Many Shades of MOOCs

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Massive Open Online Courses (MOOCs) represent an innovation in teaching and learning around which there is keen interest and much experimentation. MOOCs are being developed using different pedagogical approaches for different purposes and for different audiences. Starting with a theoretical framework to identify significant differences in basic approaches to MOOCs, this paper presents a set of four case studies of MOOCs developed and delivered in 2013 by four different institutions, community colleges as well as universities, on four different platforms with different approaches, purposes, and intended audiences. An examination of the association between the purpose and audience of these MOOCs, their design considerations, and their outcomes raises important questions for future research.

Keywords: MOOC, case study, connectivist, higher education, online teaching and learning, models, RN–BSN, developmental math, professional development, computer programming , library and information science, community college, Quality Matters

Introduction

In a startlingly short time frame, Massive Open Online Courses (MOOCs) have captured the interest and imagination of the higher education community and its many stakeholders. This interest is reflected in the extent of experimentation with an educational delivery model that has yet to develop a track record for effectiveness or efficiency in producing learning outcomes. Originating with a more focused constructivist pedagogy, the MOOCs developed over the last few years have moved from a connectivist learning experience toward a more traditional behaviorist approach. Today, there is experimentation on different MOOC models that reflect the diverse creativity of their faculty and developers. In fact, much of the experimentation with these new MOOCs is focused on what kinds of outcomes, for whom, and with what pedagogical frame these massive and open courses are best suited. MOOCs come in many shades; however, what counts is the achievement of purpose and the quality of the experience for the learner.

Regardless of approach, quality in instructional design is a critical component for a course meant to engage large (massive) numbers of learners who have not been through the typical institutional filters

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that produce a student body more homogenous in their preparation for learning. In courses offered at large scale and that are open to an audience diverse in experiences, skills, abilities and disabilities, orientation to learning, and even language, it becomes especially critical to have a course designed to provide the communication and guidance to the learner that the course instructor can't otherwise offer at scale. Clarity and specificity in objectives, the communication of learner expectations, and guidance about how to get help or support become critical in a learning structure where the responsibility for completion and achieving learning outcomes rests almost solely on the learner.

To insure that the components of the course are clearly aligned with its purpose and objectives, many institutions rely on the Quality Matters RubricTM to guide development and to evaluate the quality of instructional design. Quality Matters (QM) has a version of its rubric developed for use with courses like MOOCs. The QM Continuing and Professional Education Rubric (CPE Rubric) is intended for the design and evaluation of online and blended courses – facilitated, mentored, or self-managed – that may have pass/fail, skills-based, or other completion or certification criteria but that do not carry academic credit. Courses to which it applies may be either instructor led or self-paced; either way, they must be structured and have completion criteria.

The QM CPE Rubric differs from the QM Higher Education Rubric in a number of ways that make it more appropriate for courses that do not bear academic credit. With the CPE Rubric, courses can meet standards without active instructor facilitation and without direct student-to-student contact. There are reduced expectations of institutional support but greater expectations for enriched student-to-content interaction and requirements for clear descriptions of resources available to the continuing education student.

To date, QM has reviewed little more than a dozen MOOCs and, of these, only a few have met the CPE Rubric standards. Although the educational content of these MOOCs was very strong, it was clear that much less attention is being paid to the instructional design considerations that may be most important for such open enrollment courses offered at a scale outside of degree and credit-bearing programs. Such design considerations as effectively orienting the learner to the purpose and structure of the course and communicating resources and expectations are critical for learners who are not otherwise connected to the academic institution and have no other recourse to gain such information. The instructional design of MOOCs must be strong enough for students to be self-reliant and must be so well aligned with the purpose, objectives, and audience that students can succeed with the limited faculty interaction that has thus far defined the MOOC experience.

Because of the necessity for such strong alignment, the context of the MOOC is critical for its design. Placing MOOCs within the appropriate theoretical framework is one broad way to understand context. Explicitly identifying MOOCs by purpose and audience might be another. This paper will look at both perspectives, first laying out a theoretical framework to identify significant differences in approaches and then presenting a set of case studies to examine in detail the association between the purpose and audience of particular MOOCs, design considerations, and outcomes.

Theoretical Framework of MOOCs

MOOCs are a recent phenomenon in higher education. By widespread acknowledgment, the first MOOC was offered in 2008. The term itself was coined in Canada when Dave Cormier and Bryan Alexander used it to describe an open course with over 2,000 students that was free and took place at the University of Manitoba.

Since then, MOOCs have exploded in higher education, with first Ivy League institutions embracing and scaling up the trend, and new companies emerging to host MOOCs (Educause, 2012). But what specifically about the MOOC model is disruptive? Daniel writes "While the hype about MOOCs presaging a revolution in higher education has focused on their scale, the real revolution is that universities with scarcity at the heart of their business models are embracing openness" (Daniel, 2012, p. 1). The rush of institutions offering MOOCs will itself transform the landscape of higher education, or at the very least, help to precipitate change.

The very concept of disruptive innovation addresses this directly. "According to Christensen (1997), organizations that don't pay attention to disruptive innovation (1) maintain that their goods and services will always be needed, (2) develop sustaining improvements based on current customers, (3) don't understand the natural laws of disruptive innovation, and (4) fail to spin off an organization in direct competition with itself. These organizations risk becoming obsolete" (Thornton, 2013, p. 47). Institutions of higher education are particularly vulnerable to external influences during a time when funding is uncertain and pressures to perform come from students, citizens, and businesses alike (Lattuca & Stark, 2009). This directly addresses the discussion of "part of a more fundamental shift in universities" … which "is taking place at a time when the nature and purpose of the university as well as higher education are very much in question" (Blackmore & Kandiko, 2012, p. 128).

