Massive Open Online Courses: Innovation in Education?

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Introduction

Massive Open Online Courses (MOOCs) have developed into a significant talking point for universities, education reformers and start-up companies. The interest in this format of teaching and learning resulted in the *New York Times* declaring 2012 as "the year of the MOOC" (Pappano 2012).

Writing a chapter such as this can be a fool's game; by the time the book is published, the hype-driven world of education may well have moved on to newer buzzwords. Currently, though, MOOCs represent and reflect the angst of educators and administrators in attempting to understand the role of the university in the Internet era.

Researchers have extensively chronicled the trends and challenges in higher education (Altbach et al. 2009). MOOCs appear to be as much about the collective grasping of universities' leaders to bring higher education into the digital age as they are about a particular method of teaching. In this chapter, I won't spend time commenting on the role of MOOCs in educational transformation or even why attention to this mode of delivering education has received unprecedented hype (rarely has higher education as a system responded as rapidly to a trend as it has responded to open online courses). Instead, this chapter details different MOOC models and the underlying pedagogy of each.

Distance learning — and, more recently, online learning— has a long history of increasing access to education, dating back to 1833 (Simonson et al. 2011, p. 37). Correspondence schools and radio instruction contributed to reducing education barriers. By the late 1960s, the launch of the Open University UK (OU UK, History) resulted in the development of open access universities around the world.

Open universities were initially defined by their goal to reduce entry requirements for higher education. In the distance education model, students received texts and

reading resources via postal service and submitted assignments in return. Today, with millions of students learning at a distance (Simonson et al. 2011, pp. 14–15), research and literature have developed to address teaching practices, learner skills and attributes, as well as governance and leadership of open universities. MOOCs are a continuation of this trend of innovation, experimentation and the use of technology to provide learning opportunities for large numbers of learners.

What Are MOOCs?

Open online courses, sometimes called "massive" (MOOCs) due to their high enrolment numbers (McAuley et al. 2010), offer a middle ground for teaching and learning between the highly organised and structured classroom environment and the chaotic open web of fragmented information. In a traditional classroom or online course, learning designers and educators structure the readings, learning resources, lectures and activities of learners. As a result, learning is directed toward clearly articulated goals and outcomes. The educator provides shape and direction to the learning experience by forming groups and providing assessments, assignment focuses or guidelines.

Connectivism and Connective Knowledge (CCK08) was the first MOOC, offered both as an open course and in the Certificate in Emerging Technologies for Learning (CETL) at the University of Manitoba. CETL was designed as a Masters-level certificate with three core and three elective courses. CCK08 was the initial core course in the programme. The course syllabus was translated into six different languages: Spanish, Portuguese, Italian, Hungarian, Chinese (Simplified Character Version) and German (http://ltc.umanitoba.ca/wiki/Connectivism_2008). The course was first offered from September to November 2008, facilitated by me and Stephen Downes. A total of 24 for-credit students enrolled in the course. The course was then offered as an open online course, drawing over 2,200 additional participants. These additional students did not pay a registration fee or receive feedback on their assignments from course instructors.

As put forward by McAuley et al. (2010, p. 5):

> "A MOOC integrates the connectivity of social networking, the facilitation of an acknowledged expert in a field of study, and a collection of freely accessible online resources. Perhaps most importantly, however, a MOOC builds on the active engagement of several hundred to several thousand 'students' who self-organise their participation according to learning goals, prior knowledge and skills, and common interests. Although it may share in some of the conventions of an ordinary course, such as a pre-defined timeline and weekly topics for consideration, a MOOC generally carries no fees, no prerequisites other than Internet access and interest."

Specifically, MOOCs are:

- **Massive**, involving hundreds and thousands of students. The scale of "massive" is somewhat relative. Early MOOCs had in the range of 2,000 students, but offerings by Coursera and Udacity have exceeded 100,000 registrants. An important benefit of large numbers of students is the opportunity for sub-network formation by participants. For example, in CCK08, students formed sub-networks around language, geographical

locations, physical "meet-ups," technology spaces such as Second Life, and different education segments (primary and secondary, higher education, corporate learning).

