

# Education Letter

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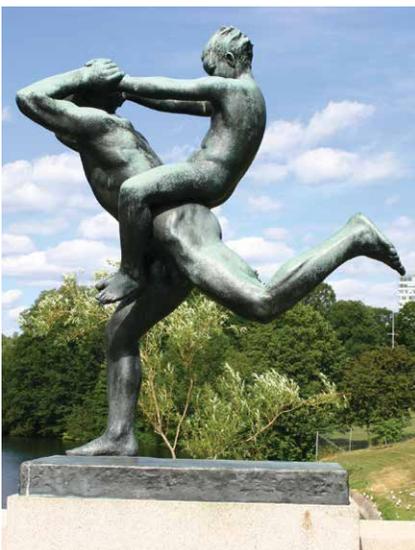
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## Beyond the Hype: The MOOC's Impact and Contribution to Online Education and E-Learning

Introduction from the Guest Editors:

SAMIRA EL ATIA, University of Alberta, and DONALD IPPERCIEL, York University

**A** *New York Times* headline dubbed 2012 “the year of the MOOC” (Pappano, 2012). Massive Open Online Courses were seen as an answer to the “higher education bubble,” promising to make ivy-league education available to the masses for free and to even “lift more people out of poverty” (Friedman, 2013). Leading universities, especially in North America, rushed to sign deals and offer MOOC courses. The education world was witnessing nothing less than a revolution. In 2013, as more educators got involved in the MOOC movement, dissenting voices were emerging, resulting in an outright backlash. A litany of shortcomings were highlighted: inadequate grading, high dropout rates, low grades, its traditional and archaic teacher-centered pedagogical model, employer skepticism, potential financial issues, its unsuitability for several academic fields, and so on. The biggest blow to the MOOC craze came in November 2013, when Sebastian Thrun, one of its leading figures and most ardent advocates, declared that MOOCs are generally of poor quality. He announced that, as a result, he would be abandoning them in order to refocus on smaller-scale vocational learning (Chafkin, 2013). The verdict seemed scathing and irrevocable: MOOCs had been revealed to be little more than the emperor’s new clothes.



Statue by Gustav Vigeland in Frogner Park, Oslo. Wikimedia Commons (CC BY-SA 3.0)

*What is clear is that MOOCs have genuine research potential*

Yet, it is equally true that MOOCs have achieved undeniable successes. For instance, following in the footsteps of Khan Academy, MOOCs have made excellent pedagogical content available to all and for free. Better yet, this learning platform has opened up the classrooms to some of the best professors in the world, in both the humanities (e.g. Michael Sandel on justice) and in technical fields (e.g. Daniel Ariely on behavioral economics). But more importantly, the MOOC movement has spurred innovative research and experimentation, the results of which are still pending. It is very likely that a major impact of the MOOC hype will be felt in blended learning as it integrates the new technologies that have come out of MOOC experimentation. What is clear is that MOOCs have genuine research potential, as confirmed by the Bill & Melinda Gates Foundation's MOOC Research Initiative, launched in 2013 to fund inquiry that "examines the efficacy of early MOOC models for various learner audiences and in a wide variety of contexts." (MOOC Research, 2103).



**Homage to Newton** by Salvadore Dali, indicating "open-heartedness," and "open-mindedness," the two very qualities important for science discovery and successful human endeavours. Photo by Mailer Diablo. Wikimedia Commons (CC BY-SA 3.0)

This special issue of Queen's *Education Letter* focuses on the challenges, innovations and possible legacy of the MOOC phenomenon, whether from a technical, pedagogical or social perspective. Our goal is to shed light on MOOCs from an educator's perspective while offering computer scientists some ideas to ponder as we enter a revolutionary phase in education. In the first article, Bates provides a historical perspective in order to assess the strengths and weaknesses of MOOCs. Karsenti, in the following article, discusses the MOOC's Achilles' heel, i.e. its floundering success rate and the importance of motivation strategies to complete a MOOC and to increase interaction. From a computer science perspective, Zaiane and Yacef propose data-driven solutions to improve the MOOC experience and highlight the need for more collaboration between the technical and the pedagogical realms. Restoule, for his part, offers a unique and compelling angle on challenges one faces when using a MOOC in indigenous education. Last but not least, Stephens reflects on the role that can and should be played by library and information service professionals in the future development of MOOCs. What makes this issue particularly interesting is certainly the variety of perspectives it offers on the MOOC phenomenon.

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# Editorial

## *At the Intersection of Computer Sciences and Online Education. Fundamental Consideration in MOOCs Education*

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**Sebastian Thrun** by JD Lasica. flickr (CC BY-NC 2.0)

*How can an event so inherently tied  
to education be so slanted toward  
computer scientists?*

In the fall of 2012, we got word from our colleagues in computer science that the originator of Udacity, Sebastian Thrun, was giving a lecture on the MOOC experience at the University of Alberta, our home institution. At that time, the University of Alberta, following other leading universities around the world, was eager to sign up with either Coursera or Udacity, the two main organizations offering MOOCs. Some institutions chose to offer courses with the former, such as MIT, University of Toronto and the University of Illinois, while others adopted Udacity, as did the University of Alberta, Georgia Institute of Technology and San Jose State University. A third MOOC provider from Harvard called EduX would later follow suit.

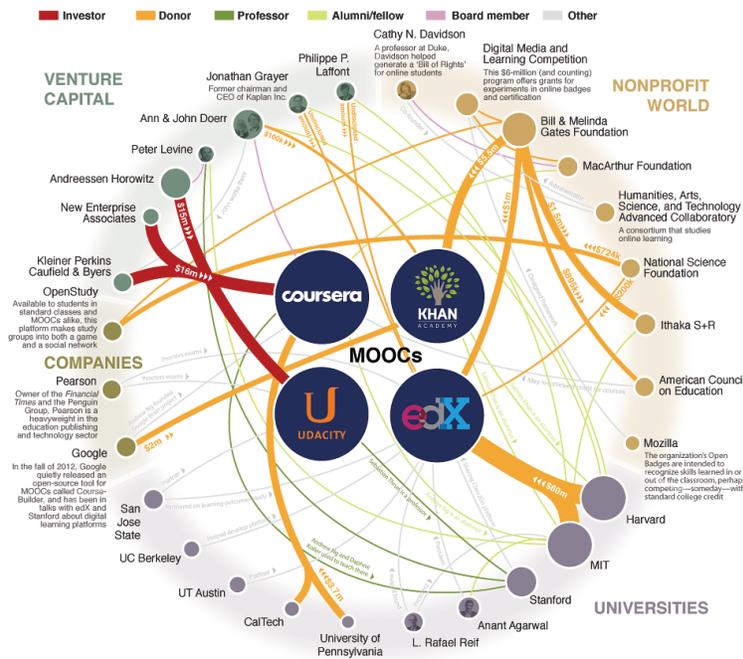
Prior to this event, throughout the spring and summer of 2012, we had followed news of the MOOC movement, discussing its potential and shortcomings. After meeting with the president of the *Agence universitaire de la Francophonie*, we had even envisioned creating a MOOC for educators in Western Africa, in an effort to foster North-South collaboration on educational projects.

