Massive open online courses: a review of usage and evaluation

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Abstract: The massive open online course (MOOC) has seen a dramatic rise in prominence over the last five years and is heralded by some as disrupting existing pedagogy and practices within the education sector, while others are far more sceptical about the impact of MOOCs. Numerous courses are now being offered on a number of different platforms, with participant numbers for some individual courses reaching hundreds of thousands. Expectations are high for what these courses can achieve in terms of opening access, widening participation and cost saving. In this paper we conduct a literature review to examine what is known about MOOCs (both those following the original connectivist model and the more traditionally didactic variety) and what indications there are that they can live up to such expectations. We discuss concerns arising from the review and identify issues including lack of evidence, absence of pedagogy, lack of support and unrealistic expectations particularly on beginner learners.

Keywords: massive open online course; MOOC; course evaluation; online learning; pedagogy.

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1 Introduction

Despite its relatively recent appearance on the education scene, the term 'MOOC' is now much in evidence in educational institutions, in the press and in the blogosphere. The MOOC, or massive open online course, offers a prospect of education beyond the confines of individual universities and organisations, allowing (possibly) free participation to large numbers of learners from any geographical location and without the need to satisfy formal entry requirements. Course participants form a network of learning in which knowledge is created and support is provided not only by 'experts' but by all contributing members of the learning community. Many hundreds of MOOCs across a wide range of topics are now offered by institutions worldwide and it is not uncommon for such courses to attract tens of thousands of enrolments.

MOOC momentum appears to be increasing rapidly. Providers such as Coursera (https://www.coursera.org/), edX (https://www.edx.org/) and Udacity (https://www.udacity.com/) have become well-known names and are expanding fast, with Coursera (https://www.coursera.org/) and edX doubling their university partners in February 2013 (Lewin, 2013). Other initiatives are following suit, for example, FutureLearn is a UK-based platform which currently has (December 2013) 30 signed up partner institutions (mainly UK) and 36 courses open for enrolment (Futurelearn, http://futurelearn.com). A European MOOC platform is being rolled out by the open courses initiative, iversity (http://www.iversity.org/) while OpenupEd (http://www.openuped.eu/) provides a pan-European portal for MOOCs across many European languages. Examples of other models include OpenLearning (https://www.openlearning.com/) which allows anyone to set up their own course free of charge and P2PU (https://p2pu.org/en/), a 'peer to peer' initiative in which open courses are developed by the community.

The idea of facilitating wider participation in learning by harnessing the benefits of online technologies, open resources (OERs), distance learning and learning communities is not new. E-learning, m-learning, the OER movement and cloud computing have all contributed to creating an environment and a technology base in which MOOCs may be realised. Further, a greater emphasis on the importance of social context and interaction has led to the development of learning theory and pedagogy in which networking plays

a central role. The time and conditions now seem conducive to MOOCs and, in contrast to failed attempts several years ago (Walsh, 2011), the models currently being used are attracting high levels of participation.

In this paper we review the current literature on MOOCs, covering research relating to MOOC pedagogy, use and effectiveness. Given the current high profile of the topic and the way in which so many institutions are rushing to provide MOOCs it might be expected that a good deal of evidence exists to indicate the efficacy of these courses in achieving desired objectives and learning goals. However, this movement has happened largely without the benefit of any real analysis and understanding which might be provided by evaluation of the courses themselves. Neither does there appear to be much consideration of underlying factors which one might expect to be at the forefront of course development such as pedagogy and catering for diversity.

This article is a revised and extended version of a conference paper (Boyatt et al., 2013) which was written in April 2013. At that time there was very little published research relating to MOOCs to be found. Liyanagunawardena et al. (2013) provide a quantitative analysis of MOOC conference and journal papers, stating that from the first one in 2008, the total for 2012 had risen to just 26. In contrast to the position with reviewed papers, there was already a large amount of material in press reports and in personal blogs from MOOC participants which provides an interesting perspective on the development of the area and a record of changing opinions and expectations on the development of and participation in MOOCs. Therefore, in addition to considering peer-reviewed publications, the initial review made extensive use of press articles, highlighting the recent developments and expectations surrounding MOOCs.

Since that time, as might be expected, the position regarding publications has altered somewhat and a search for 'MOOC' on Google Scholar now yields many pages of results. A number of funded projects relating to MOOCs are now under way and MOOC-related conferences are appearing on the calendar. In the current paper we update the review of literature and investigate what useful evaluation and analysis has been contributed in the intervening six months. We also introduce several new sections to consider further issues which have been evolving in relation to MOOCs. The new material also provides further input to discuss of the issues raised by the review and consideration of areas for future investigation.