What will college education become as a result of MOOCs and other disruptive innovations? Will they persist at all?

Despite their relatively short history, MOOCs have already splintered into two distinct models for massive learning: cMOOCs and xMOOCs. "Their differences are so stark so distinct in pedagogy that it is confusing to designate them by the same term" (Hill, 2012, as cited in Daniel, 2012, p. 2). cMOOCs embrace a constructivist approach whereas xMOOCs embrace a more traditional, behaviorist approach to massive online learning.

cMOOCs refer to a constructivist or connectivist learning experience typified by the initial MOOCs that followed a more organic philosophy of interacting with resources and with fellow students to connect learning and construct knowledge. Wiley and Green describe them as applying "the 'open' ethos to course outcomes. In other words, students are empowered to learn what they need/want to learn, and the journey of learning is often more important than any predefined learning outcomes" (Wiley & Green, 2012, p. 88). cMOOCs often encompass four main types of activities: aggregation or curation of content, remixing of content, repurposing of content, and feed forward – the term referring to sharing the newly crafted knowledge with a variety of outward facing streams (Kop, Fournier, & Sui, 2011).

Is this type of MOOC effective at positively impacting student learning? While there currently exists no robust body of research on the effectiveness of MOOCs to say one way or another, there is related

evidence to suggest that this model of massive education could be effective for student learning, when extrapolated from the perspective of a student's participation in a knowledge community. "Participation in these knowledge communities is both the process and the goal of learning in higher education" (Lattuca & Stark, 2009, loc 3785 of 8572). The authors go on to write that "Learning is thus a vehicle of socialization… and at the same time the result (or goal) of socialization" (Lattuca & Stark, 2009, loc 3785 of 8572). cMOOCs are uniquely set up for social learning. The development of a learning community "benefits both students and faculty, as it can lead toward better retention of students. In turn, course throughput rates increase (Santovec, 2004). There are different views on what route to follow to enable such a community to establish itself" (Nagel & Kotze, 2010, p. 46).

What implications does this model of MOOC have for the respective roles of teacher and learner? Blackmore addresses this challenge from a perspective wider than the debate about MOOCs, writing that "Increasingly, students are seen as the consumers of an educational service. Inadequate and unhelpful though the metaphor might be, it is a powerful one, challenging a more traditional relationship between teacher and student. The development of a network of colleagues with a shared view of the purposes of a change can be a powerful way of enabling a change" (Blackmore, 2012, p. 134). The demands of facilitating such learning requires facilitators "to adopt a multifaceted role so as to guide or influence the learners and communities to get involved and embrace social media practices" (Kop, Fournier, & Sui, 2011, p. 89). MOOCs as a model seem to be uniquely designed to challenge the traditional roles of teacher and student, instead framing the concepts within the larger concept of learner-directed education, both inside and outside of institutions of higher education.

Research into early MOOCs suggests that participation in MOOCs is bifurcated further, into categories of participants and consumers. A small percentage of students who enroll in MOOCs actually fully participate. A separate group of students tend to participate via a "consuming" style, wherein they review resources and the work of fellow students, but are not active participants in the course (Kop, Fournier, & Sui, 2011).

cMOOCs have some identified challenges that aren't necessarily in play in xMOOCs. One way it is described is that the "lack of a coherent and centralized structure and a lack of summary around learning in the MOOCs also presented challenges for some participants, in particular the novice learners" (Kop, Fournier, & Sui, 2011, p. 86). There are also concerns about the level of support provided by the instructors as an ongoing challenge of the model. The degree to which the design of the course allows for peer-to-peer feedback to foster a higher level of cognitive presence can "contribute value beyond the knowledge base of the lecturer, irrespective of the large class size" (Nagel & Kotze, 2010, p. 50).

xMOOCs are also changing the educational landscape. Though far more similar to traditional online courses, xMOOCs attempt to scale learning with extremely large class sizes that are highly structured, but in which only minimal customized feedback is provided. Often more detailed feedback is provided on a peer-evaluation basis. Because of the sheer number of students in a given course, new roles have emerged for teacher and learner, wherein the teacher becomes a facilitator of the learning process.

xMOOCs are more representative of a behavioral approach that indicates a more traditional, codified, and structured educational experience far more similar to traditional online courses, but with instructional mechanisms to allow them to serve thousands of students (Daniel, 2012). EdX, Coursera, and Udacity all offer more traditional xMOOCs. An ever-expanding marketplace of xMOOCs include courses from a range of top-tier universities. There are currently efforts underway in several states to force universities to accept the successful completion of MOOCs for college credit as a way to accelerate the achievement of baccalaureate degrees.

Case Studies

The following section contains case studies of four MOOCs designed and delivered in 2013. Table 1 provides an overview of the four different institutions that implemented these MOOCs, on four different MOOC platforms, with different approaches, purposes, and intended audiences.

Case Study 1: San Jose State University, School of Library and Information Science

A MOOC Model for Professional Development

Background

The San Jose State University (SJSU) School of Library and Information Science (SLIS) is a recognized leader in online learning with a cutting-edge curriculum, offering students the convenience of a 100% online program, as well as the technology skills today's employers seek. SLIS has provided totally online programs since 2007, and the reputation for excellence is evidenced by the *2013 Sloan-C Quality Scorecard Effective Practice Award*, faculty expertise, student support, and the SJSU *Center for Information Research and Innovation*. The SLIS faculty were early adopters of the concept of MOOCs, and in Fall 2012, support was provided to develop and offer a professional development MOOC for a global audience. Course development progressed, and the first MOOC was offered in Fall 2013.