While the concept of *massive* raises concerns about isolation and overwhelming student-instructor ratios, at least some students use the size and diversity of networks to personalise their learning through forming sub-networks.

- **Open**, in terms of access. MOOCs, particularly those offered by for-profit firms such as Coursera, are not necessarily openly licensed, but students can access the course content and participate in guest lectures without fees.

- **Online**, exclusively. In some instances, learners arrange physical meet-ups, but most of the learning activity — content and interactions — occurs online.

- **Courses**. MOOCs have a set start and stop time. Even if MOOC archives are made available after the course, social interactions in forums and blogs occur during the set times of the course offering. While there are some areas of overlap and use of open education resources with MOOCs, the content is somewhat structured and sequenced, even when multiple sources of learning content are used.

MOOC Formats

MOOC models are evolving quickly. In their current configuration, they can be classified as xMOOCs, cMOOCs and quasi-MOOCs.

xMOOCs

xMOOCs are offered in a traditional university model such as Stanford (Coursera), MIT (Massachusetts Institute of Technology)/Harvard (edX), and Udacity. This format started in the fall of 2011 with Stanford University's course in Artificial Intelligence (www.ai-class.com/). Coursera and Udacity are for-profit initiatives. In contrast, edX is not for profit.

Traditional universities, including many elite American institutions, are the driving force behind this model. The pedagogical model that underpins these courses is one of "teacher as expert" and "learner as knowledge consumer." Learning is primarily a process of the learner duplicating the knowledge structure set by the course designer and the instructor teaching the course. Weekly course topics are addressed through recorded lectures that range from 3 to 30 minutes in length. Udacity, not affiliated with a university, relies on short lectures and interactive activities that rarely exceed five minutes. Coursera, which includes traditional universities as members, offers video lectures that typically range between 15 and 30 minutes.

In order to meet the challenges of large numbers of students, assignments are computer-graded in xMOOCs. Direct instructor feedback is not common, except in discussion forums where teaching assistants and the course instructor respond to student questions. Coursera and Udacity encourage participants to form regional meet-ups to connect with other students. As of late 2012, Coursera lists over 2 million students (or "courserians") and over 200 courses.

cMOOCs

cMOOCs are based on a connectivist pedagogical model that views knowledge as a networked state and learning as the process of generating those networks and adding and pruning connections. Of particular importance in cMOOCs is the view of knowledge as generative and the importance of artifact creation as a means of sharing personal knowledge for others to connect to and with. In contrast with xMOOCs, cMOOCs are largely open in terms of the activities that learners can pursue related to the theme, with limited structure and weekly themes.

A pre-history of cMOOCs includes smaller open online courses offered by David Wiley and Alec Couros in 2007 and early 2008 (Downes 2012). Since CCK08, numerous courses have been offered in the distributed cMOOC format, as detailed in Table 1.1.

Table 1.1: Early MOOCs

Course	Facilitators	University credit?
CCK08	Siemens, Downes	Yes
CCK09	Siemens, Downes	Yes
Personal Learning Environments and Knowledge 2010 (PLENK)	Siemens, Downes, Cormier, Kop	No
Education Futures 2010	Siemens, Cormier	No
Critical Literacies 2009	Downes, Kop	No
MobiMooc 2010	Inge de Waard	No
Learning Analytics 2011	Siemens, Dron, Cormier, Elias	No
CCK 2011	Siemens, Downes	Yes
eduMOOC, 2011	Schroeder	Yes

cMOOCs are distributed, and they emphasise, the importance of learner autonomy. As a consequence of increased learner control, numerous tools and technologies are used during the delivery of an open course. Each learner selects the technologies that he or she prefers to use. Course facilitators provide: an infrastructure for content and administrative details (in the form of a wiki or a Web page); a schedule for synchronous sessions involving guest speakers or live discussions; a means of communicating with participants and providing course updates (often handled through email and blogs); and starting points for learners to form connections with each other (a learning management system such as Moodle).

quasi-MOOCs

quasi-MOOCs provide Web-based tutorials as OER, such as those of the Khan Academy and MIT's OpenCourseWare (OCW). These are technically not courses. They consist of OER intended to support learning-specific tasks such as an operation in algebra, or they are treated as asynchronous learning resources that do not offer the social interaction of cMOOCs or the automated grading and tutorial-driven format of xMOOCs. These resources are loosely linked and are not packaged as a course.