2 The rise of the MOOC

The term 'MOOC' was first applied to the ground-breaking 'connectivism and connective knowledge' (CCK08) course facilitated jointly by Stephen Downes and George Siemens in 2008 (McAuley et al., 2010). The history of the MOOC is generally charted from David Wiley's Introduction to Open Education (IOE07) course in 2007 followed by a succession of courses taking a similar open, networked approach and tackling mainly education-related topics (Rodriguez, 2012; Pisutova, 2012). In 2012 ('the year of the MOOC') a plethora of press and online reporting testifies to an explosion of activity under the MOOC moniker (Pappano, 2012; 'What you need to know about MOOCs', 2013; Angel, 2013). The platforms provided by Coursera, edX and Udacity allowed universities to adapt or develop courses which could be pushed out to learners worldwide (Lewin, 2013). For example, Coursera (https://www.coursera.org/) currently (December 2013) has 62 university partners and is offering over 300 courses.

Young points out the startling contrast: "colleges that usually move at a glacial pace are rushing into deals with the upstart company" (Young, 2012). This has been heralded by many as a disruptive transformation of pedagogy set to spark a revolution in education (Waldrop, 2013). However, others have been rather more cautious, pointing out problems and highlighting the fact that there is as yet little evidence for the educational benefits of a massive move to MOOCs (Snyder, 2012; Mackness et al., 2010; Chamberlin and Parish, 2011). Daniel (2012) refers to the phenomenon as a 'Gadarene rush'. The rate at which universities have signed up suggests this is a movement in which no one wishes to be left behind (Lewin, 2012) and in some cases university heads are being put under pressure by governing bodies to implement change more quickly (DeSantis, 2012). There is much talk of the implications and 'disruptive potential' for higher education (Yuan and Powell, 2013). Many of the pre-existing issues of traditional on-line courses, such as difficult and cost of producing materials, are not immediately solved by the move to develop MOOCs.

A central feature of the MOOC discussion is that the term is used in (at least) two very different ways. The sense in which it was first employed refers to a specific conceptual framework of networked learning in which a connectivist approach is embodied. The second indicates a more traditional, 'expert-led' course being made available on the web for open, large-scale participation. Following Downes (2013a), these are now generally referred to as cMOOCs and xMOOCs respectively. The differences in the two, in concept, pedagogy and practice, mean that when discussing issues relating to MOOCs it is often necessary to make the distinction clear.

3 The cMOOC

A cMOOC "integrates the connectivity of social networking, the facilitation of an acknowledged expert in a field of study, and a collection of freely accessible online resources" McAuley et al. (2010). Each of the potentially many participants is responsible for setting their own learning objectives and pathways. Some structure (such as a general time-line or basic suggested learning resources) is provided but it departs from the traditional idea of a 'course' in that it does not attempt to set out a fixed curriculum or even to assume that the 'experts know best' (Cormier and Siemens, 2010; Masters, 2011). Through social interactions, participants share responsibility for developing the direction(s) of the MOOC, generating knowledge within the network and supporting mutual learning. Levels of participation may vary according to a learner's personal preferences, background, time and learning objectives. There is no notion that passing a course assessment represents success, with anything else being failure.

3.1 Individual cMOOCs

The CCK08 MOOC provided an early opportunity for learning, networking, creativity and research (Mackness et al., 2010; Mak et al., 2010; Kop et al., 2011; Fini, 2009). Subsequent MOOCs in this tradition include personal learning environments, networks and knowledge (PLENK) (Kop and Carroll, 2012; Fournier et al., 2011; Kop et al., 2011; Kop, 2011) mobile learning (MobiMOOC) (de Waard et al., 2012, 2011a,b); critical literacies (CritLit) (Kop, 2011) and online education (EduMOOC) (Rodriguez, 2012). A collection of resources relating to these and other cMOOCs is provided by the

MOOC guide (Downes, 2013b). The abundance of resources, research and discussion relating to cMOOCs reflects the nature of a community in which technology-mediated interaction, collaborative knowledge-generation and the production of digital artefacts is central (McAuley et al., 2010; Kop et al., 2011). There are rich and abundant online sources in blogs and forums containing a wealth of personal experiences, comment and ideas. However, far less exists so far in terms of more 'formal' analysis (that is, with a clear methodology directed at exploring specific research questions).