MOOC Development: Purpose, Audience, and Objectives

Two faculty members (*Michael Stephens* and *Kyle Jones*) were responsible for the design and delivery of the course, *Hyperlinked Library*, that explored how libraries are using emerging technologies to serve their diverse communities. They were supported by a team composed of faculty and MLIS students to work on the administrative, instructional, technical, and support elements of the MOOC and assist with elements of content development, design, and management. Students enrolled in the SLIS master's program (MLIS) earned academic credit for their work while students from other universities volunteered their time. In the first term, they were involved in research, site construction, instructional design, and learning how to interact with members of a virtual community. In the second term, the students led discussion groups and assisted with the delivery of the MOOC.

SJSU/SLIS is committed to offering quality professional development to individuals across the globe, and MOOCs provide a mechanism to engage a large audience. The content of the MOOCs includes cutting-edge topics that provide information professionals with an introduction to the material and enables them to explore

Institution	**Platform**	**Type**	**Purpose/Course**	**Audience**
Tri-C https://tric.coursesites.com/	Coursesites/Blackboard	xMOOC	Dev. Ed. Math	Multiple
UT Arlington https://learn.canvas.net/courses/83	Canvas	xMOOC	RN–BSN Program "test drive," CE Continuing Education	Nurses, Providers
SJSU http://mooc.hyperlib.sjsu.edu/	Word Press and Buddy Press	cMOOC	Professional Development	LIS Professionals
Mass Bay BHCC	edX	xMOOC Blend	Intro. Computer Programming	CS and IT Undergraduates

Table 1. Four Approaches to MOOCs

the issues and network with others. The intended audience was reached through marketing and PR efforts as noted below.

Instructional Design

The design of this 10-week course used a combination of three types of learning theories in order to maximize the experience of the participants. The course developer, Michael Stephens, adapted concepts in connected learning, transformative learning, and connectivist learning to provide an environment for the users to be engaged in a variety of activities. The structure of the MOOC enabled the participants to access a wide range of resources, reflect on the content, create a project based on the experience, and share with others in the community. Details about the instructional design can be found here: https://mooc.hyperlib.sjsu.edu/about/instructional-design/

Technical Design

The course was built with an open source content management system, *WordPress*, and an open source plugin, *BuddyPress*, to provide a flexible platform for social interactions that supported the teaching philosophies. The design was proven successful since the instructors had used it to build learning environments for the prior six years. Additional information about the technical design is located here: https://mooc.hyperlib.sjsu.edu/about/technical-design/

Marketing

Promotion of the MOOC involved pages on the SLIS website: http://slisweb.sjsu.edu/programs/moocs. It included a MOOC program landing page and a page specific to the *Hyperlinked Library* MOOC: http://slisweb.sjsu.edu/programs/moocs/hyperlinked-library-mooc. Also, there was a web page with information on how to register.

Several strategies were used, including news features on the SLIS website, emails to target audiences, and information shared via SLIS social media channels. The instructor also promoted the MOOC on his blog. Additionally, Community Profile stories about student assistants helping with the MOOC were posted online.

Outcomes and Next Steps

Enrollment was limited to 400, and many individuals interested in the MOOC were unable to register for the course. Those who participated in the 10-week course were placed in smaller groups for easier discussion, and they were encouraged to form additional groups based on special interests. Each person had the opportunity to earn individual badges after completing specific assignments and a master badge for the successful completion of the MOOC.

A second MOOC, *Exploring Future Technologies*, will be offered in Fall 2014 using the same model. Additional details are located on the *SLIS website*.

Case Study 2: The University of Texas at Arlington College of Nursing

MOOC2Degree Case Study

Background

With an enrollment approaching 33,500, the University of Texas at Arlington (UT Arlington) is the second largest institution in the UT System and the sixth largest in Texas. The University's College of Nursing (UTACON) is one of the largest and most successful in the country,

with a 94% graduation rate and a first-time NCLEX (National Council Licensure Examination) pass rate consistently over 90% for new nurse graduates entering the nursing field. The New America Foundation, based in Washington, DC, has honored by UT Arlington as a Next Generation University, in part, for its success with online degree programs. More than 10,000 students were enrolled in online classes and degree programs in Fall 2013.

The College of Nursing began its development of high-volume, online programs in 2008 when it offered the university's first Academic Partnership degree-granting option – an RN-to-BSN completion program. Prior to the initiation of this program in 2008, the College of Nursing graduated approximately 100 RN-to-BSN completion students per year. In the 2012–2013 academic year, 1,746 students graduated from that program. This is the power of a dynamic, online program designed to be accessible and affordable.

MOOC Development: Purpose, Audience, and Objectives

After monitoring the expansion of MOOCs into higher education, in the summer of 2013, the University, the College of Nursing, and Academic Partnerships – a Dallas-based organization that assists universities to develop and offer scalable online programs – designed the university's first MOOC. The MOOC movement provided UT Arlington and its partner, Academic Partnerships, an opportunity to expand the online RN-to-BSN program through what is called a MOOC2Degree initiative. It was determined that this MOOC would be specifically designed to:

- Provide potential students with the ability to "Test Drive" UTACON's Academic Partnership RN-to-BSN program. This would ultimately lead to increased student enrollment.
- Provide a seamless process for awarding academic credit for students who complete the MOOC and enroll in the online RN-to-BSN program (this would help streamline the enrollment process for students).
- Provide continuing professional education to nurses in a key area within the healthcare field.
- Expand our brand and reputation as a leader in nursing education.
- Provide a community service by offering access to important information to nonnurse healthcare providers and the general public with the opportunity to receive a certificate of completion.

