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Unpacking MOOC scholarly discourse: a review of nascent MOOC scholarship

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The rapid rise of MOOCs (Massive Open Online Courses) signals a shift in the ways in which digital teaching and learning are engaged in and understood. Drawing upon a comprehensive search of nine leading academic databases, this paper examines the initial phase of MOOC scholarship (2009–2013), and offers an analysis of these empirical studies that conceptualizes themes in MOOC scholarship and locates them within a chronological framework. Two key phases of scholarship about MOOCs are identified, each with associated research imperatives and themes. Phase One: Connectivist MOOCs, Engagement and Creativity 2009–2011/2012. Themes of Phase One include: development of Connectivism as a learning theory, and technological experimentation and innovation in early cMOOCs. Phase Two: xMOOCs, Learning Analytics, Assessment, and Critical Discourses about MOOCs 2012–2013. Themes of Phase Two include: the rise of xMOOCs, further development of MOOC pedagogy and platforms, growth of learning analytics and assessment, and the emergence of a critical discourse about MOOCs.

Keywords: MOOCS; assessment; learning analytics; cognitive behaviorism; Connectivism

Introduction

Massive Open Online Courses (MOOCs) owe their heritage to the open education movement that sought to create and make widely available materials and conditions for participatory learning. One such precursor was Massachusetts Institute of Technology (MIT) OpenCourseWare created in 2002 to provide free web access to MIT course materials. In 2008, the term, MOOC, was introduced by David Comier to describe Connectivism and Connective Knowledge, a free and open, online course delivered to thousands of students. Today's MOOCs are internet-provided courses, open to anyone with web access, typically free of charge with no penalties for non-participation.

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Certificates of completion, badges, and grades may be associated with successful performance. MOOCs are being created at a rapid pace as Class Central, a MOOC aggregator, listed 99 courses in progress, 272 MOOCs as finished, and 310 future courses planned.[1] Similarly, discussion of MOOCs has permeated public discourse. In the six-month period from January 2013 to June 2013, the leading media outlet for higher education in the USA, *The Chronicle of Higher Education,* indexed 148 articles about MOOCs published on their site.[2] At our home institution, a public American university, we have been engaged in a number of faculty discussions about MOOCs focusing on issues such as using MOOCs in the curriculum, accreditation, transfer credit, program integrity, and effects on faculty career trajectories. MOOCs have become not only a controversial pedagogical topic on some campuses but a political one as well with some university faculty, for instance, philosophers at San Jose State University, refusing to use an edX MOOC created by Michael Sandel from Harvard (Kolowich 2013a, 2013b). Along with MOOC representations in popular discourse, scholarly research investigating MOOCs is underway. This paper identifies a solid body of empirically based MOOC research and analyses this area of inquiry, its authors, content, and direction.

Methodology

The purpose of this paper was to compile and analyse research articles published in scholarly journals about MOOCs. While there are numerous popular accounts, editorials, commentary, and the like, the goal of this project was to cut through the noise and focus exclusively on published research articles in peer-reviewed academic journals. The principle of inclusion was confined to MOOCs described as such by the scholars who investigated them. For example, scholarship on courses similar to, but not defined as MOOCs, indeed, some that may have served as precursors to MOOCs, is not included in this paper. The discussion offered here is to be understood in this delimited context. We tabulated numbers of articles, noted authorship, place of publication, author affiliation, and location. We also analysed the number, type, and location of the journals. Following Silverman (2011), we worked inductively to identify learning theories, assumptions, research directions, and themes across the literature to establish a conceptual framework for understanding the present landscape of MOOC scholarship. This analysis suggests that MOOC research can be understood as occurring in two chronological phases: (1) Connectivist cMOOCs, Engagement and Creativity, and (2) xMOOCs, Learning Analytics, Assessment, and Critical Discourse.

Data collection

Articles for analysis were drawn from a comprehensive search of nine leading academic databases starting in the year 2002 to 1 July 2013. Databases were

selected to include international and open source journals with depth in the areas of education, technology, and computer science. The search parameter of 2002, six years before the term, MOOC, was officially established, was used to ensure that all research articles on self-described MOOCs would be included. Of course, before 2008 there were reports about MOOC-like efforts, and those are beyond the scope of this study. The databases searched were: *Academic Search Complete*, *Communication and Mass Media Complete*, *Directory of Open Access Journals*, *Education Full Text*, *ERIC*, *Google Scholar*, *MathSciNet*, *Science Direct*, and *Web of Science*. Databases were searched for articles with the word, MOOC, in the title, abstract, or content. This process yielded approximately 43 articles from a variety of sources. Articles that made the cut for closer inspection were peer-reviewed, in international journals, and available in English. We eliminated articles not centrally about MOOCs. Eleven articles were excluded because they were simply informative reportage or opinion columns in newsletters, proceedings, magazines, or trade-journals. Two editorials in scholarly refereed journals were eliminated, as we did not consider the editorial to be scholarly research. This process yielded 25 scholarly articles in peer-reviewed academic journals that were directly about MOOCs.

