://www.elluminate.com): a web conferencing system. CCK08 included weekly web conference sessions, via Elluminate, usually managed as informal conversations. Sometimes guest speakers were invited.

Ustream (http://www.ustream.com): a video streaming system. In CCK08 it hosted a weekly discussion based on the activities of the week.

Pageflakes (http://www.pageflakes.com) and Netvibes (http://www.netvibes.com): services that allow aggregation of RSS feeds in a single page.

OPML and RSS: OPML is an XML file format used to easily export/ import lists of RSS feeds in aggregators. The instructors provided an OPML file including a large number of participants' blogs feeds. RSS is the standard format used for syndication of blogs and other websites.

Facebook (http://www.facebook.com): a popular social network service. It included a specific CCK08 group.

Linkedin: a social network service oriented to business contacts.

Twitter (http:/twitter.com): a micro-blogging service, based on short messages. Users publish their own "status" and read that of others.

Ning (http://www.ning.com): a service that allows users to create their own personalized social networks. A CCK08 Ning network was available.

Second Life: a 3D virtual world in which users act as avatars in a immersive environment and can create their own artefacts. Avatars can interact via text chat and audio.

Twine (http://www.twine.com): a semantic web service for collecting and connecting content by topic.

Flickr (http://www.flickr.com/): a popular photo sharing service.

Social bookmarking: a generic term for services that allow users to store and share bookmarks on the Web.

Conceptual maps: web tools to collaboratively edit conceptual and mental maps.

References

Anderson, T. (2005). *Distance learning – social software's killer app?* Retrieved from http://www.unisa.edu.au/odlaaconference/PPDF2s/13%20odlaa%20-%20Anderson.pdf.

Anderson, T. (2008). Towards a theory of online learning. In T. Anderson (Ed.), *Theory and practice of online learning*. Athabasca, AB: Athabasca University Press. Retrieved from http://www.aupress.ca/index.php/books/120146.

Angelino, L, & Natvig, D. (2009). A conceptual model for engagement of the online learner. *Journal of Educators Online*, *6*(1). Retrieved from http://www.thejeo.com/Archives/Volume6Number1/Angelinoetalpaper.pdf.

Ardito, C., Costabile, M., Marsico, M., Lanzilotti, R., Levialdi, S., Roselli, T., & Rossano, V. (2006). An approach to usability evaluation of e-learning applications. *Universal Access in the Information Society*, *4*(3), 270-283.

Attwell, G. (2007). Personal learning environments - the future of eLearning? *eLearningPapers*, *2*(1). Retrieved from http://www.elearningeuropa.info/files/media/media11561.pdf.

Cigognini, M.E., Pettenati M.C., & Edirisingha, P. (2009). Personal knowledge management skills in web 2.0-based learning. In M.J.W. Lee & C. McLoughlin (Eds.), *Web 2.0-based e-learning: Applying social informatics for tertiary teaching*. Hershey, PA: IGI Global.

Clarebout, G., & Elen, J. (2006). Tool use in computer-based learning environments: Towards a research framework. *Computers in Human Behavior*, *22*(3), 389-411.

Downes, S. (2008). *Introducing edupunk*. Retrieved from http://www.downes.ca/cgi-bin/page.cgi?post=44760.

Downes, S. (2009, April 25). New technology supporting informal learning [Web log post]. Retrieved from http://halfanhour.blogspot.com/2009/04/new-technology-supporting-informal.html.

Fini, A., Formiconi, A., Giorni, A., Pirruccello, N. S., Spadavecchia, E., & Zibordi, E. (2008). IntroOpenEd 2007: An experience on open education by a virtual community of teachers. *Journal of e-Learning and Knowledge Society*, *4*(1), 231-239. Retrieved from http://www.je-lks.it/en/08_01/11Apfini_en.pdf.

Iiyoshi, T., & Kumar M.S.V. (Eds.) (2008). *Opening up education: The collective advancement of education through open technology, open content, and open knowledge*. Camridge, MA: The MIT Press.

JISC (2009). *Study of the effective use of social software to support student learning and*

engagement. Retrieved from http://www.jisc.ac.uk/whatwedo/projects/socialsoftware08.aspx#downloads.

Leslie, S. (2007, October 29). Your favourite "loosely coupled teaching" example? [Web log post]. Retrieved from http://www.edtechpost.ca/wordpress/2007/10/29/best-loosely-coupled-teaching-examples/.

Liu, N., Zhong Y., & Lim J. (2009). *An empirical investigation on the effectiveness of virtual learning environment in supporting collaborative learning: A system design perspective in human interface and the management of information. Information and interaction.* Berlin/Heidelberg: Springer.

Martin, A. (2006). Literacies for the digital age: Preview of Part 1. In A. Martin & D. Madigan (Eds.), *Digital literacies for learning*, (pp. 3-25). London, UK: Facet Publishing.

Mason, R., & Rennie, F. (2007). Using for learning in the community. *The Internet and Higher Education, 10*(3), 196-203.

Nash, R. (2005). Course completion rates among distance learners: Identifying possible methods to improve retention. *Online Journal of Distance Learning Administration, 8*(4). Retrieved from http://www.westga.edu/~distance/ojdla/winter84/nash84.htm.

Nielsen, J. (1999). *Designing web usability*. Indianapolis, Indiana: New Riders.

Nielsen, J. (2000, July 23). *End of web design*. Retrieved from http://www.useit.com/alertbox/20000723.html.

Nielsen, J. (2007). *Web 2.0 can be dangerous*. Retrieved from http://www.useit.com/alertbox/web-2.html.

Pettenati, M.C., Cigognini, M.E., Mangione, G.R., & Guerin, E. (2009). Personal knowledge management skills for lifelong-learners 2.0. In *Social Software and Developing Community Ontology*. IGI Global Publishing. Information Science Reference. Retrieved from http://www.igi-global.com/reference/details.asp?ID=33011.

Rigutti S., Paoletti S., & Morandini A. (2008). Lifelong learning and e-learning 2.0: The contribution of usability studies. *Journal of e-Learning and Knowledge Society*, 4(1), 221-229. Retrieved from http://www.je-lks.it/en/08_01/10Aprigutti_en1.pdf.

Rubel, S. (2008). *RSS Adoption at 11% and it may be peaking, Forrester Says*. Retrieved from http://www.micropersuasion.com/2008/10/rss-adoption-at.html.

Shackel, B. (1991). Usability-context, framework, definition, design and evaluation. In B.

Shackel & S. Richardson (Eds.), *Human factors for informatics usability* (pp. 21-38). Cambridge: Cambridge University Press.

Siemens, G. (2004). *Connectivism: A learning theory for a digital age*. Retrieved from http://www.elearnspace.org/Articles/connectivism.htm.

Siemens, G. (2006). *Knowing knowledge*. Retrieved from http://ltc.umanitoba.ca/wikis/KnowingKnowledge/index.php/Main_Page.

Siemens, G. (2008). *MOOC or mega-connectivism course*. Retrieved from http://ltc.umanitoba.ca/connectivism/?p=53.

Siemens, G., & Downes, S. (2008). *Connectivism & connective knowledge*. Retrieved from http://ltc.umanitoba.ca/connectivism.

Siemens, G. (2009). *Socialization as information objects*. Retrieved from http://www.connectivism.ca/?p=127.

Weller, M. (2007). *Virtual learning environments: Using, choosing and developing your VLE*. Oxford, UK: Routledge.

Wilson, S. (2005, January 25). Future VLE - The visual version [Web log post]. Retrieved from http://www.cetis.ac.uk/members/scott/blogview?entry=20050125170206.