Instructional Design

This MOOC was designed specifically to achieve its articulated purposes. This started with the selection of the MOOC topic. The topic is important to practicing nurses and other healthcare professionals as well as one where there was an adequate amount of available open-access material to use for learning. The MOOC was entitled "Enhancing Patient Safety through Interprofessional Collaborative Practice" and was designed to be completed in six weeks with the seventh week open for those learners who wished to take the proctored final examination.

As the primary intent of the course was to allow students to "Test Drive" online education, no payment was required until course completion when the learner decided on his or her desired endpoint – credit toward a required course in the RN-to-BSN program or Continuing Education Units (CEU) credit. Consistent with the core belief of open access in MOOCs, the costs to

the learners were "pay to play." Entrance into the MOOC was free of charge. Learners who wished to receive academic credit in UTACONs RN-to-BSN program enrolled to take a final summative examination and paid the online proctoring service directly for that service (<$30 with the fee varying dependent upon the individual's preference for when the examination was scheduled). The only additional charge for receiving credit was that associated with the established process for receiving "credit by exam" ($25). Learners, who wished to receive CEU for the course, paid the CE provider $25 for obtaining a certificate for the 45 hours of continuing education credit.

An Operations Team was responsible for identifying the flow of information to allow individuals to sign up for the MOOC, participate, and reach their desired end point (academic credit, continuing education credit, certificate of completion) in a seamless way. Individuals on this team include representatives from the university's Departments of Distance Education and Admissions along with the College of Nursing and Academic Partnerships.

A Course Development team was responsible for the content and the presentation of the course. After review, a decision was made to use Canvas Open Network as the Learning Management System. Identification of course objectives, learning outcomes, curricula flow, and included content and evaluation methods were the responsibility of the course faculty. Media experts and instructional designers from Academic Partnerships assisted in course construction on the Canvas Open Network. Working collaboratively, open access learning artifacts appropriate to the course objectives were identified so as to avoid any costs associated with books or other supplementary material.

Outcomes and Next Steps

In August 2013, the course went live with a "soft launch" – limited enrollment – to pilot test the course structure and processes. On the start date, there were approximately 300 learners enrolled. In a start of the course survey, the following information was obtained:

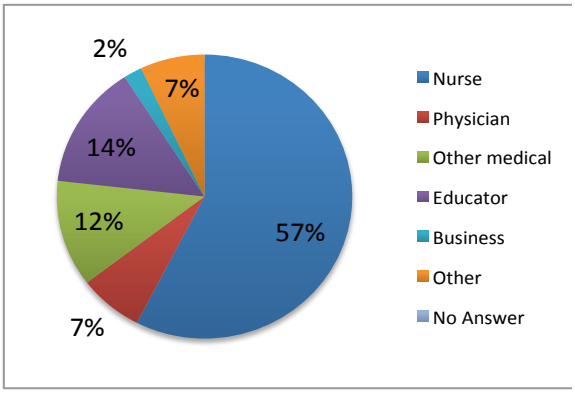
Country of origin

- 70% were from the United States
- 9% were from Western Europe
- 7% were from Africa
- 4% were from South America
- 2% were from Central/East Asia
- English was the primary language for 75% of the participants

Professional discipline (see Figure 1)

- 57% of respondents were nurses.
- 43% of these respondents were interested in course credit
- 14% were interested in CEUs

Figure 1. Breakdown of respondents by profession.



Learner experience

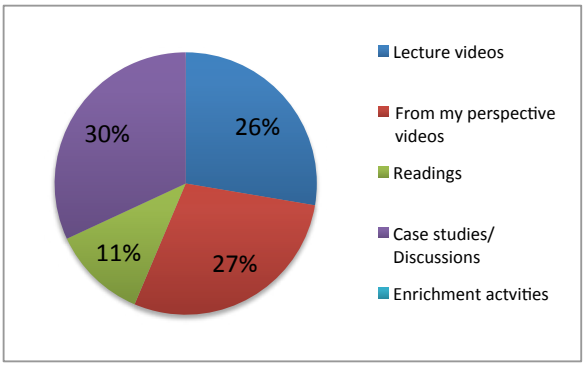
In later surveys, additional data were collected about learners' experience. The course load was in line with learner expectations. Learners expected between 2

and 4 hours of work a week. At mid-course, 66% thought course load was manageable. At the end of the course, 80% felt the course length was appropriate. Furthermore, 90% of the students gave the course a 4- or 5-star rating, which included comments such as:

- "I would like to have more of everything."
- "Great and very informative."
- "I thoroughly enjoyed this course.... It has provided me with some amazing resources to consult and dig deeper into. I am very motivated to continue to study this issue further and start seeking out opportunities to get involved in organizations focused on improving healthcare through educating others in IP collaboration."
- "The case studies give examples of real life scenarios which make me think critically. The follow up discussion opens my mind to other people's opinions."