The Saylor Foundation (www.saylor.org/) has full courses primarily as OER and available for free use by learners. These courses are being accepted for credit at some educational institutions (Carey 2012) and as an open course format using Google Course Builder (http://cb-me102.saylor.org/).

Figure 1.1 provides a timeline representation of MOOC models and early providers (Hill 2012).

Figure 1.1: History of MOOCs (from Hill 2012).
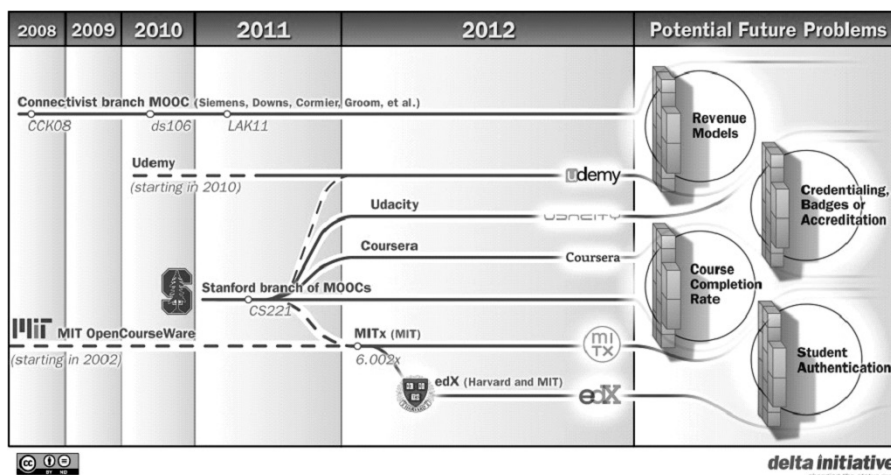
Challenges of MOOCs

Since fall 2011, with the offering of Stanford's Artificial Intelligence (AI) course, most coverage of MOOCs has focused on the positive aspects: democratising learning; free courses; and economy of scale. Numerous challenges are starting to emerge. In particular, MOOCs have high dropout rates, lack an economic or sustainable model, face challenges of plagiarism, and risk de-skilling the professoriate.

Dropout Rates

MOOCs have poor completion rates in comparison with traditional university courses. Daniel (2012) reports that an MIT course, Circuits and Electronics, only had 7,157 students out of 155,000 complete the course. However, dropouts in MOOCs may be driven by different factors than in traditional courses. Students taking a traditional course have a different level of commitment because of credit seeking, the motivation of paid tuition fees, and the need to take a course to fulfil degree requirements. Together, these factors are a type of "hard commitment" on the part of students. Failure to complete the course has implications for future study.

Learners who take a MOOC may do so for a range of reasons beyond credit. The obligation for continuing a course is not driven by responsibility of completion, but for reasons such as personal interest or motivation. To date, studies have not been conducted on the impact of "soft commitment" in MOOCs. For example, participants may be interested in taking only a few of the weekly topics out of an entire course. It is still possible that students have a sense of personal disappointment in failing to complete a course, but course completion is different

in online courses, even though many of the metrics of success (such as concern over dropout rates) are different from those in regular university courses. (During and following CCK08, I met numerous students at conferences in different countries who expressed a sense of disappointment at not completing the course or being more active.)

Sustainability

MOOCs do not yet have a sustainable revenue model. Developing, delivering and updating online courses is a resource-intensive undertaking. Until a revenue model is established, concerns will exist around the viability of MOOC providers and the MOOC model of learning. Udacity and Coursera are at the early stages of experimenting with business models, including offering career placement services (Young 2012b).