Young, J. (2008). When professors print their own diplomas, Who needs universities? *The Chronicle of Higher Education*. Retrieved from http://chronicle.com/free/2008/09/4744n.htm.

International Review of Research in Open and Distance Learning
Volume 10, Number 5. *ISSN: 1492-3831*

November – 2009

Incentives and Disincentives for the Use of OpenCourseWare

Anne M. Arendt and **Brett E. Shelton**
Utah State University

Abstract

This article examines Utah residents' views of incentives and disincentives for the use of OpenCourseWare (OCW), and how they fit into the theoretical framework of perceived innovation attributes established by Rogers (1983). Rogers identified five categories of perceived innovation attributes: relative advantage, compatibility, complexity, trialability, and observability. A survey instrument was developed using attributes that emerged from a Delphi technique with input from experts in the OCW field. The survey instrument was sent to 753 random individuals between 18 and 64 years of age throughout Utah.

Results indicated that the greatest incentives for OCW use were the following: (a) *no cost for materials*, (b) *resources available at any time*, (c) *pursuing in depth a topic that interests me*, (d) *learning for personal knowledge or enjoyment*, and (e) *materials in an OCW are fairly easy to access and find*. The greatest disincentives for OCW use were the following: a) *no certificate or degree awarded*, (b) *does not cover my topic of interest in the depth I desire*, (c) *lack of professional support provided by subject tutors or experts*, (d) *lack of guidance provided by support specialists*, and (e) *feeling that the material is overwhelming*. The authors recommend that institutions work to transition some OCW users into degree-granting paid programs as well as adopt a marketing campaign to increase awareness of OCW. Additionally, OCW websites should make their content available to recommendation engines such as ccLearn DiscoverEd, OCW Finder, or OER Recommender and should link to one or more of these sites.

Keywords: OpenCourseWare; open educational resources

Background to the Study

OpenCourseware (OCW) is dedicated to the development of freely available, stand-alone online courses and teaching materials informed by the best current research. OCW includes items such as lecture notes, reading lists, course assignments, syllabi, study materials, tests, samples, simulations, and the like (Educause Learning, 2006). Institutions of higher learning involved in OCW initiatives in the United States include founder Massachusetts Institute of Technology,

Johns Hopkins Bloomberg School of Public Health, and Carnegie Mellon, among many others. There is also a strong international presence with institutions participating in many regions, including Brazil, Columbia, Japan, Korea, Saudi Arabia, Spain, Taiwan, United Kingdom, and Venezuela, to name a few (OCW Consortium, 2009; Caswell, Henson, Jensen, & Wiley, 2008). An OCW consortium can be found at http://www.ocwconsortium.org/ and has been formed to develop a shared mission, goals, priorities, visibility, and searchability. Yet, although OpenCourseware is gaining momentum, there remain questions about its reach and effectiveness globally, nationally, and locally.

The questions are with regard to identifying incentives – those aspects that would be attractive to potential users of OCW, as well as disincentives – those aspects acting as perceived barriers to OCW use. For the creators of OCW materials, a well-developed understanding of incentives and disincentives for OCW use would indicate design imperatives that increase access and usability of the resources aimed directly at the public they are intended to serve. So far, most of the OCW resources are found and used by individuals who are seeking them. But what about those who do not know the resources exist?

This article examines Utah residents' views of incentives and disincentives for the use of OpenCourseWare (OCW), and how they fit into the theoretical framework of perceived innovation attributes established by Rogers (1983). Rogers was chosen due to his prominence in the field, his use in prior doctorate work (Allard, 2003; Al-Shohaib, 2005; Liebermann, 2006; Schroll, 2007), and his demonstration that between 49% and 87% of variance in the rate of adoption of innovations can be attributed to the following five perceived innovation attributes: (a) *relative advantage*, (b) *compatibility*, (c) *complexity*, (d) *trialability*, and (e) *observability*. Research by Rogers has been used to successfully assess information technology and technology communication (Al-Gahtani, 2003; Dayton, 2004) as well as other areas, including health services and social services. Tornatzky and Klein, for example, did a meta-analysis of 75 articles concerned with innovation characteristics and their relationship to innovation adoption and implementation (1982).

The following research questions will be answered in this paper:

(a) What perceived incentives contribute to the use of OCW by the Utah adult population?
(b) What perceived disincentives prevent the use of OCW by the Utah adult population?
(c) What diffusion attributes contribute to the adoption (incentives) of OCW in Utah?
(d) What diffusion attributes contribute to the rejection (disincentives) of OCW in Utah?

A survey instrument was developed using attributes that emerged from a Delphi technique with input from experts in the OCW field. Eleven experts where asked to participate and five were actively involved. After the attributes were identified, they were placed into the attribute characteristics established by Rogers. It was then pilot-tested with 40 individuals. Cronbach's alpha was calculated to assess inter-item consistency for the $N = 44$ pilot test and required a reliability of .70 or higher before the survey instrument would be used (Schumacker, 2005). The

survey instrument was sent to 753 random individuals between 18 and 64 years of age throughout Utah.

For this study, it is assumed that a primary concern is to understand incentives and disincentives for OCW adoption and use by the general public. Therefore, this study surveyed individuals throughout Utah, without focusing on a particular audience subset. Equally, it is assumed that concern exists regarding overall incentive or disincentive for use and adoption of all available OCW and open educational resource materials, not simply those offered from within Utah state boundaries. Therefore, the research will consider participants' interests in OCW and open educational resource materials to be relevant to a broader population.

Literature Review

MIT has perhaps the most well-known OCW project (see http://OCW.mit.edu/). The institution began publication of its courseware for public consumption in 2002 and has made content from its approximately 1800 courses available on the Internet at no cost for noncommercial purposes (Carson, 2006; Matkin, 2005), offering materials such as class notes, syllabi, assignments, problem sets, reading lists, and presentations (Lerman & Miyagawa, 2002; Olsen, 2002; Vest, 2004; Young, 2001). It has published all of its courses from all five of its schools and from 33 academic departments (Smith & Casserly, 2006; Vest, 2006). Its website is visited over 1.2 million times per month from individuals around the globe with the help of nearly 80 mirror sites on university campuses around the world, including 54 in Africa and 10 in East Asia. MIT OCW is primarily in English but has been translated into other languages, including Spanish, Portuguese, traditional Chinese, and simplified Chinese (Kirkpatrick, 2006; Smith & Casserly, 2006; Vest, 2006). Certainly, while MIT remains at the forefront of developing and delivering OCW, the number of institutions participating in OCW projects is expanding. There are more than 200 higher education institutions and associated organizations from around the world creating a broad and deep body of open educational content using a shared model. Examples include China Open Resources for Education, which incorporates 30 institutions in China, Japan OCW Consortium, which incorporates nine institutions, and Spain and Portugal's OCW Universia, which incorporates 14 institutions (OCW Consortium, 2009). Understanding more about the communities who have the potential to use these resources is increasingly important.

Incentives for Producing and Using OpenCourseWare

Research has reported why educators, both individuals and institutions, may or may not opt to use or to develop OCW materials (Downes, 2007; Moore, 2002; Smith & Casserly, 2006). Researchers have also identified, to some degree, an understanding of who is using OCW materials and why (Carson, 2006; Hanselman, 2009). There has also been speculation regarding why students might opt to use OCW materials (Smith & Casserly, 2006). However, research has not investigated what potential users see as incentives or disincentives for using OCW. Little is known in a formal adoption model, such as the attributes of innovation established by Rogers, about what incentives support adoption.