Results

Data collection efforts yielded 25 scholarly articles with a research focus on MOOCs published between 2009 and 2013. One article was published in 2009, no articles were published in 2010, 10 articles were published in 2011 and 2012, and 14 articles (59% of the total) were published in the first half of 2013 (Table 1). The 25 articles came from 12 different journals, mostly non-USA, and non-discipline specific (Table 2). Most of the articles in the collection were published in non-print, online, and open-access journals. All of the 11 articles in 2009, 2011, and 2012 were published in international open journals for distance learning. Three of the eleven articles had the same lead author (Rita Kop). Six of the 11 appeared in the same journal, *The International Review of Research in Open & Distance Learning*, although in two issues of

Table 1. MOOC scholarship by year.

Year	# of articles	# of authors and co-authors
2008	0	0
2009	1	1
2010	0	0
2011	6	16
2012	4	11
2013	14 (to July 1)	32

Table 2. List of journals with MOOC scholarship 2009–1 July 2013.

Canadian Journal of Learning and Technology
Distance Education
Educational Theory
Electronic Journal of e-Learning
eLearning Papers
European Journal of Open, Distance and E-Learning
International Journal of Advanced Computer Science and Applications
International Review of Research in Open and Distance Learning
International Journal on Computer Science and Engineering
Open Praxis
Research and Practice in Assessment
Telecommunications Journal of Australia

a later volume (Anderson and Dron 2011; Bell 2011; Kop, Fournier, and Mak 2011; Kop 2011; DeWaard et al. 2011; Tschofen and Mackness 2012). Three other articles appeared in the *European Journal of Open, Distance and E-learning* (Kop and Carroll 2011; Koutropoulos et al. 2012; Rodriguez 2012) and one article (Esposito 2012) was published in the *Electronic Journal of e-Learning*. Only one journal was American (*Educational Theory*).

Of the 14 articles published in the first half of 2013, 4 articles were published in *Research & Practice in Assessment,* a special issue on MOOCs and technology (Balfour 2013; Breslow et al. 2013; Sandeen 2013; Meyer and Zhu 2013). Four were published in education journals (Barber 2013; Portmess 2013; Rhoads et al. 2013; Rodriguez 2013), four in open and distance learning journals (Clarà and Barberà 2013; Liyanagunawardena, Williams, and Adams 2013; Liyanagunawardena, Adams, and Williams 2013; Weller et al. 2013), and two in Computer Science and engineering journals (El Ahrache et al. 2013; Tabaa and Medouri 2013).

Five continents were represented by the lead authors of the 25 articles in the database: 2 from Africa, 1 from Australia, 8 from Europe, 12 from North

Table 3. Geographical location of lead authors by continent and country for each article.

Continent	# of lead authors	Countries
Africa	2	Morocco (2)
Australia	1	
Europe	8	Italy (1), Spain (2), UK (8)
North America	12	Canada (5), USA (7)
South America	2	Argentina (2)

America, and 2 from South America (Table 3). Research methodologies used were diverse, employing both qualitative and quantitative approaches such as content analysis, surveys, interviews, self-reflection, data-mining techniques applied to MOOC courses, and social network analyses of MOOC participants' interactions and patterns of communication. Journals publishing MOOC research were confined to areas of educational theory, online and distance education, and computer science rather than traditional fields of study such as the humanities, sciences, and social sciences. This may be due to several factors and is likely temporary. Unlike traditional fields, online and distance education, and computer science journals have a relatively brief turn-around time from submission through review to publication because their subject matter is rapidly changing. Also, the educational and technological aspects of MOOCs have been understood to be within the research domain of online and distance education and computer science scholarship. However, as MOOCs continue to evolve, the social and cultural implications of MOOCs may increasingly become the focus of humanities and social science research.