De-skilling the Professoriate

One potential impact of "super professors" from top universities providing recorded lectures to other universities and colleges is the progressive de-skilling of the professoriate (Basu 2012). MOOC providers such as Coursera and Udacity are for-profit organisations backed by venture capital funding. As such, the first mandate of these providers is to their shareholders, not to students or to society.

Cheating and Plagiarism

While MOOCs are often non-credit, cheating and plagiarism is a growing concern for university providers (Young 2012a). These concerns require attention from open course providers in order for MOOCs to be considered for credit or transfer by universities.

The Impact of MOOCs

MOOCs may well be a transitory stage for education. The concerns that MOOCs raise need to be addressed before this course format is accepted broadly.

When viewing MOOCs from the perspective of how students interact and how information is created, it becomes apparent that a key aspect of this format is how it mirrors or reflects the structure of the Internet (at least, the cMOOCs). An ecosystem is developing around MOOCs. MOOCs are a platform on which various service offerings are provided. As an example, Twitter's popularity has resulted in the development of numerous products and services that enrich the experience for users. While Twitter itself was initially a platform for sharing short messages, often from mobile phones, numerous products were developed on the Twitter platform for reading tweets, sharing images and videos, and archiving tweets. This ecosystem improved the value of the Twitter platform. Similarly, MOOCs are today at an early stage, but already there are indications that a similar suite of products and tools will be built on top of existing offerings.

Another impact of open online courses is a power shift toward increased equity between educator and learner. Figure 1.2 details how the traditional faculty–content–learner role is increasingly augmented through OER and external experts.

The emerging educator–learner power shift is also reflected in access to learning content, social media and content creation tools reflective of the participatory nature of the Web.

Figure 1.2: Expanding learner access.
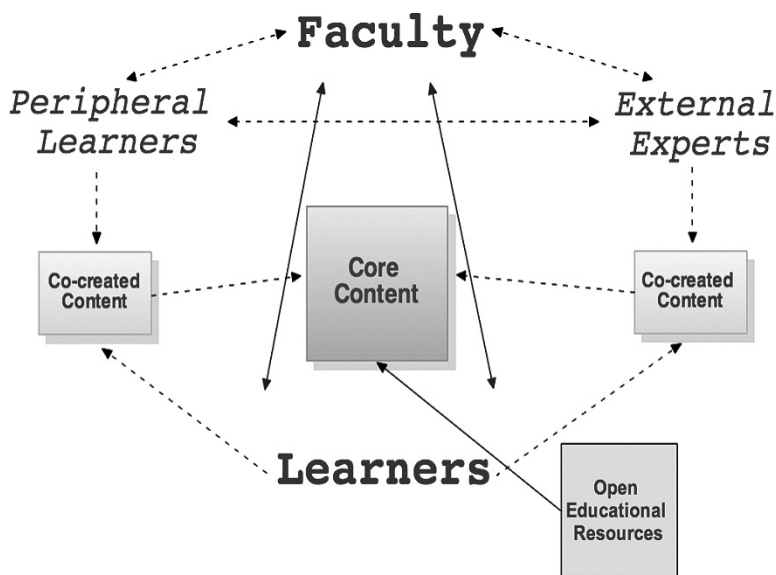
Another important contribution of MOOCs is to increase interest in, and awareness of, online learning. Online learning continues to outpace the enrolment growth of traditional university students (Allen and Seaman 2011). The media interest in open courses has generated much discussion of the opportunities of online education.

Attributes of cMOOCs

The content and discussion in a cMOOC reflect the open, networked and distributed structure of the Internet. While a classroom-type model is evident in open courses through the use of readings and recorded lectures, participants have control and autonomy to move beyond the planned structure of the course through the use of OER, the use of personal blogs, and the formation of sub-networks around areas of personal interest.