As we sat in the large brimming auditorium, waiting for the lecture, we could not fail to notice that most of the attendees were faculty and students from the engineering and science faculties. Thrun is a well-known computer scientist, robotics developer, investor and golden boy of Silicon Valley. He was somewhat of a celebrity within this crowd. But given that this talk was on a major educational breakthrough and affordable education for the masses, the under-representation of the social sciences and education was very conspicuous. In fact, we were a mere handful of people from departments of education and the social sciences. And it was only incidentally through a mutual computer scientist friend that we learned about this event. He had remembered a conversation we had had with him about MOOCs, and sent us a message stating “I thought this presentation might interest you.”

Obviously, a big red flag was raised in our minds: how can an event so inherently tied to education be so slanted toward computer scientists? By the end of Mr. Thrun’s lecture, we were nonplussed by the lack of any pedagogical focus in a presentation dedicated to a new model of teaching. We left the auditorium convinced that the MOOC phenomenon could not make any significant progress if education and social science scholars were not

centrally involved in the design. It seemed obvious to us that pedagogy, not technology should be the driver behind MOOCs. The bells and whistles of computing sciences can take course development just so far; substantive pedagogical and educational groundwork and skills remain necessary to ensure that this mode of delivery does indeed offer quality education.

*pedagogy, not technology  
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MOOCs*

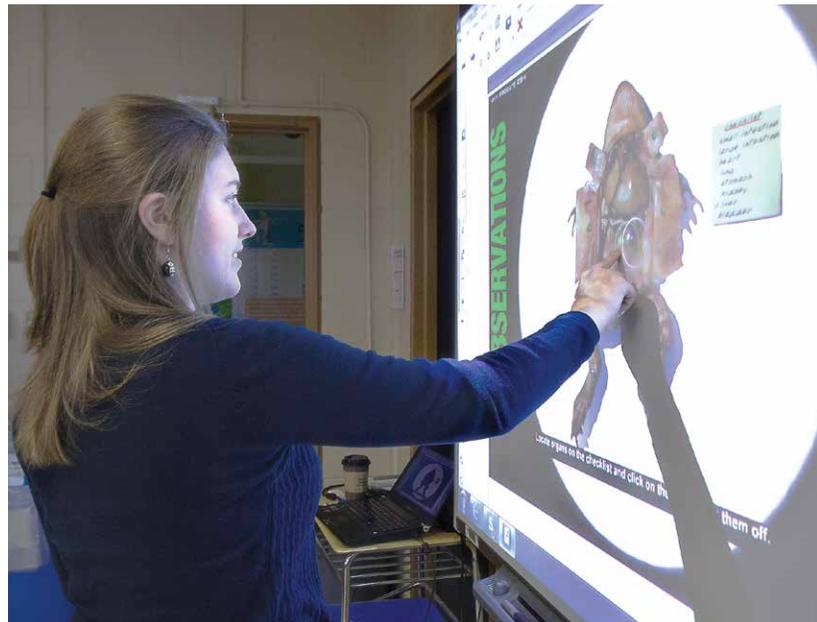


**Major Players in the MOOC Universe.** From The Chronicle of Higher Education. Graphic by Xarissa Holdway, Illustration by Nigel Hawtin

Much to our surprise, Mr. Thrun had a change of heart in early 2014 and declared that MOOCs were “a lousy product.” “I told you so” was on many lips, and it seemed that the MOOC might have been only a passing fad. Yet, given the exorbitant cost of higher education and the thirst for knowledge in developing countries, the principle of a free quality course remains appealing. Around the world, thousands still sign up for massive online courses in order to get a chance to ‘learn’ from leading scholars. As it stands, the MOOC’s future may look more modest as it finds its niche.

As we take a step back to look at the MOOC ‘revolution,’ four issues emerge, issues we believe are essential in moving MOOCs forward: quality assurance, training, resources and the need for diversity. Without research and development in each of these issues, MOOCs, as a large scale e-learning experience on a global level, would fail in their educational endeavor. When attempting to develop a MOOC, instructors need to be careful how they address and tread around these issues.

- 1 Quality assurance ranges from assessment of teaching and delivery methods to the assessment of learning itself. Among other things, it is about applying proven teaching methods adapted to the diversity of learning styles and ensuring the acquisition of predetermined learning outcomes. Undoubtedly, the diverse multicultural educational background of the massive numbers of students taking MOOCs is a major challenge that needs to be addressed before attempting to contemplate a future for MOOCs and/or any assessment model for MOOC teaching and learning.



- 2 Training is another major point that needs to be addressed in order to ensure a successful MOOC experience. By “training” we mean instruction in learning methods, learning strategies, etc. Converting a traditional course comprising lectures to students should by no means be confused with an authentic e-learning environment in which learners are active and take part in the learning process. Teachers, students and IT personnel all need to be trained in developing, designing, taking, and navigating these courses. Engagement and individualized learning and teaching are important topics to be addressed when questions of training are being dealt with.
- 3 Resources are another pivotal element that needs to be stressed in MOOC education. On the one hand, course developers need, from a very practical perspective, resources, material and labor related to computer hardware and software, online experience, and preparation time. The saying “anything can go wrong” is very real when working in the virtual world. Money and logistics required by the universities offering MOOCs is

becoming a central issue: who should fund the effort and work that go into creating and teaching a MOOC? Financial models such as those adopted by EdX and San Jose State University address this issue and attempt to respond to the resource needs by offering MOOC students the possibility to receive credits towards a certification by charging tuition. But as of yet, no solid financial model has been established. We believe that this is a key condition for the survival of MOOCs.

- 4 Lastly, MOOCs should not become a pretext for the standardization of course content. The temptation is great to have star scholars determine a learning content that could or should subsequently be used by all. This would lead to a homogenization of knowledge and of thinking, leading as a result to its impoverishment. Indeed, there is certainly a need to maintain a diversity of learning contents in order to ensure a critical and multifaceted approach to knowledge. That being said, it is certainly a very difficult task to handle the academic diversity and flow of synthesized materials with different perspectives when a MOOC is set to offer a single cultural perspective, bypassing the cultural, social, political, racial, and economical backgrounds of the students taking it.

We believe that the potential of the MOOC has not yet been fully exhausted. But there are certainly significant obstacles in its way today that should make us pause and entertain a healthy skepticism with regard to its current possibilities. That being said, there is little doubt that it opened up new and exciting lines of thought for the future of learning.