Discussion

Scholars are beginning to formulate conceptual frameworks to organize the nascent research literature about MOOCs. Liyanagunawardena, Adams, and Williams (2013) identify eight themes apparent in MOOC scholarship. These include: (1) Introductory (explaining aspects of MOOCs), (2) Concept (discussion of threats and opportunities of MOOCs in higher education), (3) Case Studies, (4) Educational theory (pedagogical approaches used), (5) Technology (discussion of hardware and software used), (6) Participant focused ((discussion of participants' experiences), (7) Provider focused (discussion of course creators and leaders), and (8) Other. While descriptive, these categories are not mutually exclusive and contain conceptual overlap with many articles occupying more than one category (Liyanagunawardena, Adams, and Williams 2013). This paper seeks to further organize themes in MOOC scholarship and locate them within a chronological framework to help understand this unfolding body of scholarship. Two key phases of MOOC scholarship are identified, each with associated themes. Phase One: Connectivist cMOOCs, Engagement and Creativity 2009–2011/2012. Themes of Phase One include: development of Connectivism as a learning theory, and technological experimentation and innovation with Connectivism in early cMOOCs. Phase Two: xMOOCs, Learning Analytics and Assessment 2012–2013. Themes of Phase Two include: the rise of xMOOCs, further development of MOOC pedagogy, growth of learning analytics and assessment, and the emergence of a critical discourse about MOOCs. Although the discussion is confined to two types of MOOCs and the associated learning theories, we do not wish to imply that other types of MOOCs based on other learning theories do not exist; merely that they have

not been analysed in published MOOC research examined here. Each of these two phases is discussed in the chronological context below.

Phase one: Connectivist cMOOCs, engagement and creativity 2009–2012

Early Connectivist MOOCs emphasized human agency, user participation, and creativity through a dynamic network of connections afforded by online technology. The Connectivist theory of learning states:

> knowledge is the set of connections, and learning is the formation of connections – either in the mind or in society. These connections together form a network. What makes knowledge and learning possible is that these connections are always changing, always growing, strengthening, as we adapt to the experiences that we have. (Downes 2013)

Similarly, Mackness, Mak, and Williams (2010) identify attributes of Connectivism as network principles of diversity, autonomy, openness, and emergent knowledge but suggest that these attributes may be compromised within some MOOC environments. Connectivism, in practice, is structured and functions in a non-hierarchical and nonlinear manner:

> Connectivists advocate a learning organization whereby there is not a body of knowledge to be transferred from educator to learner and where learning is not limited to a single environment; instead, knowledge is distributed across the Web and people's engagement with it constitutes learning. (Kop 2011, 20)

Kop goes on to identify four learning-enhancing types of activities that can occur within cMOOCs: (1) aggregation (access to lots of content resources), (2) relation (reflection on the aggregated content through blogging, discussion boards, and related technology), (3) creation (assignments or expectations that participants would create new ideas, and (4) sharing (of created content with other participants) (Kop 2011, 21). These activities demand creative engagement and are well suited for consistently active participants.

Early MOOC researchers sought to operationalize the learning theory of Connectivism by building and running cMOOCs with a few researchers (Kop 2011; DeWaard et al. 2011) doubling as both designers and facilitators of the MOOCs under study. Nearly all of the cMOOCs described in the research of this period were affiliated with Canadian distance education university programs. These include: PLENK 2010 (Personal Learning Environments, Networks and Knowledge,) CCK 08, 09, 11 (Connectivism and Connective Knowledge), CRITLIT 2010 (Critical Literacies), and MobiMOOC 2011. Enrollments ranged from 377 to 1610 participants. Connectivist scholars, George Siemens and Stephen Downes, along with Dave Cormier and Rita Kop, were facilitators in three of these four cMOOCs.

Participant interaction and modular roles for educators and participants within an open network were emphasized in these early cMOOCs. None of the four cMOOCs analyzed in the research, however, had the goal of delivering standard university course content (e.g., Math 101). Instead, they had either flexible content or, as in the case of PLENK 2010, no content in a single place, but rather distributed content through several cloud-based applications. The concept was to exploit modes of interaction and structures of the Web for learning. Course designs sought to put into practice the four design parameters of Connectivism: autonomy, openness, diversity, and interactivity. cMOOC participants were encouraged to find and share their own meaningful content across the Web in creative ways (Downes 2013).

cMOOCs afforded use of a variety of innovative pedagogical and technological approaches that were the object of much early cMOOC research. The researchers/authors in this early stage of MOOC scholarship typically survey participants to analyze their experiences with the cMOOC and assessed learning analytics that measured degree and types of participation. For example, Fini's (2009) analysis of the CCK08 MOOC is typical of such early-published research. Entitled, 'The Technological Dimension of a Massive Open Online Course: the Case of the CCK08 Course Tools', this was the first scholarly research article in an academic journal about a MOOC – a term that had just emerged a year earlier. Fini surveyed MOOC participants about their preferences regarding various cloud-based tools introduced in the course such as *personal blogs*, *concept maps*, *Moodle*, and *Second Life*. The course was facilitated by Siemens and Downes, and was offered by the University of Manitoba for credit for traditionally enrolled students, and free to others as a non-credit option. Research results uncovered a range of learner preferences about the tools that were influenced by participants' learning styles, personal objectives, and time availability.