The Centre for Educational Research and Innovation, which is a part of the Organization for Economic Cooperation and Development, has attempted to identify some basic drivers of open educational resource usage and development for all constituents, including government, educational institutions, and individuals. These include technical, economic, social, and legal drivers. It has also worked to identify the motives of individual instructors and researchers to share learning resources. The Centre identified four main groups of reasons: (a) altruism or community support, (b) personal nonmonetary gain, (c) commerce, and (d) convenience because it is not worth the effort to keep the resource closed (Trenin, 2007). However, this research only minimally addressed the consumer standpoint. Instead, the focus was on contributors or original creators of content.

Open educational resources are anticipated to have different benefits based on different audiences. From the perspective of educational networks and institutions, open educational resources can offer the means for a long-term conceptual framework focusing on reusability. They can also potentially allow a higher return on the investment of tax dollars and enrich the size and quality of the pool of resources. From a teacher's or a student's perspective, open educational resources can offer access to a broad range of subjects, which permits flexibility in topics and reuse of the resources, encourages improvements, builds or strengthens learning communities, and promotes user-centered approaches (Open eLearning, 2007).

Barriers to Producing and Using OpenCourseWare Resources

Just as the above-cited uses of open educational resources can be categorized as technical, economic, social, and legal in nature, the same can be said of barriers for use and production. The Centre for Educational Research and Innovation has attempted to identify and describe these basic barriers for open educational resource usage. Technical barriers are issues such as lack of Internet access or other necessary technical resources. Economic barriers are issues such as limited funds to invest in hardware or software, or difficulties covering developmental costs. Social barriers include undeveloped or underdeveloped skills to use the technical resources available, resources that end up being context bound, and social norms and traditions that encourage or discourage engagement with different groups. Legal barriers include copyright prohibitions, as well as a lack of clear policies or procedures (Trenin, 2007).

Perhaps the most important means for accessing open educational resources is to have access to the Internet. Without the Internet, it is necessary to obtain the resources from others through reuse in printed copies or in localized digital copies. Based on MIT's OCW data from 2005, OCW materials are indeed being widely distributed offline to secondary audiences: "18% of visitors distribute copies of OCW material to others; 46% of educators reuse content; of those, 30% give students printed copies, and 24% provide digital copies" (Carson, 2006, p. 2). These technical barriers may exist in the immediate term or in the longer term in regard to sustainability (Caswell et al., 2008; Downes, 2007). Economic barriers such as cost and sustainability are factors to be considered in any open educational resources project since the production, maintenance, and distribution of materials on the Web have very real costs associated with them (Downes, 2007; Vest, 2006). The Open Content Alliance, for example, which is digitizing

released-from-copyright materials for public use, is doing it at a cost of 10 cents a page. While this seems to be a reasonable price, it is a price just the same (Tennant & Tennant, 2005; Young, 2006). A social barrier arises if potential participants are not able to locate or use the resources available, in which case the resources will serve little if any direct purpose.

A significant legal barrier in offering open educational resources is that of copyright and intellectual property (Vest, 2006). In sharing educational materials there are copyright issues to consider, particularly if the instructor is not the originator of all of the materials used. Much of the cost related to offering an OCW site has to do with assuring that copyright and intellectual property clearances have been addressed and approvals granted (Atkins et al., 2007; Smith & Casserly, 2006). In some cases, it may not even be clear if the content is considered the property of the institution, the instructor, the student, or another originator (Fitzgerald, 2007). Therefore, tools that release or selectively release copyright are gaining a foothold. One example of this is the Creative Commons; another example is Australia's AEShareNet licensing system. As Vest (2006) noted, quality control could be a content barrier for open educational resources, particularly since there are no formal peer reviews or publisher certifications in many instances. However, it could also be argued that there is even more opportunity for quality control due to feedback and improvements by communities and networks who share the content (Open eLearning, 2007).

Rogers's Attributes of Innovation

Getting new ideas, technologies, products, or processes adopted on a wide scale is difficult. Rogers (2003) discussed the challenges and end-user tendencies in adopting new innovations. Rogers defined an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption" (p. 12). In the case of OpenCourseWare, the practice of offering traditionally private educational materials openly to the public is new, particularly when offering full course materials. Equally, OpenCourseWare materials may be perceived as a new method of learning, particularly for self-directed learners.

According to Rogers, users who may adopt an innovation consider definable attributes when making their decision. These include (a) relative advantage, (b) compatibility, (c) complexity, (d), trialability, and (e) observability. Relative advantage is "the degree to which an innovation is perceived as being better than the idea it supersedes" (Rogers, 2003, p. 229). An individual's assessment of relative advantage could include many aspects, such as social prestige, convenience, satisfaction, or economic improvement (Allard, 2003). Compatibility is "the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters" (Rogers, 2003, p. 240). If the innovation is a logical extension of the environment or it matches existing values or experiences, it is likely to be adopted more readily (Allard, 2003). Complexity is "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers, 2003, p. 16). Those that are easier to understand and that do not require attainment of new skills will be more readily adopted. Trialability is "the degree to which an innovation may be experimented with on a limited basis" (Rogers, p. 257). New ideas that can be used on a trial basis are generally more accepted and adopted partly

because they help dispel uncertainty (Rogers, p. 258). Observability is "the degree to which the results of an innovation are visible to others" (Rogers, p. 258). Innovations that are more visible and observable are likely to have greater acceptance and adoption. These attributes offer a natural alignment to questions regarding incentives and disincentives to adopt OpenCourseWare.

Methods

The state of Utah has been chosen as the sample for this study because the Utah Legislature provided $200,000 to Utah State University for OCW-related activities in the 2007-2008 budget year (Utah System of Higher Education, 2007). This implies that OCW is seen as relevant and impactful by the Utah System of Higher Education and the Utah state government.

Data Collection

The survey was sent via postal mail to a randomized group of 753 residents of Utah between the ages of 18 and 64. The names and addresses, along with information about gender, ethnicity, income, age, education, and occupation, were obtained from Alesco Data Group, LLC of Fort Myers, Florida. The demographic information used for this study includes (a) gender, (b) age, (c) education, (d) income, (e) occupation, and (f) ethnicity.

The survey package included (a) a cover letter describing the importance of the participant, incentives offered, purpose of the study, assurances of confidentiality, and completion time; (b) a statement of consent; (c) the survey with a unique identification number that tied the survey results back to the demographic variables (see Appendix), and (d) a pre-paid addressed envelope for return of the survey.

The first follow-up letter was mailed two weeks after the study introduction. The purpose of this letter was to thank those who had already completed and returned their survey package and to remind those who had not yet done so. Second and third follow-up letters were mailed to non-respondents in the third and fourth weeks after the study introduction. In the last follow-up letter, instructions were included for requesting another copy of the survey. Three individuals requested new copies of the survey via the email method specified.

Analysis Procedures

A Cronbach's alpha was also run at the completion of the collection of survey data to assess the categorization by the attributes established by Rogers. A Cronbach's alpha over .70 was the target. This was achieved for all categories for both incentives and disincentives on all of the attributes.

Of 753 surveys sent out across Utah, 35 were returned as undeliverable, leaving a total of 718 deliverable. Of the deliverable surveys, 180 responses were received, for an overall response rate of 25.06%. Of the 180 responses received, 140 were deemed usable. Five survey responses were

removed at the request of either the recipient or of a representative of the recipient; the reasons included sickness (1), blindness (1), deceased (1), mission duty (1), and personal decline (1), leaving a total of 175. Ten of the remaining 175 responses were removed because they were missing over 20% of the survey answer values, leaving 165 total responses. Additionally, a category of "do not know" eliminated another 25 responses, leaving 140 total responses.