The relationships among the various technological components of a cMOOC are detailed in Figure 1.3. Blog and Moodle forum posts, as well as tweets, were aggregated through gRRShopper, an application developed by Stephen Downes. If a post or tweet contains the course hashtag (such as CCK08), it is automatically pulled into the database for inclusion in the next edition of *The Daily*, an email sent (not surprisingly) every day. gRSShopper and *The Daily* have commenting features available to course participants, but comments are most often made directly on the blogs of participants or in the Moodle forum, as indicated by the *comment ecosystem* in Figure 1.3.

Figure 1.3: Technology elements in a cMOOC.
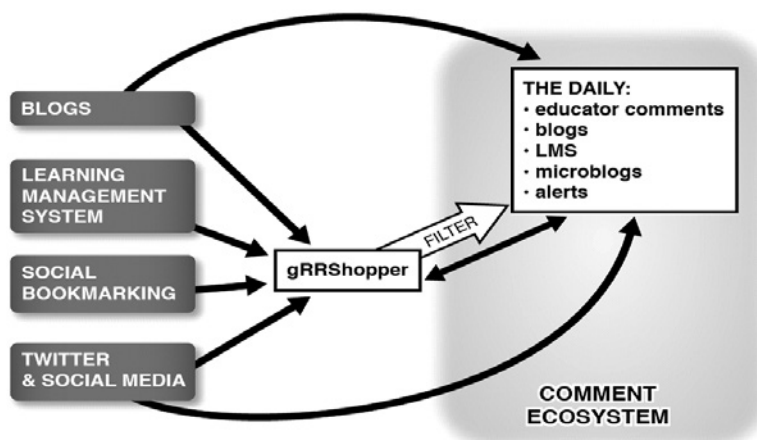
These cMOOCs are informed by connectivist views of learning — namely, that knowledge is distributed and learning is the process of navigating, growing and pruning connections. Interactions in CCK08 started in Moodle, but learners interacted in Facebook (www.facebook.com/group.php?gid=31924181180), Second Life (http://chilbo.wikispaces.com/Connectivism+Course+in+Chilbo), blogs, wikis and other spaces. Fini (2009, Section 3) details the following toolset used in his research of CCK08: "Moodle, blogs, Facebook, Linkedin, Twine, Twitter, Ning, Elluminate, Ustream, Pageflakes, *The Daily*, Second Life, RSS, conceptual maps, social bookmarking, and Flickr."

CCK08 was among the first courses that adopted the model of distributed content and interactions that have since come to define cMOOCs. Fini (2009) provides an indication of the range of tools and processes, including how some of the tools 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 learning management systems (e.g., Moodle) to 3D environments (e.g., Second Life).

Tool sets differ for each MOOC, with prominent or "fashionable" tools gaining significant attention. For example, during CCK08, a group was formed in Second Life (which was, at the time, gaining attention with educators) for individuals to meet and discuss course topics. In subsequent courses, different technologies were used that reflected the new tools gaining prominence during the time frame of the course. CCK09 resulted in significant Twitter traffic and PLENK10 produced numerous Facebook groups.

- *Knowledge is generative* – xMOOCs adopt a traditional view of knowledge and learning. Instead of distributed knowledge networks, xMOOCs are based on a hub-and-spoke model: the faculty/knowledge at the centre and the learners as replicators or duplicators of knowledge. Each week in a cMOOC starts with readings and resources that reflect the current understanding of experts in the field. Learners are asked, however, to go beyond the declarations of knowledge and to reflect on how different contexts impact the structure (even relevance) of that knowledge. Broadly, however, generative vs. declarative knowledge captures the epistemological

distinctions between cMOOCs and the Coursera/edX MOOCs. Learners are encouraged to create and share digital artifacts — blogs, articles, images and videos.

- *Coherence is learner formed and instructor guided* – This attribute is closely related to the point above. In traditional courses, instructors create knowledge coherence by bounding the domain of knowledge that the learners will explore — that is, this is the course text, here are the readings and the quizzes and tests that validate what the student has learned. In cMOOCs, the coherence between course concepts is less structured, as learners are expected to form these connections through the process of learning. Learners are asked to explore, deepen and extend the ideas presented in weekly readings and resources. Coherence is something that the learners form as they make sense of and find their way through the messy knowledge elements that make up the many dimensions of a field.