If a central dynamic of cMOOCs was participant engagement, unpacking the features of disengagement, often referred to as participant lurking, was the key. A common research question in this early phase was aimed at understanding the under-performing participant in a massive course. Kop (2011) researches the 'challenges that might prevent learners from having a quality learning experience' including self-directed learning and critical literacies (19). Tschofen and Mackness explore personality and self-determination theories for clues to explain the diversity of participant interactions in MOOCs. Koutropoulos et al. (2012) investigate whether the emotive language participants used in discussion boards within a MOOC may be predictive for future and continued participation in the course. DeWaard et al. (2011) investigate MOOC participation by exploring the chaotic learning environment of mobile learning. Kop, Fournier, and Mak (2011) explore how cMOOCs can be designed to support interactions between participants, including facilitators, to achieve transformational learning. Kop and Carroll (2011) investigated the use of cloud-based applications (e.g., *Moodle*, *Flickr*, *Second Life*, *Yahoo and Google Groups*,

Facebook, *YouTube*, *Twitter, LinkedIn*, *Crowdmap*, and *Wikispace*) to increase student engagement by affording students with skills to move from consumers of technological products to producers of digital artifacts. Although the majority of the 1580 participants in this cMOOC were disengaged, a core group of participants, mostly educators, were highly engaged and reported that the reasons for their engagement as producers of digital content were due to motivation and social support. Similarly, deWaard and her team of facilitators in the MobiMOOC 2011 described encouraging participants to sample diverse cloud applications designed for a range of learning styles to foster greater engagement.

There is little critique of the limits of Connectivism in this first phase of MOOC research; however, Bell (2011) is the exception. He does not believe Connectivism can always be applied successfully to online teaching, and suggests that Connectivism fits some learning environments better than others. Bell rejects Connectivism as a theory, and argues that it is best understood as a phenomenon rather than as a full-fledged theory of learning. Even as a phenomenon, the majority of cMOOC investigators valued the autonomous style, engaged learning in an open environment, and participatory interactivity emphasized in Connectivism. Thus, early MOOC research published in scholarly journals was focused around five key questions aimed at getting MOOCs right: (1) What is the best way to create a high-quality learning environment for autonomous (self-directed) learners? (2) Are the principles of Connectivism getting realized properly and fully in MOOCs? (3) What is the best way to support autonomous learners in MOOCs (acknowledging the evolving roles of learners and educators)? (4) What are the most effective tools and applications for participants? (5) How can MOOCs, influenced by Connectivism, elucidate the complexity of and chaos experienced by higher education at the moment?

Phase two: xMOOCs, learning analytics, assessment, and critical discourse 2012–2013

As MOOCs evolved and proliferated, new forms emerged that were similar to and different from the cMOOCs of the early days. Rodriguez (2012) argues that MOOCs need to be differentiated because they may vary in pedagogical underpinnings. Rodriguez's empirical research categorizes MOOCs into two main types: cMOOCs and xMOOCs. Comparing MOOCs based on a Connectivist pedagogical design with MOOCs based on a cognitive behaviorist pedagogical design, Rodriguez observes that while both share common features, they differ in their learning theory, pedagogical model, and the ways in which openness is understood and practiced. The cMOOCs analyzed by Rodriguez include CCK08, PLENK2010, MobiMOOC (2011 and 2012), EduMOOC (2011), Change11, LAK12, CFHE12, and Oped12. The xMOOCs analysed by Rodriguez include AI-Stanford, CS101 from Udacity, and several MOOCs from EdX and Coursera. Computer Science 221 (CS221), the Stanford MOOC on

Artificial Intelligence, was produced in 2011 by KnowLabs, a for-profit company set up by Stanford that later evolved into Udacity. The purpose was to create a platform to deliver content online repeatedly and of high quality with little input from the original instructor. There were few tools used in the xMOOC (a webpage, *YouTube* videos, and exams) and little feedback from the instructor compared with cMOOCs. Participants in the Stanford course were required to keep up with weekly assignments including quizzes to succeed. The teacher played a traditional role in the Stanford MOOC, giving lectures (video), 'explaining hints for exercises, commenting on the unfolding of the course, preparing exams etc. During office hours, a tutor would answer selected student questions. There was never direct interaction of the tutors with the students' (Rodriguez 2012). Based on this analysis of differences, as well as drawing on the classifications proposed by Anderson and Dron (2011), Rodriguez argues that the Stanford MOOC is a different sort of massive online course, an xMOOC.