The case studies (using Team STEPPS videos from the Agency for Healthcare Research and Quality) and discussion, "From My Perspective" videos, and the lecture videos were favorites (see Figure 2). While Twitter Chat was in the course design as an engagement strategy, there was virtually no engagement with these activities. On reflection, this is perhaps not unexpected given a target audience that includes a large number of nurses who had limited experience with online education. The other interactive activities were found to be very engaging.

Figure 2. Favorite part of the course.



Course completion

An interesting challenge appeared when new learners continued to enroll in the course up through the last week. This was challenging, as the group had built engagement activities into the course with the assumption that the active cohort of learners would stay reasonably constant. How best to design the MOOC to deal with new learners who join while the course is in session is something the group will be addressing in future iterations of the course.

Understanding completion rates is one of the major challenges with MOOCs and UTACON is currently considering what approach to take when reporting completion rates. For example, should one measure success by using the total number of individuals who enroll at any point in the MOOC as the denominator, only the ones who had some level of instructional activity, or only those who expressed in an interest in achieving the goals for the course? There is much debate in the literature right now about this issue. Based on our experience, there is a critical need for more robust subgroup analysis so as to understand how to define and quantify success.

Of twenty-nine registered nurses who responded to a participant survey within the MOOC, twenty-eight expressed interest in applying to UTACON's RN-

to-BSN program and receiving academic credit. By the time the MOOC closed, 50% of these were already moving forward with the application process.

Lessons learned

There were numerous lessons learned as part of this offering. Developing a MOOC is different than developing a traditional course as the learners have different motivations; course developers need to be clear about what they want to accomplish for the course and build with the learner's goals in mind. It is also important to focus on engagement strategies and develop a sense of community ("high touch") even though you are constructing the course to be "low touch" from the perspective of faculty/facilitators. For discussions, it is helpful to use case studies revolving around actual patient care situations and use facilitators to help students feel more engaged with the course and the instructor. It is also important to determine if the course will run in a set "term" or run "open access." Obtaining useful metrics is difficult – but critical – and needs to be considered from the start. Developing an evaluation plan should not be an after-thought. It is important to have a clear definition of "success" and a plan to assess for any mid-course corrections or revisions when running the course again is critical.

UTACON's inaugural MOOC2Degree effort provided important information that will inform the approach taken in the future with the initiative. In particular, it provided valuable insight into the ways that MOOCs differ from traditional for-credit courses and the ways in which the group might consider adapting our approach as it relates to course design, student engagement, and measurement in the future. Early indicators give the group reason to be enthusiastic about the potential of this initiative, and this group looks forward to sharing more detailed results once it has implemented the initiative on a broader scale.

Case Study 3: Cuyahoga Community College, Development Mathematics MOOC

A Competency-Driven MOOC Using Game-Based Mechanics

Background

Cuyahoga Community College (Tri-C) is a multicampus college in Cleveland, Ohio, serving over 52,000 credit and noncredit students. As an Achieving the Dream Leader College, Tri-C has committed substantial staff and financial resources to develop, implement, and evaluate highly structured, multiyear initiatives designed to improve student success. The College is a member of the League for Innovation in the Community College, a 19-member international organization committed to improving community colleges through innovation, experimentation, and institutional transformation. In Fall 2013, Tri-C was awarded one of the Bill & Melinda Gates Foundation grants to expedite the transition into mainstream college coursework for massive numbers of development education students. This was the beginning of turning the vision into a reality.

The Tri-C MOOC ran four separate offerings: March, April, May, and June 2013. These were four faculty-facilitated offerings each spanning four weeks. The Tri-C faculty also utilized the MOOC content in one blended offering during Summer 2013.

MOOC Development: Purpose, Audience, and Objectives

The goal of designing and developing a Developmental Mathematics MOOC was to leverage the college's extensive experience in subject matter and online learning to expedite the transition into mainstream college coursework for massive numbers of students.

In the Fall 2011 semester, Tri-C had 2,285 "new-to-college" students test into the College's first-level developmental mathematics course – MATH 0910 – Basic Arithmetic and Pre-Algebra. In the Spring 2012 semester, another 1,109 students tested into this course. Of these, nearly 3,400 students, approximately 1,600 tested at the upper end of the placement score range for the MATH 0910 course. Tri-C's Developmental Mathematics MOOC targeted these students who tested into the upper levels of pre-algebra. The MOOC was intended to bridge the gap for these students, allowing them to skip the college's MATH 0910 course altogether and go directly into the college's Beginning Algebra or Quantway course sequence. The overarching outcomes for the MOOC pilot included:

- Addressing the developmental education challenge and Tri -C's priority to help students get to college ready status at a faster pace.
- Opportunities for partnership with K-12 by targeting high schools students and helping students get to college-ready status before they enroll at Tri-C.
- Supporting returning students who want/need a brief math refresher.
- Contributing to the exploration of innovative and experiential practices in teaching and learning and being a leader among community colleges, as a Board Member Institution in the League for Innovation in the Community College.

The audience for the MOOC included a number of different student populations – both current students and nonstudents. These audiences included students currently enrolled in Tri-C's bridge courses, as well as students who desired additional practice after completing mandatory placement prep. Tri-C's work with local high school partnerships and the community also expanded the target audience to first generation, returning, post-secondary, and tech-prep students. Lastly, in partnership with Blackboard Coursesites, Tri-C was able to enroll students outside the region, state, and nation.

Instructional Design

The Tri-C Math MOOC was developed by a collaborative team of faculty and instructional designers. Several faculty members served as subject matter experts and members of the instructional design team served as both designers and developers, supporting the faculty by aligning the course, developing the course structure in the Learning Management System, loading the vetted content and materials, and setting up adaptive release for the gaming aspect of the learning experience. Finally, an external graphics developer provided unique graphics for the entire course.