Although this is a descriptive research study and it was not testing a hypothesis, the survey sample size was based on numbers used for inferential statistics. Based on the Utah population of 1,383,605 for the high school graduates between the ages of 18 and 64 in 2006 (U.S. Census Bureau, 2007), a sample size of 180 achieves a confidence level of 95% and a confidence interval of 7.3%, which surpasses the initial target of having a sample size of 150 necessary to achieve a confidence level of 95% and a confidence interval of 8%. However, with only 140 of the surveys being deemed usable, that number dropped to a confidence level of 95% and a confidence interval of 8.28%.

Findings

Perceived Incentives for Use of OpenCourseWare (OCW) by the Utah Adult Population

The greatest incentive overall for OpenCourseWare use by the Utah adult population is that there is no cost for materials, followed by the materials being available at any time:

1. i26 – no cost for materials
   (M = 4.59, SD = 0.68),
2. i17 – available at any time
   (M = 4.35, SD = 0.89),
3. i12 – pursuing in depth a topic that interests me
   (M = 4.24, SD = 0.93),
4. i9 – learning for personal knowledge or enjoyment
   (M = 4.22, SD = 0.93), and
5. i27 – materials in an OCW are fairly easy to access and find
   (M = 4.12, SD = 0.98).

Just as no cost for materials topped the list as having the highest overall mean, it ranked the highest in the number of participants who said it was an *incentive*, *large incentive*, or *very large incentive*, with 98.57% giving it a ranking of *incentive* or better. All in all, there were twelve incentives that over 90% of respondents said were an incentive, large incentive, or very large incentive:

1. i26 – no cost for materials, 98.57%,
2. i13 – improving my understanding of particular topics, 97.14%,
3. i17 – available at any time, 96.43%,
4. i9 – learning for personal knowledge or enjoyment, 95.71%,

5. i14 – improving professional knowledge or skills, 93.57%,
6. i35 – materials available are from leading universities, 93.57%,
7. i10 – keeping my mind active, 92.86%,
8. i12 – pursuing in depth a topic that interests me, 92.81%,
9. i27 – materials in an OCW are fairly easy to access and find, 91.43%,
10. i24 – access is at my preferred pace, 90.71%,
11. i32 – high quality & reliability because the content is produced by experts in the field, 90.71%, and
12. i3 – doing research 90.65%.

Perceived Disincentives for Use of OpenCourseWare by the Utah Adult Population

Overall, the greatest disincentive for OCW use by the Utah adult population was not having a certificate or a degree awarded. The five disincentives with the highest overall means for disincentives were as follows:

1. d6 – there is no certificate or degree awarded
   (M = 3.28, SD = 1.54),
2. d26 – it does not cover my topic of interest in the depth I desire
   (M = 3.17, SD = 1.31),
3. d2 – lack of professional support provided by subject tutors or experts
   (M = 3.14, SD = 1.25),
4. d3 – lack of guidance provided by support specialists
   (M = 3.09, SD = 1.26), and
5. d25 – feeling the material is overwhelming
   (M = 3.06, SD = 1.31).

All in all, there were thirteen disincentives that over 60% of respondents categorized as *disincentive*, *large disincentive*, or *very large disincentive*:

1. d2 – lack of professional support provided by subject tutors or experts, 73.19%,
2. d26 – it does not cover my topic of interest in the depth I desire, 69.85%,
3. d3 – lack of guidance provide by support specialists, 69.57%,
4. d6 – there is no certificate or degree awarded, 68.57%,
5. d5 – lack of awareness of how these tools can be used effectively, 68.38%,
6. d25 – feeling the materials is overwhelming, 67.63%,
7. d27 – lack of ability to assess how I am doing to ensure I am learning, 67.14%,
8. d42 – there is currently no accreditation tied with OCW, 65%,
9. d39 – not knowing what resources exist, 64.29%,
10. d4 – availability of this mode of teaching & learning is extremely variable, 63.97%,
11. d24 – content is produced & displayed in large chunks instead of bite-sized pieces of Information, 62.59%,

12. d7 – lack of activities & events that facilitate participation in learning opportunities 62.32%, and
13. d23 – content is not structured in a 'self learn' or 'self teach' method, 62.04%.

Diffusion Attributes that Contribute to the Adoption (Incentives) of OpenCourseWare in Utah

According to Rogers, users who may adopt an innovation tend toward particular attributes when making their decision. These include (a) relative advantage, (b) compatibility, (c) complexity, (d), trialability, and (e) observability. Descriptive statistics for incentives as categorized by these attributes of innovation are provided in Table 1. The mean score for each incentive is presented along with the standard deviation. Most incentives held an *N* of 140 except in some cases where a user either purposefully or accidentally did not answer a question.

Table 1

Descriptive Statistics of Responses for Incentives by Rogers's Attributes of Innovation (N = 140)

		Mean	Std. dev	Count
Relative advantage				
i13	Improving my understanding of particular topics	4.13	0.8	140
i6	Enriching or supplementing study on a formal course	3.63	1.16	140
i1	Seeking additional information about a subject introduced in school	3.58	1.15	140
i22	Sampling courses or study before enrolling	3.34	1.39	140
i29	Seeing more clearly see what I will be signing up for in a "regular" class	3.32	1.4	139
i2	Comparing courses at different educational institutions	2.91	1.36	140
i11	Shopping around for a college to attend	2.65	1.37	140
Compatibility				
i12	Pursuing in depth a topic that interests me	4.24	0.93	139
i9	Learning for personal knowledge or enjoyment	4.22	0.93	140
i14	Improving professional knowledge or skills	4.16	0.94	140
i10	Keeping my mind active	4.04	0.90	140
i3	Doing research	3.89	1.09	140
i4	Furthering projects or programs	3.47	1.15	140
i5	Improving my study skills	3.41	1.35	140
i15	Helping understand my own abilities to learn	3.40	1.27	140
i19	Improving my performance in academic programs	3.26	1.34	140
i30	Help in choosing my next course	3.19	1.38	140
i21	Improving my own materials through inclusion of OCW	3.05	1.41	140

	content			
i18	Improving my teaching skills	3.03	1.33	140
Complexity				
i24	Access is at my preferred pace	4.01	1.08	140
i25	Clear and familiar structure of materials	3.56	1.13	139
i23	Gaining experience in online learning	3.46	1.52	140
i8	Using and changing the materials for personal use	3.27	1.2	139
i20	Saving time in creation of educational materials	3.17	1.42	139
Trialability				
i26	No cost for materials	4.59	0.68	140
1i7	Available at any time	4.35	0.89	140
i27	Materials in an OCW are fairly easy to access and find	4.12	0.98	140
i28	Tools which allow users to find materials in multiple OCW's	3.80	1.05	138
i31	Can be accessed simultaneously by many people & infinitely replicated	3.40	1.32	140
i16	Freedom from discrimination on the basis of prior achievement	2.64	1.37	140
Observability				
i32	High quality & reliability because the content is produced by experts in the field	4.09	1.05	140
i35	Materials available are from leading universities	4.06	0.93	140
i34	Communicating with others	3.14	1.28	139
i33	Seeing the communications of others	3.06	1.23	140
i7	Two-way interaction and collaboration between groups	2.94	1.24	139

Diffusion Attributes that Contribute to Rejection (Disincentives) of OCW in Utah

Descriptive statistics for disincentives as categorized by the attributes of innovation are provided in Table 2.