McAuley et al. (2010) use a narrative enquiry approach, providing a shared reflection on the relationship of MOOCs to issues of the digital economy and digital skills. The wide-ranging discussion highlights many features, opportunities, connections and challenges presented by the MOOC model. A number of studies have been based on the early CCK08 course, such as the survey of active participants conducted by Mackness et al. (2010) to investigate learners' experiences relating to autonomy, diversity, openness and connectedness/interactivity. All four characteristics were developed within the MOOC. However, areas of tension were also observed: lack of structure and poor support led learners to retreat to more traditional, closed group working. Both a user survey and concept mapping from blogs and forums relating to CCK08 were studied by Mak et al. (2010) and indicated that learners' preference for use of blogs or forums related to their personal learning styles. Forums were largely unmoderated but blogs were aggregated and distributed daily. Many users were dismayed by unacceptable behaviour in forums. In a further study based on CCK and PLENK, Kop et al. (2011) conducted user surveys, forums and analysis of network information as a basis for investigating issues of learner support. They conclude that "creation of a place or community where people feel comfortable, trusted, and valued" is central to providing the necessary support structure for learning.

Mackness et al. (2013) provide a qualitative report on the experiences of a 'small, task-oriented MOOC', 'first steps in learning and teaching in higher education' (FSLT12). They conclude that, while this type of course can be effective in supporting professional development, students had difficulty in "coping with uncertainty, openness, and academic identity".

Examples of evaluation relating to MOOCs for specific online communities which follow principles of openness and community-driven knowledge creation include the open translation MOOC (Beaven et al., 2013) and an anti-bullying MOOC for schools (Torres et al., 2013).

3.2 Pedagogy and technology

Work has also started to emerge relating MOOCs to other aspects of learning and pedagogy. Research based on PLENK conducted by Kop and Carroll (2012) combined information from user surveys and data analytics to investigate creativity in learning and how this can be promoted in a MOOC setting.The need to build confidence within the learning environment was seen as critical to active and creative participation, and this is promoted by interaction with others and seeing the artefacts they are sharing. These findings relate to those of Mackness et al. (2013) for FSLT12. Survey information from participants of MobiMOOC was also used by de Waard et al. (2011b, 2012) to investigate MOOCs in the context of mlearning. The two are seen as being well-aligned in that "both learning forms allow for knowledge creation to happen over time without being tied to a particular space and contexts". A further analysis of information from

MobiMOOC participants considers aspects relating to chaos theory, emergence, and complexity theory (de Waard et al., 2011a).

Another area of investigation for any topic related to online learning and learning environments is the technology itself. Interestingly, there is as yet very little formal comparison and analysis of this for MOOCs. Sadigh et al investigate automatic exercise generation (Sadigh et al., 2012). Fini (2009) considers technology from the users' perspective, using survey information from CCK08. Opinion was divided as to whether the wide choice of tools was 'complete' or 'confusing and too rich'. It was found that issues of time, language and IT skills were major influences on users' choice of tools with the result that "learners favoured the passive, time-saving mailing list over interactive, time-consuming discussions forums and blogs".

4 The xMOOC

The xMOOC model, as evidenced by Coursera, edX and Udacity, comes from the perspective of making courses from respected institutions available in mass, online mode for free and with no barriers to entry. While recognising the importance of peer support and open access, these are more in the mould of traditional university courses in which there is a set curriculum defined by experts and definite learning objectives and assessments (and possibly certification) relating to achievement of the learning outcomes (Rodriguez, 2012; Daniel, 2012). Learners may participate in the learning community through social media such as blogs and forums. They also share responsibility for support and feedback, for example, in Coursera's peer assessment mechanism.

Because the rise of the xMOOC has occurred so recently there is little published work so far. There is however a large amount of material in the form of newspaper articles charting the latest developments ('What you need to know about MOOCs', 2013) and blogs giving accounts of personal experiences or reflecting on MOOC issues.This provides an interesting context, however each blog is a single perspective of one learner's experiences and newspaper articles may be little more than reports based on company press releases.

4.1 Individual xMOOCs and subject interest

Published studies relating specifically to xMOOCs are starting to emerge. One early, comprehensive report comes from the Coursera course on bioelectricity offered by Duke University (Belanger and Thornton, 2013). This provides a useful perspective on participation and staff effort. Of the 3,576 respondents to the initial survey (out of about 11,000 enrolments), roughly two thirds had at least a first degree. A similar proportion had previous experience of the topic either from formal education or their own exploration. The end of course exam was taken by 346 students, with 313 passing all course requirements to obtain a certificate. A 'low conservative estimate' of 620 hours of staff time is given for course preparation and delivery.