The course was designed and developed during a two-month period (January–February 2013), as the first offering was scheduled for March 2013. This required a high level of interaction between the faculty and the design team, needing regular communication, quick turnaround times, and collaboration. The collaboration was critical to the success of the project, and working together, the full team was able to fix technical issues, adapt the course as needed, and improve the support to students.

Game mechanics

The MOOC was designed using game mechanics with a storyline (similar to the reality television show "Survivor") about the world of math challenges on "Believe Island." The course consisted of four different levels for the competencies related to Tri-C's lowest level of developmental math. In each level, students were able to interact with a variety of open educational resources, including an open educational textbook, instructional videos, and practice activities. Once they felt confident, students were then required to complete both checkpoints and challenges. Each checkpoint helped the students as a "self-test" on their proficiency of a key concept, while the challenges were designed to demonstrate mastery of all the concepts in a particular level. Students had to complete the challenge with a score of 80% or better. If they successfully completed, students "leveled up" into the next level of the course and earned a virtual badge (integrated with Mozilla Open Badges). If students did not earn an 80%, they had the opportunity to complete the challenge as many times as they needed based on a random block question pool developed by the faculty subject matter experts. The challenges created a low-risk, safe-failure environment to encourage persistence in the learners.

Open educational resources

The Tri-C MOOC did not recreate the wheel. Instead, the course was designed using existing open learning objects for the Pre-Algebra MOOC. This included the open textbook, videos, practice activities, and more. The checkpoint and the challenge questions were developed by the faculty.

The selection and vetting process to align the OER with the course objectives was a time-consuming task. The faculty worked collaboratively with the instructional designers to vet and view the resources through Kahn Academy, Connexions, Teacher Tube, and other sources. Tri-C also openly licensed, through Creative Commons, the images and the entire course for use by any nonprofit institution.

Quality Matters

Tri-C's Developmental Math MOOC was designed with the principles of QM in mind. The course site was the first MOOC in the country to earn QM recognition via the QM CPE Rubric (Quality Matters, 2014). This demonstrates that MOOCs can indeed meet high standard of course design quality. *Course video tour*.

An overview of the full course design can be found in the navigational video at http://www.youtube.com/embed/kMeh-DOaVtHo.

Technical Design

The course was designed in *Blackboard Course* sites, using open educational resources from Khan Academy and a number of additional repositories. Students could register and enroll directly in the Blackboard Course sites to gain access to the course.

Marketing

Tri-C used a number of different marketing strategies to reach out to the multiple audiences, including: (1) informational flyers – (in both print and virtual formats), (2) emails, (3) webpages – Tri-C's website and the eLearning & Innovation blog, (4) face-to-face communication at the testing centers where students complete the placement tests, and (5) collaboration with a number of local high schools. Furthermore,

the Ohio Board of Regents and the Ohio Association of Community College shared the MOOC information via listserv to the statewide memberships.

Outcomes and Next Steps

The process of designing, developing, and implementing Tri-C's MOOC was a definite success with a number of learning opportunities for best practices. The collaborative and iterative design and development process, partnering a team of faculty with instructional designers, worked extremely well to deliver the MOOC in a short time frame.

Figure 3 provides an overview of the total number of students engaged at each level. The total success and completion rate equaled 18.4%, which is nearly double the national average. The results indicate that the incorporation of low-tech game mechanics in the course through the use of adaptive release may have been one of the reasons for success. The low-risk, low-failure learning created by the game-based learning strategies proved successful for this MOOC for a developmental education audience and may prove beneficial for all MOOCs.

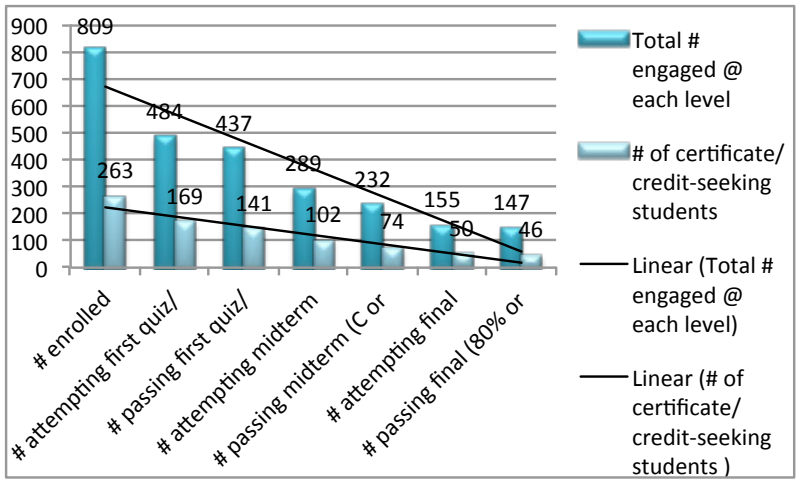


Figure 3. Total number of students engaged at each level versus number of certificate/credit seeking students engaged at each level.

Gates grant report results

- The full MOOC Report can be found at https://breeze.tri-c.edu/moocreport/, which includes MOOC completion rates by age group and satisfaction data.
- Keep up on the latest about Tri-C's MOOCs at http://elearningandinnovation.com/pilots-and-initiatives/moocs/.