Table 2

Descriptive Statistics of Responses for Disincentives by Rogers's Attributes (N = 140)

		Mean	Std. dev	Count
Relative advantage				
d27	Lack of ability to assess how I am doing to ensure I am learning	2.97	1.26	140
d21	There is a lack of teacher-supplied motivation, feedback & direction	2.90	1.33	140
d23	Content is not structured in a 'self learn' or 'self teach' method	2.85	1.23	137
d4	Availability of this mode of teaching & learning is extremely variable	2.82	1.17	136
d43	Not clear that unstructured communication on its own is very helpful to learning.	2.52	1.16	140
d1	The need to be a skilled self studier or independent learner	2.51	1.25	137
d41	Concern that free resources lack quality	2.49	1.31	140
Compatibility				
d6	There is no certificate or degree awarded	3.28	1.54	140
d26	It does not cover my topic of interest in the depth I desire	3.17	1.31	136
d8	Concern about intellectual property	2.68	1.28	139
d9	There is a mismatch to my local language or culture	2.33	1.54	137
d16	Having no intent to learn at this level	2.22	1.27	139
d12	Education is not important for my social group or community	2.16	1.37	138
d14	Being discouraged from engaging in additional education	2.06	1.28	139
d10	Concern about feeling included	1.98	1.17	140
d13	It goes against the norms or customs of my culture	1.85	1.24	137
d15	It goes against the norms or customs of my family or community (social)	1.74	1.12	138
Complexity				
d2	Lack of professional support provided by subject tutors or experts	3.14	1.25	138
d3	Lack of guidance provided by support specialists	3.09	1.26	138
d25	Feeling the material is overwhelming	3.06	1.31	139
d17	Not understanding how to use this resource	2.80	1.40	139
d24	Content is produced & displayed in large chunks instead of bite-sized pieces of information	2.74	1.18	139
d29	Lack of availability of guidance materials on study skills	2.73	1.25	137
d28	Wanting personal support through encouraging self-reflection & guidance within some of the in-text activities and formal assessments	2.63	1.19	139
d18	Not having the qualifications to use this resource	2.55	1.33	139

d38	Needing to learn & understand how to navigate and use such resources	2.43	1.26	140
d20	Concern about handling these new ways of learning	2.39	1.14	140
d11	Concern about being competent or capable to study at this level	2.29	1.22	139
d37	Not having the qualifications or prior achievements necessary for access	2.28	1.33	140
Trialability				
d39	Not knowing what resources exist	2.92	1.30	140
d40	Not understanding what the resources are	2.84	1.33	140
d32	Limited or no access to the Internet	2.58	1.73	140
d31	Limited or no access to a computer	2.57	1.73	140
d33	Other technical barriers preventing easy use or reuse	2.56	1.44	140
d19	Concern about handling these new technologies	2.39	1.28	140
d34	Physical circumstances that limit my access	2.20	1.42	139
d35	The cost of being online	2.12	1.36	140
d36	Being geographically remote	1.92	1.27	139
Observability				
d42	There is currently no accreditation tied with OCW	3.02	1.47	140
d5	Lack of awareness of how these tools can be used effectively	3.01	1.22	136
d7	Lack of activities & events that facilitate participation in learning opportunities	2.79	1.19	138
d22	Feeling educational materials & opportunities are not as open as possible	2.68	1.18	138
d30	Lack of recording of learning & achievements in e-portfolios or journals	2.50	1.18	139

Thematic Findings

Perceived Incentives for Use of OpenCourseWare (OCW) by the Utah Adult Population

In order to better understand the greatest incentive questions for OpenCourseWare use, a comparison of the mean ranking and frequency rating was performed.

Table 3

Greatest Incentive Questions for OpenCourseWare Use

Mean ranking	Frequency ranking	Question	
1 (4.59)	1 (98.57%)	i26	No cost for materials
2 (4.35)	3 (96.43%)	i17	Available at any time
3 (4.24)	8 (92.81%)	i12	Pursuing in depth a topic that interests me
4 (4.22)	4 (95.71%)	i9	Learning for personal knowledge or enjoyment
5 (4.16)	5 (93.57%)	i14	Improving professional knowledge or skills
6 (4.13)	2 (97.14%)	i13	Improving my understanding of particular topics
7 (4.12)	9 (91.43%)	i27	Materials in an OCW are fairly easy to access and find
8 (4.09)	11 (90.71%)	i32	High quality & reliability because the content is produced by experts in the field
9 (4.06)	6 (93.57%)	i35	Materials available are from leading universities
10 (4.04)	7 (92.86%)	i10	Keeping my mind active
11 (4.01)	10 (90.71%)	i24	Access is at my preferred pace
12 (3.89)	12 (90.65%)	i3	Doing research

From these combined results, three themes emerge: (a) self-directed knowledge and learning, (b) convenience, and (c) quality.

- The self-directed learning aspects can be seen in questions i3 – doing research, i9 – learning for personal knowledge or enjoyment, i10 – keeping my mind active, i12 – pursuing in depth a topic that interests me, i13 – improving my understanding of particular topics, and i14 – improving professional knowledge or skills.

- Convenience aspects can be seen in i17 – available at any time, i24 – access is at my preferred pace, i26 – no cost for materials, and i27 – materials in an OCW are fairly easy to access and find.

- Quality aspects can be seen in i32 – high quality and reliability because the content is produced by experts in the field and i35 – materials available are from leading universities.

The desire for self-directed knowledge and learning coincides with the compatibility attribute as it addresses perceived needs and values. The desire for convenience and quality coincides with the relative advantage attribute in that it is perceived as being better than other options.

Perceived Disincentives for Use of OpenCourseWare (OCW) by the Utah Adult Population

In order to better understand the greatest disincentive questions for OCW use, a comparison of the mean ranking and frequency rating was performed, the results of which are presented in Table 4.

Table 4

Greatest Disincentive Questions for OpenCourseWare Use

Mean ranking	Frequency ranking	Question	
1 (3.28)	4 (68.57%)	d6	There is no certificate or degree awarded
2 (3.17)	2 (69.85%)	d26	It does not cover my topic of interest in the depth I desire
3 (3.14)	1 (73.19%)	d2	Lack of professional support provided by subject tutors or experts
4 (3.09)	3 (69.57%)	d3	Lack of guidance provided by support specialists
5 (3.06)	6 (67.63%)	d25	Feeling the material is overwhelming
6 (3.02)	8 (65%)	d42	There is currently no accreditation tied with OCW
7 (2.97)	7 (67.14%)	d27	Lack of ability to assess how I am doing to ensure I am learning
7 (3.01)	5 (68.38%)	d5	Lack of awareness of how these tools can be used effectively
8 (2.92)	9 (64.29%)	d39	Not knowing what resources exist
9 (2.85)	13 (62.04%)	d23	Content is not structured in a 'self learn' or 'self teach' method
10 (2.84)		d40	Not understanding what the resources are
11 (2.82)	10 (63.97%)	d4	Availability of this mode of teaching & learning is extremely variable
12 (2.8)		d17	Not understanding how to use this resource
13 (2.79)	12 (62.32%)	d7	Lack of activities & events that facilitate participation in learning opportunities
14 (2.74)	11 (62.59%)	d24	Content is produced & displayed in large chunks instead of bite-sized pieces of information

In consideration of these combined results, five themes emerge: (a) lack of support, (b) no valid certification, (c) topic issues, (d) lack of content, and (e) lack of resource knowledge.

- Lack of support aspects can be seen in d2 – lack of professional support provided by subject tutors or experts and d3 – lack of guidance provided by support specialists.

- Lack of valid certification aspects can be seen in d6 – there is no certificate or degree awarded and d42 – there is currently no accreditation tied with OCW.

- Topic issue aspects can be seen in d25 – feeling the material is overwhelming and d26 – it does not cover my topic of interest in the depth I desire.