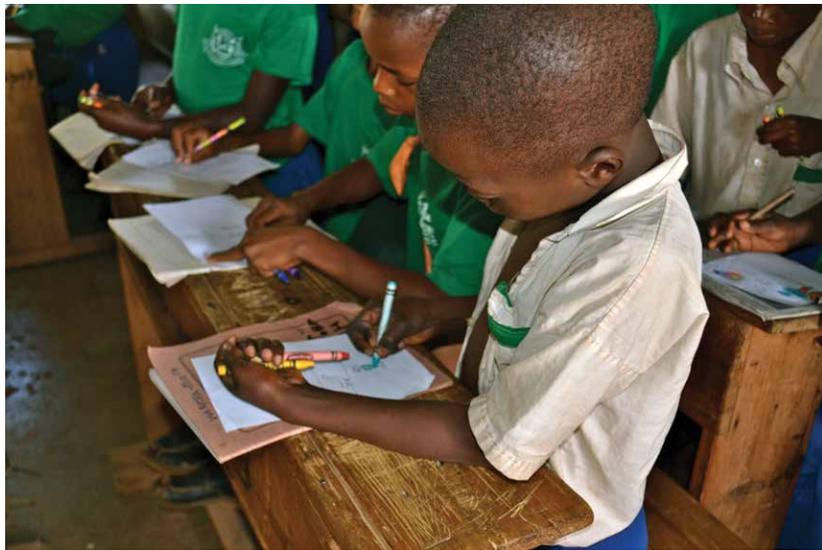


*Statue by Gustav Vigeland in Frogner Park, Oslo.* Wikimedia Commons (CC BY-SA 3.0)

# An Historical Perspective On MOOCs

TONY BATES, President and CEO, Tony Bates Associates Ltd. and Professor, Simon Fraser University

**T**here has been a great deal of 'hype' and extravagant claims for MOOCs. Some have argued that they will revolutionize higher education, offering free, high quality university education to all (Ng, 2013); others have suggested that MOOCs are the answer to providing higher education to the poor in developing countries (Koller, 2012); others that MOOCs are identifying radically new ways to improve learning (Agarwal, 2013).



The main benefits claimed by institutions offering MOOCs (Hollands & Tirthali, 2014) are:

- extending reach by offering high quality courses to millions of people free of charge
- building and maintaining brand
- reducing costs or increasing revenues
- improving educational outcomes
- innovation in teaching and learning
- research on teaching and learning

However, Hollands and Tirthali claim on the basis of their research that there is no evidence to date to support any other than the first claim, of extending reach, and others point to:

- the very high non-completion rates
- the difficulties of assessing accurately very large numbers of students, especially in the non-quantitative subjects
- lack of learner support (compared, for instance, to that offered in credit-based online learning)
- the weakness of peer assessment given the very wide range of abilities and prior knowledge of participants,
- the difficulty for learners of navigating and evaluating a massive number of online discussion comments and posts
- poor pedagogy
- the colonial or imperialist notion of offering programs from the United States as a replacement for indigenous degrees and qualifications
- the lack of sustainable business models, especially for the institutions offering MOOCs

To understand why MOOCs have attracted such attention and controversy, it is useful to look at the historical context, because MOOCs did not emerge from outer space, but belong. The first attempts at using computers for education focused on using machines to teach directly. B.F. Skinner started experimenting with teaching machines in 1954, based on the theory of behaviourism. In essence programmed learning structures information, provides immediate feedback to learners, and tests learning. This use of machines based on a behaviourist approach was called computer-assisted learning (CAL) or computer-based training (CBT), but went out of fashion in the 1980s, mainly because it did not handle well the higher levels of learning such as critical thinking, analysis and synthesis that are required at a university level, although CBT is still used in training in the workplace.

In the late 1970s, Murray Turoff and Roxanne Hiltz at the New Jersey Institute of Technology started experimenting with online discussion forums, which they termed 'computer-mediated communication' (CMC). In 1988, the Open University in the United Kingdom offered a course, DT200, that as well as the OU's traditional media of printed texts, television programs and audio-cassettes, also included an online discussion component using CoSy (a CMC software system developed at the University of Guelph). Since this course had 1,200 registered students, it was one of the earliest 'mass' open online courses.

We see then the emerging division between the use of computers for automated or programmed learning, and the use of computers to enable students and instructors to communicate with each other.

Before the World Wide Web was formally launched in 1991, it required lengthy and time-consuming methods to load text, and to find material on the Internet. In 1995, the first learning management systems (LMSs), such as WebCT (which later became Blackboard) were developed. LMSs provide an online teaching environment, where content can

*MOOCs did not emerge from outer space, but belong within a rich ecology of online learning*



**B.F. Skinner**, c. 1950. Wikimedia Commons (CC BY 3.0)

be loaded and organized, as well as providing 'spaces' for learning objectives, student activities, assignment questions, and discussion forums. LMSs are primarily text-based, although they can also incorporate other media such as podcasts or short video clips. LMSs had integrated basic educational design features, but required instructors to redesign their classroom-based teaching to fit the LMS environment.



**The Skinner Teaching Machine.** Wikimedia Commons (CC BY 3.0)

Online credit-based courses in both universities and colleges expanded rapidly from 2000 onwards, increasing at a rate of over 10% per annum each year. There are now between 5.1 and 7.1 million online students in credit-based higher education courses in the USA, the vast majority of which use some form of learning management system. (U.S. Department of Education, 2014; Allen and Seaman, 2014)

In the late 1990s the cost of creating and distributing video dropped dramatically due to digital compression and high-speed Internet access, leading to the development of lecture capture systems. Lecture capture technology enables students to view or review lectures at any time and place with an Internet connection. The Massachusetts Institute of Technology (MIT) started making its recorded lectures available to the public, free of charge, via its OpenCourseWare project, in 2002.

By 2008, George Siemens, Stephen Downes and Dave Cormier in Canada were using web technology to create the first 'connectivist' Massive Open Online Course (cMOOCs), a community of practice that linked webinar presentations and/or blog posts by experts to

participants' blogs and tweets, with just over 2,000 enrollments. The courses were open to anyone and had no formal assessment.



**Žižkov TV Tower in Prague** by Karl Davison. flickr (CC BY-NC-SA 2.0). Sculptures by Czech sculptor David Černý of babies crawling up and down are attached to the tower's pillars.

In 2012, two Stanford University professors launched a lecture-capture based MOOC (xMOOC) on artificial intelligence, attracting more than 100,000 students, and since then MOOCs have expanded rapidly around the world. There are several key points to be noted from this historical analysis.

- Credit-based courses have tended to be more text based and re-designed to suit the needs of distance learners, with strong learner support from instructors, incorporating computer-mediated communication. As a result they have in general high completion rates (see for instance Means et al., 2009; Ontario, 2011; Johnson and Mejia, 2014).
- xMOOCs based on lecture capture on the other hand require no changes to the standard lecture model, supported by Powerpoint and computerized testing, and in a sense revert back to a primarily oral and behaviourist teaching. xMOOCs lack of learner support in the form of ongoing communication with instructors is a marked characteristic that enables them to offer courses for free, but results in very low completion rates (see for instance Rivard, 2013).