From an epistemological point of view, Rodriguez argues that cMOOCs are characterized by generative knowledge, whereas xMOOCs are characterized by declarative knowledge. xMOOCs may be more appropriate for learning where there are clear right and wrong answers, but behaviorist pedagogy is ill suited for critical thinking and the practice of creativity (Rodriguez 2013). On his view, the Connectivist paradigm would seem better positioned to take advantage of resources and connections available in the networked global learning environment. Both of his categories of MOOCs share geographical diversity of participants, large rates of attrition, and operate on a large scale, although xMOOCs are much larger in scale than cMOOCs. Differences between the MOOCs include learning goals, levels of participation, and roles for leaders (tutors vs. facilitators). Rodriguez raises interesting observations about perceived patterns in cMOOCs and xMOOCs that suggest a binary framework that may be problematic. xMOOCs, for instance, may not necessarily be tied to behaviorist pedagogies and behaviorist pedagogies can express Connectivist aims. For example, xMOOCs could function as space of democratization of interaction with tutors who encourage participants to reflect critically on course materials and engage with each other. Rodriguez's point about the exclusive license agreements and limitations on the use and sharing of course material still apply.

The concept and practice of 'openness' in MOOCS also gets differentiated between the two MOOC formats by Rodriguez (2013). For example, while cMOOCs promote the use of open licenses, xMOOCs are not open in the usual sense of the word (Rodriguez 2012, 2013). In cMOOCs, the learner has freedom to use, create, and share materials without restriction. Learner autonomy is privileged and learner-to-learner networking and communication is encouraged – not just for discussion, but also for essential practices that constitute learning in Connectivist theory. By contrast, in xMOOCs, openness is limited. For example, Coursera's materials are not truly open because the

terms of service contract circumscribe participant engagement with course materials:

> Coursera grants you a personal, non-exclusive, non-transferable license to access and use the Sites. You may download material from the Sites only for your own personal, non-commercial use. You may not otherwise copy, reproduce, retransmit, distribute, publish, commercially exploit or otherwise transfer any material, nor may you modify or create derivatives works of the material. (Rodriguez 2013, 71)

For xMOOCs, openness means open access to anyone. For cMOOCs, openness in a connected environment constitutes the locus and practice of knowledge acquisition and production.

Along with research on the differentiation of MOOCs, researchers have also begun to evaluate the practice of studying MOOC participants as research subjects, paying special attention to issues of privacy and informed consent (Esposito 2012). MOOCs generate large amounts of data about participant behavior with 'minor privacy concerns by researchers' (Esposito 2012, 319). Because MOOCs often take place in an open web space with full access to non-subscribed viewers, this raises questions of ownership and responsible use of participant data. With some MOOCs 'informed consent' for use of data is established through the terms that participants must agree to in order to participate. Thus, participation implies consent. Yet, participant understanding of privacy and consent may be as varied as the learners themselves and, depending on location, participants may be subject to different data protection laws. 'Enrolled learners in a MOOC are potentially all over the world and therefore they are likely to have different cultural and personal sensitivities about privacy issues' (Esposito 2012, 320). It is easy to imagine MOOC participants feeling violated when some of their discussion posts on the open web find their way into unintended contexts. Esposito calls for a more explicit implementation of informed consent based on 'a consideration of participants both as authors in the online setting and as human subjects embedding unexpected privacy sensitiveness' (Esposito 2012, 325). This is particularly relevant for MOOCs that emphasize the sharing of personal information and experience.

Learning analytics

Learning analytics is the set of practices that collect and use statistically based data to identify patterns for understanding learning behaviors and outcomes. Predictive algorithms and adaptive feedback mechanisms hardwired into MOOCs track, record, and analyze every click a student makes to generate data aimed at understanding the ways in which students learn in MOOCs (McKay 2013). Early results of such studies are starting to be published and offer a glimpse into student behavior in MOOCs. In the Breslow et al. (2013) study, which reported on edX's initial MOOC course, Circuits and Electronics

(6.002x), the databases contained all student IP addresses so that student geo-locations were easily identifiable. Students who enrolled in the MOOC, which ran from March to June in 2012, represented most of the world's countries (194 countries). The vast majority were male, between the ages of 20 and 40, and had already earned a college degree or higher. This MOOC demographic may or may not represent the demographics of other MOOCs and is based on participant self-disclosure. It is likely that the subject matter of this MOOC, Circuits and Electronics, attracted this particular demographic.