Case Study 4: Massachusetts Bay Community College and Bunker Hill Community College

xMOOC Content Implementation: Community College MIT edX Partnership

Background

The edX organization at MIT, Massachusetts Institute of Technology, Cambridge, MA ("edX Home Page," 2014) approached Massachusetts Bay Community College (MassBay) in August 2012 and proposed that MassBay offer the MITx MOOC course, 6.00x *Introduction to Computer Science and Programming* to MassBay students in a blended (hybrid) format ("edX Intro Python," 2013).

The community college instructor would use (in whole or part) the MITX 6.00x MOOC course content (syllabus, course materials, video lectures, problem sets, exams, etc.) in a pilot course in spring semester 2013. Bunker Hill Community College (BHCC) was invited in September 2012 to participate in the project.

MassBay, located in Wellesley Hills, and BHCC, located in Boston, are both

multicampus, urban institutions in the greater Boston area with many students from low-income and underrepresented communities. MassBay and BHCC serve 6,500 and 14,000 full and part-time students, respectively. Both schools are comprehensive colleges; MassBay and BHCC offer 70+ and 100+ associate and certificate degree programs, respectively. BHCC serves a highly diverse student population with 67% students of color ("BHCC Fast Facts," 2014). MassBay similarly serves a diverse student body where 44% are students of color ("MassBay Fast Facts," 2014).

MassBay's Computer Science Department has a larger computer science associate's degree program in comparison to BHCC's Information Technology Department which offers large computer support, database, networking, and computer security degree programs, along with a small computer science program. Instructors at both colleges were identified to develop courses to implement the MITx 6.00x course for blended (hybrid) delivery in spring semester 2013.

MOOC Development: Purpose, Audience, and Objectives

This edX-Community College Partnership, funded by the Bill and Melinda Gate Foundation, was established to conduct the first empirical study exploring the efficacy of offering massive open online courses (MOOCs) for college course credit in a more traditional community college setting (Bell, Hunter, L'heureux, and Petersen, 2013).

Important Project Research Questions:

- Can community colleges (and other credit granting institutions) adopt and use MOOCs to benefit their students?
- To what extent do edX courses (and MOOCs in general) need modification for delivery in a community college classroom?
- How do different types of students respond to the flipped classroom approach?
- How does the community college student experiences (and performance) compare to those students who have completed the same course as a MOOC in the Fall 2012?
- What support does the faculty need to use the edX courseware? How are institutions able to support them?
- Is this a scalable approach for community college courses in computer science?

This project focused on two audiences: (a) U.S. community colleges and (b) the highly diverse (i.e., by income, gender, age, race, ethnicity, language, prior academic preparation, especially in mathematics) undergraduate student populations commonly served by community colleges.

The edX MOOC course, 6.00x *Introduction to Computer Science and Programming Using Python*, is similar in content and structure to a course taken by noncomputer science majors at MIT. 6.00x was "designed to help people with no prior exposure to computer science or programming learning to think computationally and write programs to tackle useful problems" ("edX Intro Python," 2013). The MIT edX 6.00x MOOC ran for the first time in fall 2012 with roughly 20,000 participants active in the MOOC (over 80,000 had enrolled initially).

During the fall 2012 semester, a team of faculty at MassBay and members of the BHCC's Computer Information Technology Department worked with edX administrators and technical staff to design distinctly different courses in order to address differ-

ences in students' math proficiency at the two colleges. The majority of the MassBay students were computer science majors. However, these blended courses both used the MITx 6.00x MOOC course unchanged (including the problem sets and exams). The MassBay course, CS 270 *Practical Python Programming*, followed the same schedule as the MITx 6.00x MOOC course. The BHCC course CIT *Python Programming*, would progress more slowly through the MITx 6.00x MOOC materials – completing seven of the original 14 weeks (Bell, Hunter, L'heureux, and Petersen, 2013; "MCO-Keynote," 2013).

The MITx 6.00x MOOC course was analyzed with regard to its organization, pedagogical style, course outcomes, video lectures, activities, support materials, etc. The instructors at both community colleges recognized that the in-class sessions needed to give students a holistic and clear understanding of the academic challenges to be addressed in the MITx 6.00x MOOC assignments. The community college instructors supplied the missing "alignments" or "scaffolding" between MITx 6.00x MOOC course outcomes and the individual MITx 6.00x MOOC assignments.

Discussions during the course design phase on how best to support students given the differences in the math comfort levels and prior programming experiences between MassBay and BHCC students led to different pedagogical approaches. Only 29% of BHCC students had taken at least one college programming course, compared to 83% of MassBay students (Bell, Hunter, L'heureux, and Petersen, 2013).

The MassBay instructor adapted course materials used to teach a previous programming course and created online "notebooks." These short tutorials, that MassBay students accessed online, contained supplemental materials and interactive preparatory exercises so that students could independently complete their MITx 6.00x MOOC assignments and tests. At the weekly classroom sessions, the MassBay instructor primarily worked, as needed, with students singularly or in small groups; lectures were rare. The MassBay course, CS 270 *Practical Python Programming*, followed the same timetable and schedule as the MITx 6.00x MOOC course.

The BHCC instructors elected to teach more traditionally with lectures and small group work with many hands-on activities. Student met twice weekly with their instructors. The BHCC course, CIT 523 *Python Programming*, used the same content but at a slower pace, such that seven weeks of the MITx 6.000x MOOC materials were covered by the end of the Spring 2013 semester rather than the full 14 weeks. BHCC students could still access the remainder of the course materials and finish the MITx 6.00x MOOC course on their own so they might qualify for the edX completion certificate.