- Issues around lack of content can be seen in d4 – availability of this mode of teaching & learning is extremely variable, d7 – lack of activities & events that facilitate participation in learning opportunities, d23 – content is not structured in a 'self learn' or 'self teach' method, d24 – content is produced and displayed in large chunks instead of bite-sized pieces of information, and d27 – lack of ability to assess how I am doing to ensure I am learning.

- Lack of resource knowledge aspects can be seen in d5 – lack of awareness of how these tools can be used effectively, d17 – not understanding how to use this resource, d39 – not knowing what resources exist, and d40 – not understanding what the resources are.

A lack of support is related to the complexity attribute, as is a lack of resource knowledge. The issues of having no valid certification, topic issues, and lack of content issues relate to the compatibility attribute; the users, it seems, do not feel the resources are consistent with their current needs.

Incentives in the Use of OpenCourseWare (OCW) in Utah by Age, Income, Gender, Education, County, Occupation, and Ethnicity

Some significant correlations were found at both the .05 and .01 levels, but all of the correlations were low:

- The highest correlation between age and incentives was question 22 – sampling courses or study before enrolling $r(135) = -.336$, $p < .0001$.
- The highest correlation between income and incentives was question 26 – no cost for materials $r(135) = -.307$, $p < .0003$.
- All correlations between incentives and both gender and education, although statistically significant, were under .25.
- There were no significant correlations between incentives and county, occupation, or ethnicity.

Although the statistical results were significant, they were low when comparing incentives and demographic variables. It is an area for further analysis and should be considered, but it is beyond

the scope of this report. A breakdown of the overall results for each demographic variable is available at http://digitalcommons.usu.edu/etd/389/.

Disincentives that Prevent the Use of OpenCourseWare (OCW) in Utah by Age, Income, Gender, Education, County, Occupation, and Ethnicity

Some significant correlations were found at both the .05 and .01 levels, but all of the correlations were low:

- The highest correlation between age and disincentives was question 21 – there is a lack of teacher-supplied motivation, feedback & direction $r(135) = -.390$, $p < .0000$.
- The highest correlation between income and disincentives was question 23 – content is not structured in a 'self learn' or 'self teach' format $r(132) = -.274$, $p < .0014$.
- The highest correlation between education and disincentives was question 2 – lack of professional support provided by subject tutors or experts $r(133) = -.225$, $p < .0090$.
- There were no significant correlations found between disincentives and county, occupation, gender, or ethnicity.

Similar to the statistical results for incentives, the correlations were statistically significant but low when comparing disincentives and demographic variables. Additional analysis of the correlations is available at http://digitalcommons.usu.edu/etd/389/.

Diffusion Attributes that Contribute to the Adoption (Incentives) of OpenCourseWare (OCW) in Utah

In looking at incentives based on the attributes of innovation, trialability has the highest overall mean score of 3.82 on a five-point scale, compatibility has an overall mean of 3.61, complexity has an overall mean of 3.49, observability has an overall mean of 3.46, and relative advantage has an overall mean of 3.37.

Based on Rogers, it was expected that relative advantage would be the most influential of all of the attributes of innovation as a predictor of the overall weighted mean for incentives (Rogers, 2007). However, the construct of compatibility was the highest influence, explaining 34.88% of all variability. Compatibility is the degree to which an innovation is perceived as consistent with existing values, experiences, and needs and includes items like socio-cultural values and beliefs, previously introduced ideas, and client needs (Rogers, 2007). Relative advantage placed second, explaining 19% of all variability; this was followed by trailabity, explaining 18.34% of all variability.

Diffusion Attributes that Contribute to Rejection (Disincentives) of OpenCourseWare (OCW) in Utah

Considering disincentives categorized by the attributes of innovation, observability has the greatest negative influence with an overall mean of 2.80 on a five-point scale, then relative advantage at 2.72, complexity at 2.69, trialability at 2.46, and compatibility at 2.35.

It was expected that the attributes as a predictor of the overall weighted mean for disincentives would be complexity or compatibility (Rogers, 2007). As Rogers noted, compatibility of an innovation with a preceding idea can either speed up or retard its rate of adoption. A negative experience with one innovation can actually significantly harm the adoption of another one and is referred to as information negativism. Plus, potential adapters might not recognize they have a need for an innovation until they become aware of it, and its consequences. In considering complexity, Rogers notes that the complexity of an innovation, as perceived by members of a social system, is negatively related to its rate of adoption. He notes that although complexity may not be as important overall as relative advantage or compatibility, for some new ideas complexity can be a very important barrier to adoption.

Complexity, or the degree to which an innovation is perceived as relatively difficult to understand and use, was indeed the greatest predictor, explaining 29.37% of all variability. This predictor was followed, however, by trialability, which explained 27.16% of all variability. After that came compatibility, the degree to which an innovation is perceived as consistent with existing values, past experiences, and needs, which explained 24.63% of all variability.

Discussion and Recommendations

Learning and *knowledge* are perhaps the most significant incentives for using OpenCourseWare (OCW). However, based on this study, individuals are not driven to use OCW as a precursor to attending a particular institution or to taking a particular traditional class as these questions were asked specifically on the survey. Related incentive questions, which were *not* highly ranked compared to other incentives, include the following:

1. i2 – comparing courses at different educational institutions
   (M = 2.91, SD = 1.36),
2. i11 – shopping around for a college to attend
   (M = 2.65, SD = 1.37),
3. i22 – sampling courses or study before enrolling
   (M = 3.34, SD = 1.39),
4. i29 – seeing more clearly what I will be signing up for in a regular class
   (M = 3.32, SD = 1.4), or
5. i30 – help in choosing my next course
   (M = 3.19, SD = 1.38).

These results imply that users are self-directed learners. Perhaps the only exception to this is in considering that there was a small correlation between the following three incentives and age:

1. i22 – sampling courses or study before enrolling (M = 3.34, SD = 1.39) $r(135) = -.336$, $p < .0001$,
2. i29 – seeing more clearly what I will be signing up for in a regular class (M = 3.32, SD = 1.4) $r(134) = -.318$, $p < .0002$, and
3. i30 – help in choosing my next course (M = 3.19, SD = 1.38) $r(135) = -.331$, $p < .0001$.

Yet, at the same time, there were significant disincentives beyond cost, a lack of support, and no valid certification. Institutions offering OCW could perhaps work to transition some OCW users into degree-granting paid programs by (a) noting available degrees or courses associated with the class the individual is reviewing or (b) permitting a more flexible model of institution entry where individuals could enter into a program at their level of competency. A "test drive" model can be developed to promote or market an institution, using OCW as a maven trap (Gladwell, 2002). Implementing this model would help users keep their educational costs down, while receiving desired support and valid certification.

Offering a flexible entry model into traditional at-a-cost education could be accomplished by offering some type of testing to determine if the OCW user comprehended and mastered the course objectives. If testing is offered, the OCW website could suggest other OCW courses of potential interest as well as provide information about associated degrees or traditional instructor-led courses that seem to be a good fit. A tool that accomplishes this recommendation already exists and is known as the OER Recommender (see http://www.oerrecommender.org). Examples of recommendations can be viewed on Utah State's OCW website at http://ocw.usu.edu. The users could find their personal level of competency using measurable assessments. Once the users reached their maximum capability and did not pass a measurable assessment, the results message could explain the potential benefits of traditional instructor-led education for areas they need more help with, noting that although there would now be a cost there would also be support as well as acknowledged and accredited certification or degrees granted. The site could also note traditional at-a-cost classes for which there are no OCW alternatives, yet are practical for their area of interest. This may include classes for which there is extensive lab time, expensive equipment requirements, or requisite instructor-led time. For it to be attractive to the end user, however, the user would need to enter into traditional education at their level of competency. A competency model is where a student can prove competency in a particular subject area and receive credit for that area. One value that should be noted on OCW sites, if applicable, is institutional accreditation.