Another aim of learning analytics is to correlate student characteristics (age, gender, nationality, etc.) with achievement in MOOC courses. Results suggest that achievement is not so much correlated with demographics as it is with individual knowledge and competencies as was found in the Breslow study. But again, caution is advised as these data reflect just one MOOC course. Learning analytics research also focuses on discerning micro-patterns of behavior about the ways in which students use course materials available in MOOCs. For example, analyses track the time students spend watching lecture videos, doing homework, completing labs, engaging in discussion boards, consulting the textbook, and other course resources. The concept is to identify high-performing students and map their activities and behaviors in the MOOC to determine the best presentation sequence of course materials. Researchers seek to identify when certain resources might be most useful and in what ways. For example, what resources do the best MOOC students use for different tasks? What behaviors do they perform when preparing for an exam? What behaviors do they engage in when working on homework? Learning analytics compares discussion board behavior of high achieving students with others. Who asked questions? Who answered questions or made a comment? Does discussion board communication correlate with course success? The 'best students' are defined in different ways. 'Best' usually refers to students who persisted through the course and who increased their scores on exams and homework the most. Thus, 'best' is operationalized as learning, growth, and persistence.

The development of learning analytics may accelerate further if edX follows through on plans to make their MOOC databases available to other researchers (Reich 2013). According to Breslow et al. (2013), the next phase of data-mining research will focus on further development of models and analytics to offer understanding about the ways in which student background and other patterns of student engagement with course content either assist or hinder students' ability to persist and complete the course, including attempting to understand the high dropout rates of MOOCs.[3] Most MOOCs have large enrollment numbers, but less than 10% completion rates (Agarwala 2013). The reasons for high attrition rates in MOOCs are unclear. It could be that, because MOOCs are usually free, participants use MOOCs as a resource and come and go, in and out of MOOCS, taking the specific bits and pieces they seek (Clow 2013).

Assessment

MOOC assessment is a growing area of scholarly output. Issues explored in this corpus include the ways in which MOOCs can be used to substitute for traditional forms of higher education, and made acceptable as a legitimate form of higher education. Assessment typically focuses on accreditation concerns with less emphasis placed on assessment of MOOC methodology per se. The American Council on Education (ACE), a policy-making organization representing over 1800 accredited colleges and universities, has recommended that college credit be granted to students who successfully complete any of the following MOOC courses: (1) Pre-Calculus from the University of California, Irvine; (2) Introduction to Genetics and Evolution from Duke University; (3) Bioelectricity: A Quantitative Approach from Duke University; and (4) Calculus: Single Variable from the University of Pennsylvania (Sandeen 2013). A few colleges and universities worldwide have begun to accept MOOC completion for credit such as the University of Helsinki, Finland and the University of Maryland. But practices and policies vary widely. For example, a traditionally matriculated student at Harvard who takes a MOOC delivered via Harvard's own edX platform is not permitted to receive credit for completion of the course. Most policy-makers working in this area believe that the credit issue will need to be resolved if MOOCs are to grow and be accepted (Sandeen 2013). The shift to competency-based degree programs in higher education (rather than credit hour programs) opens the door to alternative degree pathways that are friendlier to the MOOC model.

Overall, most in the assessment community welcome MOOCs as 'an extremely positive development' (Sandeen 2013, 11) and have high expectations that MOOCs will solve a number of social and educational challenges that have worsened over recent decades. These include relying on MOOCs to (1) increase the numbers of students who achieve post-secondary education; (2) fill the gap of decreased public educational funding by providing high-quality, low-cost education for the many through privatized means; and (3) use their ability to collect data about student behavior to integrate, customize, and deliver optimal student learning outcomes. If any of these goals are to be realized by MOOCs, research is needed on a number of related issues. These include the problem of authentication of the identity of the person taking the MOOC, cheating, and proctoring of MOOC exams. Possible techniques to verify personal identity include biometric palm of the hand vein recognition technology and computer keystroke recognition, which are both being explored for use in the MOOC context (Sandeen 2013). Addressing the challenge of perceived cheating in MOOC coursework, Meyer and Zhu (2013) offer a form of item response theory, namely, scale linking and score equating to show how fair testing conditions, with a real person as an exam proctor, can be used to enhance MOOC credibility. However, because of costs, real person proctoring is seldom done in MOOCs. It is usually used only as a last resort and only for a singular

summative assessment. As an alternative, webcam proctoring is more frequently used and provides surveillance of the student for the duration of the exam.