Breslow et al. (2013) and DeBoer et al. (2013) report on the evaluation of the first edX MOOC, a course on Circuits and Electronics which ran from March to June 2012. The work provides some interesting figures and graphical representations relating to student demographic, motivation and engagement with resources. Even more

importantly, the authors raise crucial questions about what 'success' in the context of a MOOC really means and the predictive power of analytics can best be used. Work is now beginning to identify and evaluate useful data concerning different subgroups of MOOC learners. An example of this is provided by Kizilcec and Schneider (2013) who track subpopulation engagement.

A further useful evaluation of a curriculum design MOOC is provided by Cross (2013). As well as providing some basic numbers (such as levels of active participants and contributors week by week) the study solicited participants' suggestions on evaluation criteria. These factors (such as whether personal expectations had been met) were incorporated into the assessment as far as possible. They provide some interesting insights but are less amenable to 'neat' statistical representation and interpretation. Some appear to beg further questions, for example, only 50% of respondents to the post-course survey reported that their original learning goals had been met but this could be for a variety of reasons including the difficulty for learners in being able to identify suitable goals initially.

Many subject areas are now represented by MOOCs on the major platforms. The affordances of MOOCs for specific disciplines and topics have been discussed by a number of authors with subjects including computing (Vihavainen et al., 2012), engineering (Heckel et al., 2012), medicine (Masters, 2011; Skiba, 2012), library studies (Bond, 2013; Creed-Dikeogu and Clark, 2013), physics (Aiken et al., 2013) and law (Schrag, 2013).

4.2 Differences of approach

Although many MOOCs are often lumped together under the xMOOC tag, many commentators pointed out that there can be significant differences between them. Armstrong (2012) concludes that MIT's offerings within edX, embedded in a long institutional history of online course strategy, bears the hallmarks of disruptive innovation likely to lead to fundamental transformation. He contrasts this with how Coursera is currently being used by many institutions which 'stick a toe into the water without making a commitment'.

5 Comparisons and other models

xMOOCs and cMOOCs have fundamental differences of approach underpinned by seemingly opposed ideologies. As Downes (2013a) says: "cMOOCs focus on knowledge creation and generation whereas xMOOCs focus on knowledge duplication". Despite this, both are linked by the shared name of MOOC, although the interpretation of each of the term's component letters seems to vary as much between MOOCs of the same type as between the x and c varieties.

5.1 What's in the name?

Some xMOOCs have attracted hundreds of thousands of enrolments and could therefore be seen as truly massive in comparison to the numbers that would be accommodated on, for example, a traditional university course (although online

and distance learning have already been pushing the classroom boundaries in this respect). For example, Udacity's CS101 'Introduction to Python' attracted over 300,000 students (Udacity, httpshttp://blog.udacity.com/2013/05/py-dacious-course-hits-pi-dacious.%html). cMOOCs have typically been considerably smaller with typically several thousand enrolments (Rodriguez, 2012). However, 'massive' in some cases seems not to be interpreted literally, but to be regarded more as a course being large for its own context, or as the potential to reach larger numbers, or as being able to reach significantly more learners than traditional means could (Lukes, 2013). At the smaller end of the scale, the University of Maine at Presque Isle has used the MOOC philosophy of adding capacity and opportunity by adding an online stream (capped at five people) to an existing course of 15 traditional learners (Kolowich, 2012b). The organisers were referring to it as a 'little open online course' or LOOC (although others are using this acronym to refer to variants of the MOOC restricted to local access).

'Open' is also interpreted in a variety of ways. It may indicate lack of barriers to joining, including no formal prerequisites or fees (at least not for basic provision) and no geographical limitations. However, there are models of MOOCs in which payment might be very similar to what is required for the face-to-face course or for elements such as accreditation. Rodriguez (2013b) argues that the interpretation of openness is a main dividing point between cMOOCs and xMOOCs. In a cMOOC, openness also refers to the legitimate participation of learners at any level of involvement: an openness of practice (Cormier and Siemens, 2010) supported by "a mechanism that allows a given perspective to be entered into the system, to be heard and interacted with by others" (Downes, 2007). in contrast, the xMOOC's expert-led model means that learner interaction and input may be encouraged by some but is not central to all (Rodriguez, 2013b).