It should be noted that according to this study there is no direct relation between the amount of education a potential OCW user has and the incentives for OCW use, so institutions might also want to re-assess their presumptions relating to prior educational attainment in relation to who may be using, and potentially mastering, OCW materials.

Lack of content or topic issues is another area that surfaced as a disincentive. This disincentive could, in part, be remedied by elevating the status of current OCW/OER recommendation engines such as ccLearn DiscoverEd (see http://discovered.creativecommons.org/search/), OCW Finder (see http://www.ocwfinder.com/), or OER Recommender (see http://www.oerrecommender.org) and perhaps merging the capabilities of each into a singular engine. OCW websites should make their content available to these recommendation engines via tags for their content and should reciprocally link to one or more of these sites. Although users might leave one particular institutional site in favor of content in another, they are encouraged to continue their pursuit of knowledge, and this is one of the ultimate goals of OCW and the open educational resources movement.

A final disincentive category that emerged was a lack of knowledge of the resources available either altogether or in regard to how to best use them. A marketing campaign could help with overall awareness. In order to market an innovation, a good starting point is to consider the consumer's innovation decision process. According to Rogers this process entails (a) knowledge of an innovation's existence and function, (b) persuasion toward or away from the innovation, (c) decision to adopt or reject the innovation, (d) implementation of the decision, and (e) confirmation, which reinforces or reverses the decision (2003, p. 169). Based on the survey results, a number of potential users would need to be informed about OCW and its use. This factor is present in the results of d5 – lack of awareness of how these tools can be used effectively (M = 3.01, SD = 1.22), d17 – not understanding how to use this resource (M = 2.8, SD = 1.4), d39 – not knowing what resources exist (M = 2.92, SD = 1.3), and d40 – not understanding what the resources are (M = 2.84, SD = 1.33).

In marketing efforts it is suggested that institutions follow Rogers's advice for campaign communications. Campaign communications include (a) using formative research to understand the intended audiences and campaign messages, (b) setting specific and realistic campaign goals, (c) using audience segmentation to create more homogenous audience groups, and (d) designing mass media messages that trigger interpersonal network communication to occur.

Equally, institutions will want to identify potential opinion leaders, change agents, and champions. As Rogers notes, opinion leaders provide information and advice about innovations to many individuals in the system (2003, p. 27). Change agents influence an individual's decisions toward the innovation (2003, p. 27). Champions put their weight behind an innovation, thus overcoming indifference or resistance (2003, p. 414). Rogers asserts that mass media is best for communicating at the knowledge acquisition stage to inform potential users of the innovation, and interpersonal communications are best used at the persuasion stage to influence potential users. Institutions will want to consider marketing OCW and other related open educational resources as technology clusters to encourage more rapid diffusion results.

Confusion relating to OCW usage itself will be difficult to resolve across institutions or even across departments within an institution; efforts to offer consistency in the user experiences across course offerings is advisable.

Conclusion

There is little doubt that open educational resources, including OpenCourseWare (OCW), will have an impact on education worldwide. What is unknown, however, is the scope, breadth, and depth of that impact. One must consider the consequences of diffusion of the OCW innovation, remembering that those consequences may be desirable or undesirable, direct or indirect, and anticipated or unanticipated.

There are many possible futures. The intent of this research is to help drive OCW projects a step closer to satisfying end-user desires and expectations, thus promoting their use as educational change agents. It is important to understand the perceptions of the end users because, as Rogers notes, "Perceptions count. The individual's percepts of the attributes of an innovation, not the attributes as classified objectively by experts or change agents, affect its rate of adoption" (Rogers, 2003, p. 223). This study incorporated all assessed incentives and disincentives into Rogers's attributes of innovation. However, it should be noted that according to Rogers, 47% to 87% of variance in the rate of adoption is explained by the five attributes. Other factors include the type of innovation, communication channels used, the nature of the social systems, and the extent of the change agent's promotion efforts (2007).

References

Al-Gahtani, S. (2003). Computer technology adoption in Saudi Arabia: Correlates of perceived innovation attributes. *Information Technology for Development*, *10*(1), 57. Retrieved from Academic Search Premier database.

Al-Shohaib, K. A. (2005). *Diffusion and adoption of the Internet among public relations practitioners in Saudi Arabian organizations* (Unpublished doctoral dissertation). The University of Southern Mississippi, Hattiesburg.

Allard, S. L. (2003). *Innovation in a university social system: The adoption of electronic theses and dissertations digital libraries* (Unpublished doctoral dissertation). University of Kentucky, Lexington.

Atkins, D. E., Brown, J. S., & Hammond, A. L. (2007). *A review of the open educational resources (OER) movement* (Report to the William and Flora Hewlett Foundation) [Electronic version]. San Francisco: William and Flora Hewlett Foundation.

Carson, S. (2006). *2005 program evaluation findings report MIT OCW*. Cambridge, MA: Massachusetts Institute of Technology.

Caswell, T., Henson, S., Jensen, M., & Wiley, D. (2008). Open educational resources: Enabling universal education. *International Review of Research in Open and Distance Learning, 9*(1), 1-12.

Dayton, D. (2004). Electronic editing in technical communication: A Model of user-centered technology adoption. *Technical Communication, 51*(2), 207-223. Retrieved from Academic Search Premier database.

Downes, S. (2007). Models for sustainable open educational resources. *Interdisciplinary Journal of Knowledge and Learning Objects, 3*, 44.

Educause Learning Initiative. (2006). *ELI innovations & implementations—The open learning initiative* (ELI5013). Boulder, CO: Educause.

Hanselman, M. (2009, February 26). OCW receiving national, international recognition. *Utah State Today*, p. 3. Retrieved from http://www.usu.edu/ust/index.cfm?article=34468.

Kirkpatrick, K. (2006). OCW. *Searcher, 14*(10), 53-58. Retrieved from Professional Development Collection database.

Lerman, S. R., & Miyagawa, S. (2002). OCW. *Academe, 88*(5), 23.

Liebermann, T. (2006). *A diffusion of innovation model modified for educational technology*

working with coaches and physical education teachers (Unpublished doctoral dissertation). University of Calgary, Canada.

Matkin, G. (2005). The move toward open educational resources. *Distance Education Report, 9*(9), 1-2.

OCW Consortium. (2009). *OCW Consortium members*. Retrieved from OCW Consortium website: http://www.ocwconsortium.org/.

Open eLearning Content Observatory Services. (2007). In G. Geser (Ed.), *Open educational practices and resources* (OLCOS Roadmap 2012, pp. 1-149) [Electronic version]. Austria: Open eLearning Content Observatory Services.

Rogers, E. M. (2003). *Diffusion of innovations*. New York: Free Press.

Schroll, D. (2007). *Examining what influences a teacher's choice to adopt technology and constructivist principles in the classroom learning environment* (Unpublished doctoral dissertation). Walden Online University.

Schumacker, R. E. (2005). *Standards for interpreting reliability coefficients*. Retrieved from http://www.appliedmeasurementassociates.com/White%20Papers/Standards%20for%20Interpreting%20Reliability%20Coefficients.pdf.

Smith, M. S., & Casserly, C. M. (2006). The promise of open educational resources. *Change, 38*(5), 8-18.

Tennant, R., & Tennant, R. (2005). The open content alliance. *Library Journal, 130*(20), 38-38.

Tornatzky, L. G., & Klein, K. J. (1982). Innovation characteristics and innovation adoption implementation: A meta analysis of findings. *IEEE Transactions on Engineering Management, 29*(1), 28-45. Retreived from http://www-management.wharton.upenn.edu/klein/documents/Tornatzky_Klein_1982.pdf.