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- The primary drivers of xMOOCs are Stanford University and MIT, and MOOCs were designed by computer scientists rather than educators; they have ignored the lessons learned from credit-based online learning (see Bates, 2013). However, because Ivy League universities were very late coming to online learning, they needed to re-brand online learning in their own image.
- xMOOCs are more like broadcasting in the sense that a single message goes out to thousands of viewers. The claims for MOOCs are almost identical to those made when radio, television and satellite broadcasting were first introduced. MOOC proponents could learn much from the strengths and weaknesses of educational broadcasting (see for instance, Bates, 1985).
- cMOOCs based on a connectivist approach to learning receive less publicity but use a much more radically different approach to learning than xMOOCs or even credit-based online courses. In the long run, cMOOCs are much more likely to have an impact on university and college teaching than xMOOCs.

The future of MOOCs is difficult to forecast. They will certainly evolve over time, and will probably find some kind of niche in the higher education market, probably as a form of continuing education. MOOCs are merely the latest example of the rapid evolution of technology, of the over-enthusiasm of early adopters, and of the need for careful analysis of the strengths and weaknesses of new technologies for teaching. Consequently, faculty and instructors need a strong framework for assessing the value of different technologies, new or existing, and for deciding how or when these technologies make sense for them and their students to use.



**Radio Broadcast**, by Julia Eckel. From the Smithsonian American Art Museum flickr (CC BY-NC-ND 2.0)

# Is Student Motivation the Key to Enhanced Success Rates in MOOCs?

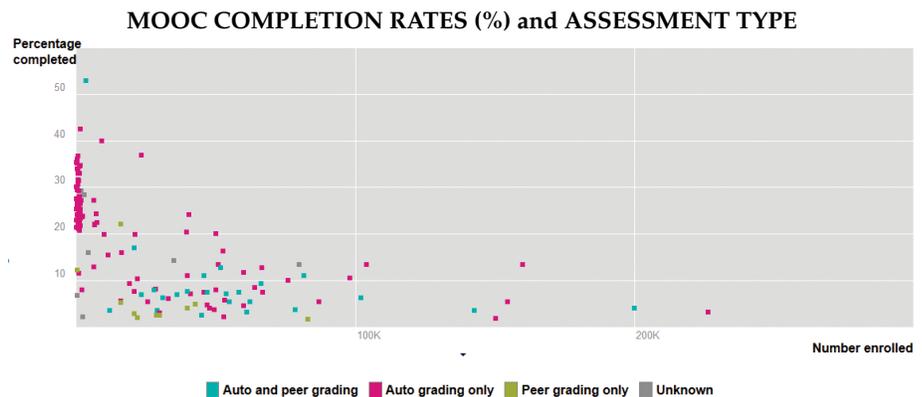
THEIRRY KARSENTI, Canada Research Chair on Technologies in Education,  
University of Montreal

**M**OOCs or massive open online courses have captured the interest of learners around the planet. They may be considered a new kind of distance education, a kind that has taken universities in North America and elsewhere in the world by storm. Since 2011, major American universities have hastened to join the new gold rush, and universities around the globe are increasingly embracing this innovative delivery mode. In fact, the numbers are startling: altogether, some 30 million students in over 230 countries have enrolled in a MOOC, and the trend is still rising sharply. Moreover, in the wake of the new Californian law, Bill SB520, which is designed to encourage university campuses to provide credit-bearing, transferable online courses, this number is expected to grow exponentially in the coming years. Is this a revolution, or simply a passing fad? Maybe it's a little of both. On the one hand, we are definitely in unknown territory, as never before imagined. What would we have thought 10, 20, or 30 years ago if someone had predicted that a university course could be given to 300,000 students across 203 countries at the same time, and online? It would have been unbelievable.



**Still Life** by David Teniers the Younger. Wikimedia Commons (PD-ART; PD-OLD-70)

Will MOOCs take higher education to a whole new level? Many experts thought so not too long ago. Others were not so sure. Some have called MOOCs the “single most important experiment in higher education” (Weissmann, 2012). Yet very few studies have investigated this topic. Moreover, when MOOC success rates are disclosed, they are alarmingly low: often, less than 3% of students pass the final exam. For example, Duke University enrolled, only 313 passed the final exam (see Catropa, 2013). This amounts to a 2.45% success rate. And what about universities and colleges that do not disclose their

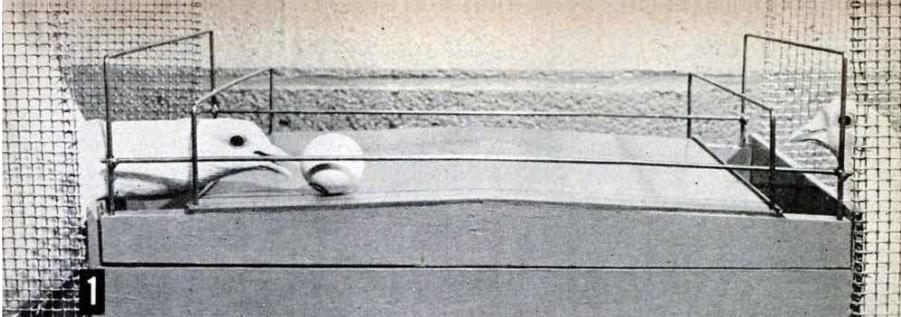


**Data** by Katy Jordan, [www.katyjordan.com/MOOCproject.html](http://www.katyjordan.com/MOOCproject.html)

success rates? Could they be even worse? Ho et al. (2014) recently published the results for the first 17 HarvardX and MITx MOOCs/courses. There were 841,687 registrations. But only 43,196 students earned certificates of completion. This clearly shows that even prestigious universities do not have a decent success rate.

Many authors (see Yeager, Hurley-Dasgupta, & Bliss, 2013) stress that MOOCs nevertheless provide opportunities for thousands of learners to interact with each other, especially in discussion forums. Most MOOCs include this feature, but so do many university courses, whether or not they are delivered at a distance. Certainly, the number of learners enrolled in MOOCs raises the diversity of the participants to epic degrees, particularly in cases where over 100,000 learners are enrolled. However, the handful of studies that have been conducted on MOOCs have demonstrated that notwithstanding the enormous popularity of MOOCs today, the vast majority of learners do not participate in discussion forums (see Kop, 2011; Kop, Fournier, & Mak, 2011; Manning & Sanders, 2013). In other words, to really benefit from the diversity of the thousands of students enrolled in the MOOC, students would have to engage in the collaborative activities that are provided, in the discussion forums in particular. Otherwise, there is really no diversity. In the view of Manning and Sanders (2013), any conclusions about the effectiveness of MOOCs should be drawn with caution. Apart from the appalling success rates, many studies have shown that the degree of autonomy and the social presence required of the students constitute major challenges (see Kop et al., 2011).