Being open might also refer to the openness of resources provided by the MOOC. However, once again there is no guarantee of this (particularly in an xMOOC) since material may well be licensed more restrictively. There are implications for universities here too. For example, as Kernohan (2013) points out, universities publishing via Coursera are required to grant "a perpetual, non-exclusive, royalty-free, global licence to Coursera" limiting their own future use of the materials. Further, Kernahan raises the issue that platform providers are reluctant to use open licences since this would prevent the tracking of resource usage which provides potentially valuable input for learning analytics.

Although 'online' and 'course' may seem to be on safer ground there are also issues relating to these. MOOCs are designed for online delivery, but there is discussion of how this relates to development and disruption in the off-line world (Rodriguez, 2013a). Further, results obtained by DeBoer et al. (2013) suggest that one of the few positive indicators of student success is collaboration off-line. Supporting interaction between students in the physical world may therefore be an important additional step. The notion of a 'course' is also somewhat ambiguous. In the knowledge generation approach 'the course' is a much more difficult idea to pin down. Even in the case of a prescribed, expert-led agenda, an individual user may only require one targeted part which for them would constitute successful achievement.

It is now the case that terms such as adaptive MOOC (aMOOC), semi-massive open online course (sMOOC), small private online course (SPOC) and a host of other letter combinations are used by various authors to indicate variations on the theme.

5.2 Other models

Kalz and Specht (2013) suggest that the xMOOC and cMOOC as currently encountered are both extremes and that neither is a sensible approach towards supporting effective learning in a multi-faceted community: "the learning design of MOOCs based on the two archetypes cMOOCs and xMOOCs fails to address the real issues of large-scale open online courses and does not take into account earlier approaches to address diversity in large-scale open online learning environments" [Kalz and Specht, (2013), p.8].

Not all xMOOCs take the same approach: the model can be used in different ways. Daniel (2012) refers to some being 'more cMOOC in approach' than others and believes that MIT's strategic xMOOC development is a move towards cMOOC methods and philosophy. However, others argue that "the two current branches of MOOCs are different and will not merge" (Hill, 2012b). The cMOOC ideology "emphasizes creation, creativity, autonomy, and social networked learning" with a focus on shared knowledge creation rather than knowledge duplication (Siemens, 2012).

Whether it is possible or not for an xMOOC to be 'a bit connectivist' it is certainly the case that some MOOC developers are trying to push the stereotypes and develop accessible, mass-participation courses which are more than just a one-size-fits-all knowledge delivery exercise. Examples include the e-learning and digital cultures course from the University of Edinburgh (Knox, 2013) (with it is 'tutor presence' through live video-conferencing) and attempts to support different learning styles (Grünewald et al., 2013). Vihavainen et al. (2012) report a computing MOOC where a high degree of support is provided by current on-campus students who can themselves obtain course credits for acting as tutors. The University of Warwick is running a MOOC to support teachers preparing for delivering the new UK computing curriculum. This offers two modes: the first is similar to most xMOOCs with free access to all materials and peer support and quizzes; the second covers costs of tutor support for online programming lab support and a marked assignment (myscience, 2013). There are other proposals for 'enhanced' MOOCs in which payment gains the student access to extras such as more support and formal, accredited assessment (Kolowich, 2012c).

Increasingly, MOOCs are being used by universities as one element within a blended learning or flipped-classroom approach (Blom et al., 2013; Cooper and Sahami, 2013; Sandeen, 2013).

To try to provide a better framework for capturing different types of MOOC, Clark (2013) suggests a taxonomy based on learning functionality and provides a starting list of eight types (for example, a 'transfer MOOC' is a course which has been moved directly from a traditional context). Conole (2013) proposes a set of 12 dimensions on which MOOCs could be scored as low, medium or high. While a system along these lines would seem to be a good way of providing a meaningful summary of a course type, it is unclear why the stated dimensions should be considered as the defining set of characteristics. It is also the case that the classifiers themselves (such as 'degree of openness' and 'scale of participation') are themselves highly ambiguous and open to interpretation.

6 Issues of teaching and learning

Learning theory relates to the conceptual framework of learning (if any) to which a course is aligned. Pedagogy relates to specific educational and instructional processes which help students to learn.