Instructional Design

MassBay and BHCC courses were designed to support the "flipped classroom" pedagogy. Students accessed MITx 6.000x MOOC materials online: watched the online videos; performed the online exercises; submitted the online homework; and took the online tests (the edX platform supported instant scoring, feedback, and multiple submission attempts) just like any MITx 6.00x MOOC student. Students at each community college had required classroom meetings each week. At MassBay, students met for one 90-minute session; BHCC students met twice weekly for 60-minute sessions. The community college students participated in classroom activities, completed additional homework assignments, and took in-class exams.

Technical Design

The community college courses were mounted on the stand-alone edX LMS platform developed by edX during Fall 2012 and piloted for this project. The entire MITx 6.00x course was copied into what has become the "Open edX" platform ("Open edX code," 2014). MassBay and BHCC instructors could independently access their respective course shells to insert announcements, set up discussion forums, etc. The edX staff provided extensive technical support throughout the design phase and during the Spring 2013 semester.

Implementation

The pilot courses (CS 270 and CTI 523) ran once, starting in January and ending in May, 2013. Students registered for these college credit-bearing (and transferable) courses at their respective colleges, as usual. Upon completion of the course, students received a final (letter) grade along with the opportunity to qualify for the certificate of completion issued by edX. A student thus could be successful in the course by completing the stated course requirements in the syllabus for CS 270 or CIT 523 and not qualify for the edX certificate.

Marketing

MassBay and BHCC recruited students internally through informational flyers, posters, emails, and a specially produced edX video posted on the websites ("edX-BHCC," 2013; "edX-MassBay," 2013). However, the most effective approach was to visit classrooms in fall 2012 and explain the project with its potential benefits to the students.

Outcomes and Next Steps

Dr. Damien Bell, the edX evaluator from Boston College, conducted interviews, and completed pre- and postsurveys of students' and instructors' perspectives at both colleges. He conducted student focus groups, gathered data on student participation for in-class and online course activities, and made classroom observations (Bell, Hunter, L'heureux, and Petersen, 2013). Preliminary analysis of project results demonstrates that students at both community colleges were able to handle the MITx 6.00x MOOC course materials with structured, in-class support from their instructors. The MassBay and BHCC students' overall academic performance was better than that of the participants in the Fall 2012 MITx 6.00x MOOC where the great majority of those that earned the MITx completion certificates had at least a bachelor's degree or higher. The Fall 2012 MITx 6.00x MOOC started with around 20,000 active students. Of the roughly 11,000 who took the MITx 6.00x MOOC midterm exam, 59% passed compared to 90% of the community college students that tested (N= 29). The retention rate was better for the community college students. Of the original 40 community college students (21 at MassBay; 10 at BHCC), 73% took the MITx 6.00x midterm exam and 26 students (65%) completed their courses (and also earned MITx completion certificates). For the Fall 2012 MITx 6.00x MOOC, about 5,000 participants (~25% of the original 20,000) successfully finished the course and earned the MITx completion certificate (Bell, Hunter, L'heureux, and Petersen, 2013; "MCO-Keynote," 2013). The final report with the full analysis of this project is expected in Spring 2014.

Discussion and Conclusion

The four case studies highlight the kind of experimentation on MOOCs occurring in higher education today. As the purpose and audience for MOOCs vary, so do their design and development. Each of the MOOCs described here was a learning experience for its institution and its individuals – developers, instructors, and students alike. MOOCs will continue to evolve as we continue to experiment, examine the outcomes, and continually improve our efforts as a result. As is the case in the most effective experimentation, the questions being raised by these MOOCs and others are often the most important part of the innovation.

These MOOCs were designed for a variety of different audiences; however, can every kind of learner take advantage of MOOCs? What adaptations need to be made – in pedagogy, design, or content – to accommodate those learners who would otherwise be disadvantaged by a MOOC approach?

Do low completion rates of MOOCs matter? What other success measures, in addition to or instead of completion, are important? Will the integration of game mechanics or related techniques improve engagement and completion? Does a blended learning structure improve performance and completion rates?

Should MOOCs offer college credit and/or should learners receive credit after-the-fact for MOOCs? What criteria need to be met for MOOCs to be credit-worthy? Can a single MOOC support multiple purposes or outcomes; in particular, can it effectively provide multiple completion pathways to include credit toward degree? Can it be an important piece of such a pathway?

Is grading at scale possible? With the appropriate software, can machine grading be effective in all courses? How can automated grading software be used to promote student engagement?

With MOOCs, one of the biggest attractions is also the biggest challenge. MOOCs provide a learning platform that can bring together hundreds to hundreds of thousands of learners in a single course. Sharing the platform, however, is much different and far simpler than engaging in shared learning. The creation of real learning communities is made more challenging by scale, not easier, in the behaviorist approach of the xMOOC. Yet, such communities and the learning they afford may be essential to the awarding of academic credit in all but direct assessment models. This challenge is one reason the next generation of MOOC experimentation involves blended learning models where the learning community is nurtured outside of the MOOC and the MOOC becomes the high-quality material with which the community engages. In these models, MOOCs are transitioning from online course to online content.

It is still very early in the development of the MOOC model to fully understand the potential of MOOCs and the lessons we can learn from them about teaching with technology. Whether their future is as scalable online courses, content supplements, or something altogether different, the energy and momentum they have created for experimentation around teaching and learning is a singular achievement. Regardless of the shade of any particular MOOC, their lasting impact will be to energize the field to understand, improve, and enhance the quality of the educational experience for the learner.

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