The key to find a solution to extremely low success rates seems to be in line with strategies to enhance student motivation, both to complete the MOOC, but also to increase online communication and collaboration with other students. That is, motivation, a force that energizes and directs behavior toward a goal (e.g. Deci, Ryan and Guay, 2013), seems



**Picture from 1950 relating to Dr. B.F Skinner's research into the theory that reward is more effective in getting people — or in this case pigeons — to perform tasks. the birds play a modified game of ping-pong. The winner is rewarded with food after each shot.** flickr (CC BY-NC-ND 2.0)

to be the key to drastically change the low success rates in MOOCs. In fact, according to previous studies (e.g. Karsenti, 2013), current educational challenges in MOOCs go beyond declining success rates: most MOOCs today face a crisis in student motivation. Student motivation is critical for learning, and several researchers have found a positive and robust correlation between motivation and achievement to prove it (Deci et al., 2013). Various studies have attempted to highlight the elements that impact on motivation. Deci et al. (2013) argue that teaching practices may have a tremendous impact on student motivation, and that they can affect it in many ways.

Since the beginning of the twentieth century, the concept of motivation has been studied according to a variety of perspectives. More recently, Deci, Ryan and their colleagues (2000, 2008, 2013) argued that an individual's motivation is mainly determined by his or her need for self-determination and competence. According to Ryan and Deci (2000), feelings of self-determination correspond to individuals' perception of the origin of their actions. If students believe that they have chosen their behavior, their feelings of self-determination will be heightened. The context in which the task is achieved is then perceived as promoting autonomy. Conversely, if students believe that their behavior is a result of external induction, their feelings of self-determination are weakened and the context in which the task was accomplished will be perceived as controlling. A stronger feeling of self-determination will have a positive impact on the development of a student's academic motivation, whereas the opposite will have a negative impact. For Ryan and Deci (2000), the second determining principle of motivation is the perception or feeling of competence. This element may be defined as a complex affective state, which is relatively stable, lasting and linked to an individual's representation of his or her aptitude, of his or her competence in regards to a given activity. Events which help individuals to feel

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competent increase their self-determined types of motivation. On the contrary, events which undermine individuals' feelings of competence decrease their self-determined types of motivation. The authors emphasize that there also exists in individuals an important need for affiliation complementing the need for autonomy, and which is also necessary for the development of self-determined motivation. In fact, according to Deci and Ryan, everything which is likely to influence these three factors, that is to say the feelings of self-determination, competence and affiliation, would thus have an impact on student motivation.

In light of this, it seems that when developing MOOCs, universities should make sure to find activities or implement online teaching strategies that would clearly help learners feel in control (self-determination), competent (feelings of competence), all that while collaborating online with their peers (feelings of affiliation). Is the MOOC a revolution, or just a passing fad? Only time and research will tell. However, right now, many are wondering how the thousands of upcoming students will be taught and motivated to complete their MOOC. Though this promises to be a thorny problem, Deci and Ryan's motivation theory offers some guidance: everything which is likely to influence the feelings of self-determination, competence and affiliation, would thus have an impact on student motivation. This affective aspect of MOOCs could be the key to enhanced students success rates.



**Dying Achilles (Achilleas thniskon)** by Ernst Herter in the gardens of the Achilleion Palace in Corfu. Wikimedia Commons (CC BY-SA 3.0). Floundering success rates is the "Achilles' heel of MOOCs."

# MOOCs are not MOOCs yet: Requirements for a true MOOC or MOOC 2.0

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## Massive Open Online Courses 1.0

**W**hilst traditional online courses have limited enrolments, MOOCs are aimed at large-scale interactive participation. Scalability is, thus, a major driving goal for MOOCs. However, while the engineering issue of scaling the delivery on the Web is well understood, scaling up the learning models and the assessment of learning endures as a challenge. MOOCs still predominantly remain a traditional diffusion of knowledge conveyed by text and video via the Web, where active learning is limited and oversimplified. In addition to its remarkable scalability, the novelty resides in its openness, which contributes to a democratization of learning.



***Simultaneous Windows on the City*** by Robert Delaunay.  
Wikimedia Commons  
(PD-ART; PD-OLD-70)

Another aspect considered as an innovation is their reliance on online forums, even though these have been accompanying online and blended courses for quite some time. Nonetheless, social media style collaboration constitutes a major pillar of MOOCs. With interaction via online forums, the sheer scale of the massive number of participants constitutes an important crowd sourcing for learning, but this blessing becomes a curse as it lacks both a trust model (Fullam & Barber, 2007) and means for assessment and manageable monitoring. Learners are left on their own to match themselves with other potential collaborators, with little constructive and personalized feedback. In sum, there is no real community building and social learning; and there are no scalable assessments that involve more than multiple-choice questions. Peer assessment is sometimes offered, but offers no guarantee of appropriate feedback.

Despite being massive on the enrollment side, the completion rate is dismal (Ramesh et al., 2013). Because the dropouts are typically those potential learners from the socio-economical class originally targeted, MOOCs have started to lose their glimmer for many in higher education. However, the technology will survive and evolve to a new generation, adopting existing technology in data mining and machine learning, and creating more data-driven education platforms.



### MOOC 2.0

Current MOOCs are notoriously impersonal: students can feel quite isolated and lost in the masses. To alleviate this problem, new MOOCs should promote social learning to a

larger extent. MOOC 2.0 should solicit more student participation and more interaction between students, as well as between educators and students. Due to the sheer scale of these courses, vast amounts of data are being generated and should be collected, analyzed and interpreted. In addition, more potentially useful data could be collected at smaller granularity levels. Collecting and understanding this data would certainly benefit future designs of adaptive MOOCs, as well as new education delivery models. A science discipline aiming at applying data mining technology in education already exists but has not yet been adopted by MOOC developers. Educational Data Mining (EDM) is a nascent multidisciplinary research area combining learning science and data mining, which explores data originating from online educational systems (Baker & Inventado, Educational Data Mining and Learning Analytics, 2014) in order to build adaptive educational systems and intelligent tutoring systems (Koedinger et al, 2013). As argued in (Zaiane 2001), EDM can assist learners by personalizing content and feedback, as well as support educators in the assessment of acquisition and usage of the provided curriculum. This can already be done with machine learning, which is concerned with the study and construction of automated systems that can learn from data and build predictive models; in machine learning, the more data the merrier. Due to their scale, MOOCs provide an opportunity to yield valuable information on online learner behavior.

**Assisting the Learner.** To make MOOCs more personal, adaptation through individualized tutoring is imperative. Machine learning has already been used for adaptive interfaces and can be utilized for personalization of feedback and personalization of curriculum that matches the student's learning style and pace. Recommender systems are ubiquitous in e-commerce. They estimate user preferences based on historical user-preference data. Their use in e-learning has already started (Zaiane 2002). They can recommend learning activities, exercises, resources, as well as help students choose courses, teachers, academic programs, etc. Finally, current MOOCs do not have mechanisms for community building. Students are encouraged to work together, collaborate and form groups in an ad hoc manner. Yet, there are technologies to match people based on symmetric or asymmetric models of similarity. User recommendation in reciprocal or bipartite social networks has been used for matching people together (Akehurst et al, 2011). These reciprocal recommenders can be used to match students more effectively and optimally.