To enrich the pedagogical repertoire, student writing is attempted in some MOOCs, but assessment remains an obstacle. Two forms of essay assessment are currently described in research on MOOCs: *Automated Essay Scoring (AES)* software used by edX, and *University of California – Los Angeles Calibrated Peer Review*™ (*CPR*) used by Coursera. These *AES* tools work by using 'machine-measured characteristics to predict human ratings of essays such as average word length, number of words in the essay, discourse element length, proportion of grammar errors, scores assigned to essays with similar vocabulary, and frequency of least common words' (Balfour 2013, 42). The belief is that refinement of these applications will allow MOOCs to move beyond the limitations of multiple choice tests and formulaic problems with right and wrong answers. The *AES* market is presently dominated by three products: *e-rater*™ produced by Educational Testing Service, *Intellimetric*™ produced by *Vantage Learning*, and *Intelligent Essay Assessor*™ produced by *Pearson Knowledge Technologies*. Recent research compared *AES* software and *CPR* across four dimensions: types of papers scored, consistency of scoring, comments provided, instructor intervention, and advantages for student learning and found them to be comparable (Balfour 2013). There are limitations to *AES* systems, however. They cannot 'assess complex novel metaphors, humor, or provincial slang … As writing becomes more unique, such as in term papers on individually selected topics, academic articles, scripts and poetry, commercial applications break down' (Balfour 2013, 42). The National Council of Teachers of English (NCTE) is on record as opposing machine scoring student writing and there is student resistance to using *CPR* (Furman and Robinson 2003, in Balfour 2013). It is tricky to gauge evaluations of the applications because the majority are conducted by the industry themselves. *AES* and *CPR* are most successful in working with short essays (fewer than 750 words), where there is a clearly defined answer that is sought, and the information is concrete and straightforward – not metaphorical, original, or creative. As *AES* and *CPR* get deployed in MOOCs, the MOOCs themselves serve to generate further data analytics with which subsequent iterations of *AES* and *CPR* are refined.

Critical discourse about MOOCs

Critiques of MOOCs are being articulated that identify problematics related to MOOC epistemology, pedagogy, and cultural hegemony (Rhoads et al. 2013). For example, the problem of epistemology concerns the narrow view of knowledge employed in some MOOCs that view knowledge as a product to be transmitted to anyone with an internet connection and a computer – as if knowledge were a package to be delivered. Critics argue this is an

impoverished understanding of knowledge and, moreover, one that does not acknowledge the inherent relationship between power and knowledge. Foucault's insight that power produces knowledge (because power creates normative understandings), permits us to see how MOOCs, given their influence, may promulgate particular interests, and particular expressions of knowledge over other interests or other expressions of knowledge. Rhoades encourages consideration of the effects of 'an Internet-based knowledge system in which certain disciplines and fields of inquiry become [more dominant while other disciplines and fields become] further marginalized by their lack of adherence to this form of knowing' (Rhoads et al. 2013, 92). In other words, MOOCs may become a tool to further the relatively narrow goals of academic capitalism such that disciplines that serve the dominant economic order are privileged.

The problem of pedagogy refers to a limited understanding of what constitutes empowering teaching. While the development and deployment of various technological tools have proliferated, most MOOCs are structured in a unidirectional manner, with video lectures and multiple-choice tests, epitomizing the 'banking concept of education' (Freire 1996, 53). Such a narrow view of teaching and learning fails to capture the richness and transformative potential of high-quality education. Rhoads et al. (2013, 96) caution, 'Technology by itself will not empower learners. Innovative pedagogy is required'. The problem of hegemony relates to a concern that the MOOC movement, in its present state, further benefits and promotes already elite universities. Issues of power arise 'when one considers who is most likely to be positioned as a producer of a MOOC?' (Rhoads et al. 2013, 102). Well-heeled universities like Harvard, MIT, Stanford, Yale, Columbia, and Carnegie Mellon as well as corporate start-ups have dominated the current political economy of MOOCs. Such MOOCs are expensive to produce and pose barriers to entry to this new industry. The consequence may be that less-affluent universities are more likely to be positioned as consumers of MOOCs, rather than producers of MOOCs (Rhoads et al. 2013). To the extent this occurs, it marks a shift in the traditional structure and function of all universities as sites of knowledge production. We would suggest that additional critical questions concern whether faculty creators of MOOCs are able to own and control their MOOCs. In addition, there needs to be a deeper examination of the ways in which the organization of faculty work in higher education may be disrupted as 'superstar' faculty at prestigious institutions give away their labor and potentially displace the work of other faculty. Do MOOCs pose a threat of deskilling the profession of faculty in higher education, as historically has been the pattern with adoption of technological innovations in other fields?