- *Interactions are distributed and multi-spaced* – CCK08 started by being primarily centred in a Moodle discussion forum. As the course progressed, interactions occurred with many tools and technologies, including Second Life, PageFlakes, Google Groups, Twitter, Facebook, Plurk, blogs, wikis, YouTube and dozens of others.

- *Solutions are innovation and impact focused* – It is now a cliché to state that the world is complex and that knowledge is continually evolving. However, just because it is a cliché does not mean it is not true. Society faces complex challenges. Solutions to these global challenges will likely be found in distributed and networked approaches. The challenges are too big to be addressed in traditional sub-clustered empirical knowledge models. Integrative and holistic knowledge approaches, distributed across global networks can help (e.g., the way the virus that causes SARS in 2003 was identified). With cMOOCs, attempts are made to emulate connective and integrative knowledge: a tug on one part of the knowledge network impacts other parts.

- *Autonomous and self-regulated learners are fostered* – cMOOCs revolve around a power question: What can learners do for themselves with digital tools and networks? cMOOCs foster not only a particular type of knowledge in a particular area of inquiry; they also foster a self-regulated, motivated and autonomous learner. When an instructor does for learners what learners should do for themselves, the learning experience is incomplete. Developing capacity for learning and the mindsets needed to be successful learners is a central attribute of cMOOCs. The goal is not only the epistemological development of learners (knowing things), but also their ontological development (becoming a certain type of person).

Curriculum and Learning Outcomes

Participative pedagogical models are particularly appropriate for use with OER. The learning content or curriculum, when it consists of OER or other free content on the Internet, plays a different role than they do in traditional courses. Traditional courses are generally designed with some learning target (outcomes) and sequenced content intended to direct the learner to achieving planned outcomes.

On the surface, this model is useful for managing the education experience, as the intent of courses are clearly mapped to specific course, programme or degree outcomes. The reality of the learning experience is more complex than is indicated by structured curriculum. Learners approach courses with varying levels of expertise and knowledge, gained through formal courses and life experiences. A group of 30 students will consist of diverse learners having different knowledge profiles. In a participative pedagogical model, learners are able to select and interact around new knowledge and avoid duplication. The educator continues to play a role in ensuring that all learners meet the needs of each course. However, where a course cannot be personalised for each student, due to teacher-learner ratios, learners can self-organise and self-regulate to personalise the learning process. Instead of creating a rigid course structure in advance of learner engagement with curriculum, a cMOOC defines learning outcomes, but gives students freedom in exploring and accessing the course content.

Finally, structure in cMOOCs is a by-product of the interactions that occur between learners and content, learners and the educator, and learners with other learners. The experience of student interaction is then "stitched together" as learners move through the course through analytics (Hawksey 2012). Analytics reveal the coherence developed through interaction for different students, rather than the structure that is formed in advance of the course starting.

Conclusion

The OER movement faces an important challenge in responding to MOOCs. While the hype pendulum has swung strongly in the direction of open online courses, as educators start to face the challenges and shortcomings of MOOCs, it is reasonable to expect that attention will turn to concerns about access to educational content and effective pedagogical models.

One challenge that OER advocates need to consider is the broader appeal of ease of use and access than just openly licensed content. For example, learners who take Coursera courses have, to date, not demonstrated a significant interest in OER or any content and course licensing. The main interest is "free as in access" not "free as in remixing/re-use."

Additionally, how do small colleges and universities participate in open online courses? Companies such as Coursera are partnering with elite universities. The prominent xMOOC model has not yet provided an opportunity for less elite systems to teach courses on their platforms.

The future of MOOCs is unclear, considering the rapid development of MOOCs from obscurity in late 2011 to mainstream attention in 2012. The OER movement is quickly evolving, as are software, content and platform providers. Media attention proclaims disruption for education. Regardless of what the future holds for open online courses, a critical need exists for learners from around the world to be able to access quality learning content and learning experiences. As the MOOC hype subsides, it is important for the OER movement to continue to advocate for openness, access and learner-focus.

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