**Supporting the Educator.** Particularly with very large cohorts, it is imperative to have tools to assist in evaluating the students' learning behavior and track their activities for assessment. The technology exists to automatically partition the students and student actions, and understand the learning strategies. Data clustering analysis (Aggarwal & Reddy, 2014) can group students or online activities into sets that naturally segment the massive cohort of students and pinpoint for instance those students that require assistance. This analysis can also shed light on how the content and tools are in effect used by the learners. A very popular technique in EDM is finding relationships using association rule mining (ARM) (Baker & Yacef 2009). ARM discovers relationships between online actions and can find the patterns that are frequent with some learning outcomes and can

*Machine learning has already been used for adaptive interfaces and can be utilized for personalization of feedback and personalization of curriculum that matches the student's learning style and pace.*

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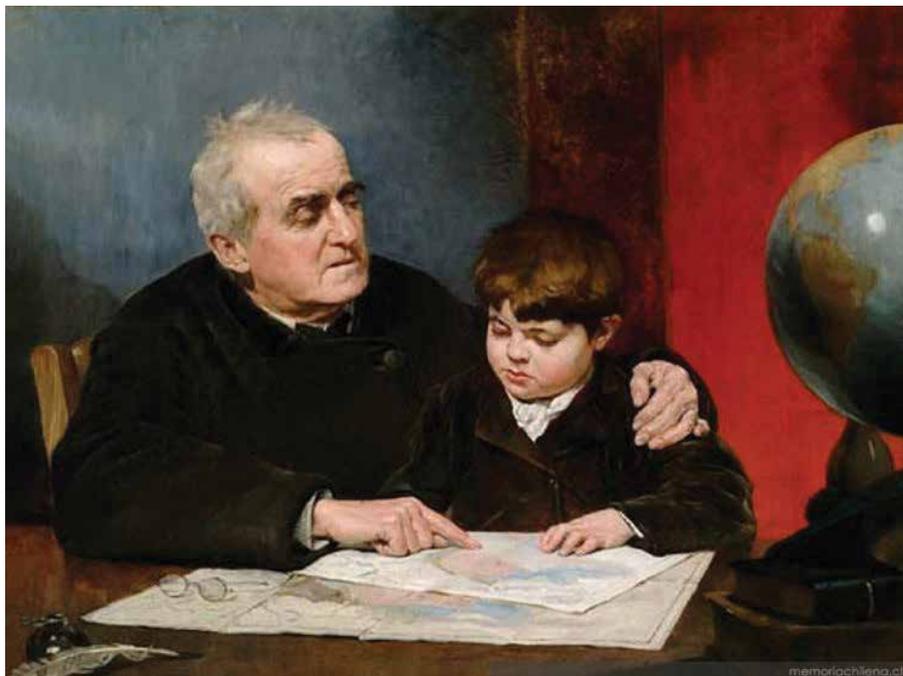
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**The Geography Lesson** by Chilean painter Alfredo Valenzuela Puelma. Wikimedia Commons (PD-ART; PD-OLD-70)

also be used to predict success or failure. Sequential pattern mining discovers temporal relationships or sequences of events and has been used to discover the paths of student collaborations that more likely lead to success (Perera et al. 2009). Improving student outcome can also be done with predictive modeling. Non-intrusive prediction of future events or skills in order to support intervention and needed support has already been successfully tested. For instance, predicting dropouts (Yang 2013) can be immensely beneficial for MOOCs, where the dropout rate is significant. Furthermore, since the major interaction in MOOCs is the exchange via online forums, an assessment of the interaction can be achieved via social network analysis (SNA) (Rabbany, ElAtia, Takaffoli, & Zaiane, 2014). SNA can disclose the structure of the interaction, the groups that naturally form and their dynamics. It can reveal intrinsic roles participants have, such as leaders, connectors between groups, followers, active actors in the diffusion of knowledge, instigators of relevant discussions, moderators, passive members, outliers, etc. Finally, intelligent tools, namely process mining, exist to extract process-related knowledge from workflow logs. Process mining has been used to evaluate activities in educational information systems and analyze assessment data after multiple-choice tests (Pechenizkiy et al. 2009).

## Conclusion

The potential of MOOCs is under-exploited. Their technology offers many research opportunities to assess the impact of massive interactive courses in education and possibly test effective potential pedagogical models (Kay et al. 2013). MOOCs need to adapt automatically to learners by presenting individualized content and feedback. MOOCs also need to provide instructors with intelligent tools to better assess the learning that is taking place, to analyze the real interaction between students, as well as to point out learners that require special attention and content that needs to be refined. This is even more important in a context of a massive number of simultaneous learners. Fortunately, many of the needed data mining technologies already exist but they need to be integrated to MOOCs. The data collected and analyzed would help uncover new best practices for online educational settings. MOOCs are at an exciting point in their development and we believe that the next generation will be more intelligent and adaptive using machine learning.



**A broken old floppy disk in a school playground.** Flickr (CC BY-NC-SA 2.0)

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# Transforming the MOOC Experience: Indigenizing Online Learning

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Can Massive Open Online Courses (MOOCs) be indigenized? In early 2013, I taught OISE's first MOOC, *Aboriginal Worldviews and Education* to over 21,000 learners worldwide through Coursera in partnership with University of Toronto. Only seven months earlier, I'd never heard of MOOCs or taught a course to a group larger than 120 students. When I began developing the *Aboriginal Worldviews and Education* course, I was concerned that a course of this size delivered online would draw me into using a behaviourist pedagogy that typically comes with a one-way flow of information where the majority of the teaching is prepared in advance and in isolation from learner feedback. My approach in teaching indigenous education in classrooms is usually very responsive to the group in the room, exploring issues as they are raised by the students and following the spirit of discussions into tangents not necessarily named in the syllabus but nonetheless relevant to learning more about the topic at hand.



For Coursera, and probably most MOOC platforms, instructors videotape their lectures in advance and upload them for captioning and transcribing, a service that increases

accessibility, especially for a global audience. I struggled with having to produce the majority of the content ahead of the course offering. A key component to teaching in an indigenous way is interactivity, responsiveness to the particular group and its needs, reading the feeling of the group and responding accordingly. I wanted to avoid what Freire (1970) called the “banking concept” of education where students are passive recipients of content. I began to ask myself, how could I engage students in meaningful dialogue? How could we make this online experience more connectivist? How might I apply Freire’s notion of conscientization to this course and contribute to social change?



Using transformative learning as a conceptual framework, I sought to find ways to bring a more reflective and critical discourse to the MOOC. Merriam, Caffarella and Baumgartner (2007) assert that “Transformational Learning is about change, dramatic, fundamental change in the way we see ourselves and the world in which we live” (p. 123). Working with a team of graduate assistants, and technical support from university staff, we began to actively seek ways to create an online space in which people felt comfortable and safe to share their personal experiences and stories.