MOOCs are also being critiqued for their linguistic representations that are paradoxical and impenetrable. For example, the discourse of MOOCs, which is characterized by a decontextualization of learning and a decontextualization of technology, paradoxically, contains within it both the possibility of

democratized education as well as the reproduction of post-colonial forms of knowledge. Udacity's pledge 'that at Udacity we put you, the student, at the center of the universe' turns out to be false and impossible: 'There is no such place. Udacity *is* no place' (Portmess 2013, 3). As Portmess observes, Coursera MOOCs are branded for appeal by being connected to a prestigious university, but separated from that context so that they may be more readily consumed. While leveraging the mystique of top-tier universities, MOOCs exist well outside of the space and cultures of these hallowed halls. For example, the case could be made that edX is more about running a massive data collection experiment than about providing an education. According to Portmess, we should not dismiss this marketing language of MOOCs as inconsequential. Phrases such as 'the world's best courses, the best professors, top universities, and world class education' express condescension toward other universities and re-inscribe first-world privilege (Portmess 2013, 3). The issue is further amplified as 60% of students in MOOCs come from outside of the USA (Sandeen 2013). MOOCs exist within a social and economic context that shapes the ways in which knowledge is produced, delivered, and consumed (Portmess 2013). For instance, the assumption of ubiquitous internet access is problematic. Poor learning outcomes in a pilot Udacity math MOOC at San Jose State University were attributed, in part, to insufficient internet and computer access experienced by students enrolled in the course (Kolowich 2013a, 2013b). Some low-income students in the class could not afford computers or high-speed internet connections at home and were unable to engage in the course. This experience points to the need for a more realistic acknowledgement of the uneven technological resources of MOOC students as well as possible unfavorable effects of the deployment of MOOCs in educational settings.

Furthermore, we would suggest that there has been a subtle, but significant shift in the ways in which faculty and students are labeled in MOOC discourse. While the title professor is rarely used, the term instructor or facilitator is frequently invoked. This semantic shift may express a diminished importance of perceived knowledge, autonomy, and status on the part of the educational leader. Professor and instructor/facilitator are not equivalent terms. Similarly, in the MOOC discourse, students are frequently not called students, but rather referred to as participants, a linguistic modification which would seem to dislodge their primary identity as learners. The import of these and other aspects of MOOC discourse require further critical investigation. Thus, Phase two of MOOC scholarly literature comprises research trajectories aimed in several different directions: (1) efforts toward the establishment of differentiation among MOOCs with regard to pedagogical underpinnings, (2) development of learning analytics based on student characteristics and behaviors that are recursively applied in MOOCs, (3) advancement of forms of assessment that position MOOCs as legitimate pathways of education, and (4) the rise of a critical discourse about MOOCs and their implications for teaching and learning.

Conclusion

Data on early MOOC scholarly research reveals an international community of distance and e-learning researchers involved with experimentation, innovation, and investigation of learning effectiveness in MOOCs with little research focused on critiques of the MOOC enterprise. After initial Connectivist MOOC research, largely by Canadian scholars, there was a shift to research on behaviorist pedagogy with the deployment of xMOOCs largely by elite universities and start-ups such as Coursera and Udacity. The second phase of MOOC research pointed to different pedagogical assumptions and methodologies employed in MOOC platforms and practices. Published studies also began to document the ways in which some MOOCs, with their massive research agenda for mining data, exploit the digital traces of participant activity, and advance the field of learning analytics and assessment. In response to these developments, some scholars have articulated a critical discourse about MOOCs questioning the ways in which some MOOCs may reinscribe status quo structures of power and ways of knowing. Discipline-based and interdisciplinary research on MOOCs, beyond the current areas of distance and e-learning, will be necessary for the academic community to assess more fully the ramifications of massive open online education and to shape its future directions.

Notes

1. As of 25 May 2013 (http://www.class-central.com/).
2. Of these, 110 were news articles, 31 were opinion and ideas, 41 were advice articles, and 1 was a global article (these are *Chronicle* website categories).
3. The LASyM prototype (a learning analytics system for MOOCs) (Tabaa and Medouri 2013) may offer answers in this regard as the software is compatible with existing systems and allows for data mining related to characteristics that may mark a MOOC participant as an 'at risk' learner.

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