Trenin, D. T. (2007). *Giving knowledge for free: The emergence of open educational resources* [Electronic version]. Danvers, MA: Organization for Economic Co-operation and Development.

Vest, C. M. (2006). Open content and the emerging global meta-university. *Educause Review, 41*(3), 18-30.

Appendix

Distribution Survey of OpenCourseWare Incentives and Disincentives

OCW (OCW) is dedicated to the development of freely available, stand-alone college-level online course and teaching materials on a variety of topics. It includes items such as lecture notes, reading lists, course assignments, syllabi, study materials, simulations, and the like as used in current courses which are then made freely available on the Internet.

Some of the OCW projects available to you include:

- Carnegie Mellon OpenLearningInitiative at http://www.cmu.edu/oli/
- Johns Hopkins Bloomberg School of Public Health OCW at http://OCW.jhsph.edu/
- Massachusetts Institute of Technology OCW at http://OCW.mit.edu/
- University of Notre Dame OCW at http://OCW.nd.edu/
- Tufts University OCW at http://OCW.tufts.edu/
- University of California, Irvine OCW at http://OCW.uci.edu/, and
- Utah State University OCW at http://OCW.usu.edu/

Please indicate how much of an ***INCENTIVE*** each of these characteristics would be to you personally, where **1 means "not an incentive at all" and 5 means "very large incentive".** Please choose "do not know" if you feel you cannot answer this question.

	Not				Large
Seeking additional information about a subject introduced in school	1	2	3	4	5
Comparing courses at different educational institutions	1	2	3	4	5
Doing research	1	2	3	4	5
Furthering projects or programs	1	2	3	4	5
Improving my study skills	1	2	3	4	5
Enriching or supplementing study on a formal course	1	2	3	4	5
Two-way interaction and collaboration between groups	1	2	3	4	5
Using and changing the materials for personal use	1	2	3	4	5
Learning for personal knowledge or enjoyment	1	2	3	4	5
Keeping my mind active	1	2	3	4	5
Shopping around for a college to attend	1	2	3	4	5
Pursuing in depth a topic that interests me	1	2	3	4	5
Improving my understanding of particular topics	1	2	3	4	5
Improving professional knowledge or skills	1	2	3	4	5
Helping understand my own abilities to learn	1	2	3	4	5
Freedom from discrimination on the basis of prior achievement	1	2	3	4	5
Available at any time	1	2	3	4	5
Improving my teaching skills	1	2	3	4	5
Improving my performance in academic programs	1	2	3	4	5
Saving time in creation of educational materials	1	2	3	4	5
Improving my own materials through inclusion of OCW content	1	2	3	4	5
Sampling courses or study before enrolling	1	2	3	4	5
Gaining experience in online learning	1	2	3	4	5
Access is at my preferred pace	1	2	3	4	5
Clear and familiar structure of materials	1	2	3	4	5

No cost for materials	1 2 3 4 5
Materials in an OCW are fairly easy to access and find	1 2 3 4 5
Tools which allow users to find materials in multiple OCW's	1 2 3 4 5
Seeing more clearly see what I will be signing up for in a "regular" class	1 2 3 4 5
Help in choosing my next course	1 2 3 4 5
Can be accessed simultaneously by many people & infinitely replicated	1 2 3 4 5
High quality & reliability because the content is produced by experts in the field	1 2 3 4 5
Seeing the communications of others	1 2 3 4 5
Communicating with others	1 2 3 4 5
Materials available are from leading universities	1 2 3 4 5

Do not know: ☐

Other: _____

Please indicate how much of a ***DISINCENTIVE*** each of these characteristics would be to you personally, where **1 means "not at all a disincentive" and 5 means "very large disincentive".** Please choose "do not know" if you feel you cannot answer this question.

	Not Large
The need to be a skilled self-studier or independent learner	1 2 3 4 5
Lack of professional support provided by subject tutors or experts	1 2 3 4 5
Lack of guidance provided by support specialists	1 2 3 4 5
Availability of this mode of teaching & learning is extremely variable	1 2 3 4 5
Lack of awareness of how these tools can be used effectively	1 2 3 4 5
There is no certificate or degree awarded	1 2 3 4 5
Lack of activities & events that facilitate participation in learning opportunities	1 2 3 4 5
Concern about intellectual property	1 2 3 4 5
There is a mismatch to my local language or culture	1 2 3 4 5
Concern about feeling included	1 2 3 4 5
Concern about being competent or capable to study at this level	1 2 3 4 5
Education is not important for my social group or community	1 2 3 4 5
It goes against the norms or customs of my culture	1 2 3 4 5
Being discouraged from engaging in additional education	1 2 3 4 5
It goes against the norms or customs of my family or community (social)	1 2 3 4 5
Having no intent to learn at this level	1 2 3 4 5
Not understanding how to use this resource	1 2 3 4 5
Not having the qualifications to use this resource	1 2 3 4 5
Concern about handling these new technologies	1 2 3 4 5
Concern about handling these new ways of learning	1 2 3 4 5

There is a lack of teacher-supplied motivation, feedback & direction	1 2 3 4 5
Feeling educational materials & opportunities are not as open as possible	1 2 3 4 5
Content is not structured in a 'self-learn' or 'self-teach' method	1 2 3 4 5
Content is produced & displayed in large chunks instead of bite-sized pieces of information	1 2 3 4 5
Feeling the material is overwhelming	1 2 3 4 5
It does not cover my topic of interest in the depth I desire	1 2 3 4 5
Lack of ability to assess how I am doing to ensure I am learning	1 2 3 4 5
Wanting personal support through encouraging self-reflection & guidance within some of the in-text activities and formal assessments	1 2 3 4 5
Lack of availability of guidance materials on study skills	1 2 3 4 5
Lack of recording of learning & achievements in e-portfolios or journals	1 2 3 4 5
Limited or no access to a computer	1 2 3 4 5
Limited or no access to the Internet	1 2 3 4 5
Other technical barriers preventing easy use or reuse	1 2 3 4 5
Physical circumstances that limit my access	1 2 3 4 5
The cost of being online	1 2 3 4 5
Being geographically remote	1 2 3 4 5
Not having the qualifications or prior achievements necessary for access	1 2 3 4 5
Needing to learn & understand how to navigate and use such resources	1 2 3 4 5
Not knowing what resources exist	1 2 3 4 5
Not understanding what the resources are	1 2 3 4 5
Concern that free resources lack quality	1 2 3 4 5
There is currently no accreditation tied with OCW	1 2 3 4 5
Not clear that unstructured communication on its own is very helpful to learning.	1 2 3 4 5

Do not know: ☐

Other: _____

Thank you for completing this survey. Please now place it in the enclosed envelope and drop it in the postal mail.

Athabasca University

International Review of Research in Open and Distance Learning
Volume 10, Number 5. *ISSN: 1492-3831*

November – 2009

Open Access Week

Terry Anderson

The publication of this special issue on openness coincides with the first international Open Access Week, held from Oct. 19-23, 2009. IRRODL's sponsor, Athabasca University, participated in this event by hosting five noon-hour web conferences, which were presented by internationally known experts on various components of openness. The sessions were hosted by Elluminate.com.

The archives of these events contain recordings of the Elluminate sessions, MP3 and MP4 podcasts, and the slides used by the presenters. The five presentations are as follows: The Open Access Scholar, Open Access Research Opportunities and Strategies, Open Access Publication, Open Access Archives and Repositories, and Open Educational Resources. IRRODL readers are invited to visit Atahabasca University's Open Access Week archives.

Athabasca University