My MOOC featured about 10 video lectures released on a weekly basis with related resources tied to each video, such as additional readings, video screenings, and websites. The course had one assignment that was peer-assessed, worth 50% of the final grade and two quizzes worth 20% each. A participation mark of 10% encouraged students to post in the discussion forums often—to receive the full 10% they had to post a minimum of 20 times. In addition, there were three optional non-graded activities that were designed

*A key component to teaching in an indigenous way is interactivity, responsiveness to the particular group and its needs, reading the feeling of the group and responding accordingly*

to encourage forum participation on key topics. In several video lectures and “screenside chats” I encouraged students to make comments about the lecture material in the forums.

### Translating indigenous education to an online environment

One characteristic of indigenous education is seeking ways to engage the whole person in developing spiritual, emotional, intellectual and physical aspects of their being (Cajete,



1994; Bopp, Bopp, Brown and Lane, 1989). Using a medicine wheel as organizational principle, our course activities sought to focus on these different aspects of being. Activity One asked participants to describe a place that has special meaning to them. Many people interpreted this icebreaker as a spiritual question. Activity Two involved writing a response to what it feels like to experience loss of life and knowledge. Students completed a list of ten names all of which have taught them something valuable. They are then directed to strike off a name one by one until only one name is remaining. In the debrief students learn that in some regions 90% of the North American indigenous population was killed by disease, warfare, and other means over the course of a few generations. This activity had an emotional component. Another activity had students analysing a segment of discourse from Prime Minister Harper’s Indian Residential Schools Apology of 2008. It was largely an intellectual exercise. The peer assessment assignment required creativity as students used ethnographic writing to describe with detachment and cultural insight, an event or location that is familiar to them.

A key focus of our course design efforts was to ensure the forums would be used often as a place for deep discussion and dialogue, just like a face-to-face indigenous education class would make space for this kind of exchange. The discussion forum in particular was helpful in creating a more “horizontal student-teacher relationship” (Taylor, 1998, p. 18) and demonstrating how much students have to contribute to the learning environment. The online forum is used by students to support one another and answer each other’s questions. There were a total of 43 879 posts in the forums made by 4685 participants and 326 266 views of forum posts.

The course team made a concerted effort to interact in discussions and be responsive. We posted in forums and answered questions. We shot three “screenside chats” that were cheaply produced videos responding to questions that arose in the week prior to the ‘chat’ video. This was an attempt to respond to questions in as close to real time as we could approximate with the challenges of a course with global reach and participants in nearly every time zone. Perhaps the best example of our attempt to be responsive was our addition of new material in week four that was required viewing. It was a video made by one of the course participants that the design team became aware of in week one when the student introduced himself to us by email and a posting in the forums. After watching his short video about the Idle No More movement, we decided to make it one of the course required viewings. The speed at which one can add or remove content when it’s online allowed us to make these adjustments, although one of the critiques of our course was that a full syllabus was not shared ahead of time. Quite honestly, some of the content was still being produced for future weeks as the course was already underway. We weren’t sure which videos would necessarily be ready for posting.

## Diversity of Voices

The open online platform offered great opportunities for diverse voices and media to be included in the course. I incorporated videos from Aboriginal Elders and community members to provide a diversity of voices. The online platform proved particularly helpful in this regard as we were able to hear from a broad range of indigenous scholars, thinkers and activists. The response from course participants demonstrated the effectivity of this approach:

...Dr. Restoule, provides something more like a docent in a museum tour. He exposes you to a wide range of material about which he is very knowledgeable, and draws your attention to things you might otherwise have missed while keeping the tour group moving along. While you may not actually visit the museum again, you know that if you do go back, what objects you like to look at in more detail.

Another student touched on another goal in the course design: to encourage students to take up their own learning long after the course was complete:

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...the teaching in this class really has been different from my other experiences in Coursera and classes in general. I really felt like a great effort was made to give us lots of different KINDS of resources, to get us to think on our own, investigate and ponder on our own, imagine, understand, create. This is the only class out of several I've taken on Coursera where there were so many additional resources of all kinds, where there was such a creative kind of essay assignment, and where the lectures themselves seemed to wrap throughout just like a medicine wheel.



**World travel and communications recorded on Twitter** by Eric Fischer. Green is physical movement, purple is replies from someone in one location to someone in another; combining to white where there is both. flickr (CC BY 2.0)

## Towards transformative learning and social change

We watched as students took learning into their own hands, creating Facebook study groups, in-person meet-ups and a twitter hashtag for the course so students could immediately share their thoughts on the course and their learning. There is a notion that the learning process could continue after the course is over and that authentic networks of people interested in life-long learning could be promoted. As the four-week course progressed, critical reflection became more substantial and students engaged in the notion of praxis, “moving back and forth in a critical way between reflecting and acting on the world” (Taylor, 1998, p. 18). It was clear students were deeply concerned about Aboriginal history and worldviews and were challenging themselves to think in new and transformational ways.

# MOOCs: Transforming LIS Professional Development Programs

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## Introduction

Several decades of research on self-directed learning (SDL) show that non-linear, unimpeded, and serendipitous connections have the capacity to transform educational systems and the participants in these systems. However, many of our institutions are locked into traditional models that are not designed to accommodate the experimental practices and disruptive technologies responsible for the upheaval in information seeking, organization, and use.

Library and Information Science professionals, faced with evolutionary transitions in research and learning, sought new ways to quickly expand their own knowledge and expertise. LIS professional development (PD) environments such as Learning 2.0 and 23 Things and their many global adaptations may have been precursors to the connectivist environments that were designed into the free, not-for-credit, massive open online courses (MOOCs).

*Library and Information Science professionals, faced with evolutionary transitions in research and learning, sought new ways to quickly expand their own knowledge and expertise*



By Chris Devers. flickr (CC BY-NC-ND 2.0)

MOOC instructional designs incorporate multiple schools of learning. The xMOOCs follow a cognitive-behaviorist approach and deliver pre-organized instructional modules from a centralized platform. The cMOOCs follow a constructionist, connectivist approach and share participatory opportunities from distributed platforms. cMOOCs may be constructed to offer learning and practice opportunities, provide spaces for sharing, feedback, and reflection, and gather data to inform design enhancements. cMOOCs are especially fertile environments for experimentation with emerging technologies because the platforms are flexible and support serendipitous connections and playful interchanges.



*In the Rain* by Franz Marc. Wikimedia Commons. (PD-ART; PD-OLD-70)

Some questions about this new learning landscape resonate: How will MOOCs and especially cMOOC environments change the roles that LIS professionals should play in future virtual learning communities? Are LIS professionals needed to manage and facilitate access to resources, when they are openly available on the Web and within the MOOC platforms?

### **Potential for MOOCs as learning environments for PD**

Burgeoning research centered on the MOOC learning experience can provide insights into the platform as a space for PD. Within MOOCs, Kennedy reported that self-organizing systems have the capacity for transformation, when information connections are

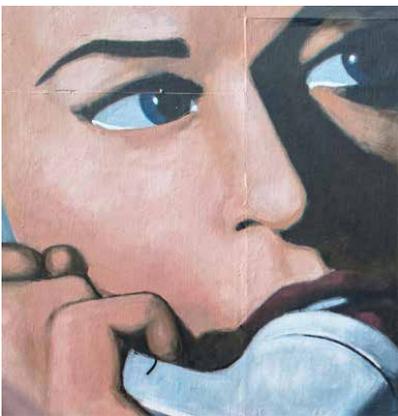
unimpeded (2014). According to Kennedy, openness is a core component of a cMOOC, and open information flow is a vital characteristic of self-organizing complex systems. Kennedy refers to openness as related to many different concepts: open registration, open assessment processes, open source software, students who are open to many different types of learning, open technology, and open curriculum.

Herring (2014) noted that peer-to-peer networks and online communities experience dramatic learning growth with the use of emerging technologies that facilitate connectivity. Connectivism assumes that learning occurs within social networks, and according to Herring, the cMOOC was conceived to test the power of social, online learning. With the MOOC, it is the power of the combination of expert-guided learning that can be scaled to massive international audiences combined with the social collaboration that is producing results that attract corporate investment into MOOC learning. Herring further notes that online collaboration and practical application in combination with global access to expert instruction holds special promise. According to Herring, it is the combination of scaling expert instruction and guidance to massive international audiences, who, until MOOCs, would not have had access to such high levels of instructor quality, together with the incredible opportunity for peer-to-peer collaborations that focus on solving practical, industry-related problems, that holds promise. Negrea (2014) suggests that MOOC designs also can provide supportive sandbox environments, where participants can build confidence with emerging technologies and apply new skills.



**The Emperor's New Clothes Monument** in Odense, Denmark. Photo by Vladimir Shelyapin. Wikimedia Commons (CC BY-SA 3.0)

*The MOOC structure itself is altered by the conversations happening both inside and outside a MOOC*



Derived from **Give Me a Ring** by Kat NLM. flickr (CC BY-NC 2.0)

## Challenges within MOOCs

Wildavsky (2014) warned of problems caused by low quality pedagogy in MOOCs. Wildavsky writes of limitations of technology in MOOCs that hamper interactions between instructors and students, and, instead, push instruction to be one-way. He wonders if there could be a “core defect in the online model” (p. 75). It is possible to assume that the advanced technologies used within MOOCs automatically improve pedagogy, but when all eyes are directed toward the latest tool, this assumption can cause an imbalance in what aspects of a MOOC are studied, assessed, and improved. In addition, pedagogies are not culturally neutral. MOOC developers and instructors can unintentionally impose a Western academic model and inhibit the growth of local academic cultures.

John recommended being alert to MOOC designs that simply transfer modules of classroom material to online environments (2012). The practice of allowing instructors to simply transfer course material to a MOOC delivery system with no pedagogical help to properly optimize and expand the material to take advantage of MOOC opportunities is an indication that institutional fears of losing revenue from not offering MOOCs quickly enough can drive MOOC implementation rather than course designs that could increase student engagement. According to John, there can be a stigma associated with not moving courses quickly enough onto online platforms, even when student needs might be better met with other instructional designs. For example, peer grading, which is used to handle scale issues in large MOOCs, is not the most pedagogically sound approach for giving feedback.

Kennedy reported that high attrition may result from a lack of technical expertise and low familiarity with non-linear learning environments (2014). In addition, while MOOCs offer the promise of a connected and diverse international community, a high percentage of MOOC participants are male, and approximately two-thirds come from the United States (Wildavsky, 2014). It may be necessary, as John (2012) argued, for big data gathered from large-scale MOOCs to drive the development of MOOC enrollment, delivery, and teaching practices. John also suggested that institutions work to attract specialized talent for testing, creating, and delivering pedagogically sound learning platforms.

## The Hyperlinked Library cMOOC

Tracing the evolution of information worker PD programs has been an interest of mine since I was an Internet trainer in the mid-1990s. Library and information science (LIS) professionals, who once relied upon yearly conferences, employer-provided seminars and workshops, and association newsletters in order to update their knowledge, are enrolling in SDL opportunities to expand their knowledge and skill sets.

With my co-instructor Kyle Jones, who is currently working toward his doctorate at the University of Wisconsin-Madison’s iSchool, I am mining the survey data from the

Hyperlinked Library massive open online course (MOOC) #hyperlibMOOC that we taught during Fall 2013 for 363 LIS professionals. We designed a sandbox environment using WordPress and BuddyPress platforms to test emerging technologies, experiment and play with new roles, and self-select teams for collaborative artifact creation.

With support from the San José State University School of Information, feedback on the broad professional development opportunity we offered via the MOOC is providing unique views of how models of online learning for library staff continue to evolve. This article summarizes some of those findings.

## Roles for LIS Professionals in MOOCs

MOOC participants played the roles of learner, connector, and collaborator in a self-directed and social learning experience, and we discovered that the large-scale, open learning environment enabled the formation of expanded and more nuanced roles and affinities. In the post-#hyperlibMOOC survey, participants offered ideas for roles that might be developed within MOOC learning environments, and the conference paper by Stephens and Jones (2014a) organized the suggested roles into the following categories:

**The Guide** gives learners what they want and need, with an arsenal of technological tools.

**The Access Provider** builds, curates, and shares resources to help learners wherever they may be, without the confines and barriers of traditional learning spaces. The Access Provider works with authors, scholars, and other content providers to develop contracts and make resources available as openly as possible.

**The Creator** creates formalized modules or courses for their participants across a wide spectrum of topics, with varying degrees of focus, and multiple instructional approaches.

**The Instructor** designs new platforms and methods for offering learning opportunities, which will encourage LIS professionals to capture and curate more knowledge in formats for anywhere, anytime learning.

## Collaboration & Reflection

Findings from our research yield a positive view of the cMOOC experience, with many inspired to explore new potentials in the LIS field, especially with new technologies (2014b). MOOC participants discovered that they can learn, reflect upon professional practices, discuss and exchange ideas with others in evolving networks and create new networks outside their individual library environments.

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## Reaching Beyond

Expansions to MOOCs are frequently not foreseen by MOOC designers or instructors. The MOOC structure itself is altered by the conversations happening both inside and outside a MOOC. One of the most intriguing results of the #hyperlibMOOC developed outside the system that [Kyle] and I designed. Throughout the course, participants shared within the MOOC and via external social networks. As the course concluded, one active group of #hyperlibMOOC participants spun off a blog community of their own and started a MOOC "alumni" group on Facebook. At the American Library Association's Midwinter Meeting in 2014, I encountered one of the #hyperlibMOOC participants handing out badge ribbons for this new affinity group emblazoned with "Hyperlinked Library Alumni."

## Conclusion

Our early research supports the concept that MOOCs have the potential to attract a more diverse participant base, serve as supportive training spaces for new skills, overcome the challenges to learners posed by non-linear design, and supply the transformative environments needed for professional development in these times of dramatic social change. As for #hyperlibMOOC, we'll be updating and refining the model for future offerings so that our ongoing research will further enhance the delivery of large-scale PD opportunities. We welcome all who are interested in learning about the model and the platform to join us.