6.1 cMOOCs and connectivism

The cMOOC approach embodies a connectivist theory of learning as described by Siemens (2005) and Downes (2007). Connectivism focuses on the networks of the digital age in which learning "is focused on connecting specialized information sets, and the connections that enable us to learn more are more important than our current state of knowing" (Siemens, 2005). Learning is seen as a process of identifying and making connections. It relies on "the ubiquity of networked connections between people, digital artefacts, and content" supplied by the World Wide Web (Anderson and Dron, 2011). The emphasis on both interaction and the creation of digital artefacts shows links with both constructionism and social constructionism (Anderson and Dron, 2011).

Some question whether connectivism is a really a new learning theory, suggesting that it is more at the level of curriculum and pedagogy (Verhagen, 2006; Kop and Hill, 2008). A number of pedagogic challenges have also been noted within constructivist MOOCs including the difficulty of forging a path in a confusing proliferation of possibilities, the need for a good level of critical skills and confidence, heavy reliance on charismatic network leaders and the difficulty of helping learners engage and maintain social presence (Anderson and Dron, 2011; Kop, 2011; Chamberlin and Parish, 2011).

Anderson and Dron (2011) note that "connectivist models are more distinctly theories of knowledge, which makes them hard to translate into ways to learn and harder still to translate into ways to teach". Tschofen and Mackness argue that diversity of personality and learning preferences (such as differences arising from introversion and extroversion) need to be further explored within connectivist environments (Tschofen and Mackness, 2012). They reflect that the question of legitimate participation may have more to do with ideology than the complex needs of individual engagement.

Recent work by Clara and Barbera (2013, p.132) has suggested that connectivism does not provide an acceptable account of learning in a networked environment: "although at first glance the connectivist proposals may seem appealing, connectivism does not provide an adequate explanation of learning phenomena in Web 2.0, and therefore it is not able to provide an adequate pedagogy for MOOCs". It is likely that this is just the start of the debate concerning connectivism a theory of learning.

6.2 Pedagogy in xMOOCs

Whereas cMOOCs arise from a very definite ideology, the opposite is true for xMOOCs. Many show little evidence of pedagogic consideration or instructional design and display a "continual lack of recognition of the research, design and best practices that have come from earlier work on online learning" (Bates, 2013). Many xMOOCs use a lecture-dominated format, lack support and feedback and employ narrow assessment methods (Armstrong, 2012). While MOOCs have been hailed as the latest 'disruptive technology' (Conole, 2013), the majority of current MOOCs are xMOOCs which are

anything but disruptive. Traditional teaching methods are used (Ari, 2013), but without the possibility of traditional support methods.

While the goals of reaching large communities of learners and of saving costs have driven many institutions to develop MOOCs, surprisingly little consideration seems to have been given initially to the difficulties of scaling up effective support and assessment methods. Commonly used approaches are peer review and automatic assessment (Balfour, 2013). While these can be very effective tools, the provision for feedback and support in current MOOCs often does not meet users' needs (see Section 7). In an attempt to standardise peer marking the scheme can be so determined that there is no advantage over automatic assessment (Ari, 2013). A number of projects are currently under way which explore how to strengthen the effectiveness of peer to peer interaction using activities which help the formation and effective operation of learning communities within a MOOC. Cross (2013) evaluates the use of project-based collaborative work. The intention was to promote social learning within project groups, but in practice participants were not so enthusiastic, finding it difficult to initiate and maintain the work of the group. Few thought that it had been important to their learning. While group work and social learning may be a very effective tool these results indicate that this needs to be designed and supported very carefully and users may well want to opt out.

While some MOOC providers such as MIT do have a history in e-learning development, many do not (Daniel, 2012). It is not the case that MOOCs will be good quality simply because they come from acclaimed institutions (Pisutova, 2012). Further, high-ranking universities may be very experienced in developing excellent materials for the high-achieving, independent learners that form their traditional student base, but they may have little experience of how to teach other types of learners. Armstrong interviewed provosts from two institutions providing xMOOCs and found that "they were not providing any pedagogical help in the preparation of the courses (in fact, they looked confused about the question)" (Armstrong, 2012).

With such large classes, the diversity amongst learners may be extremely high. Coping with diversity is an established area of educational research, but this is another area that MOOCs have so far done little to address (Kalz and Specht, 2013). The majority of current MOOC participants are already established independent learners (Belanger and Thornton, 2013). Ari (2013) is one of a number of commentators to note that currently MOOCs are generally suitable for a 'traditional student' and "people with professional education and experience looking to expand their knowledge". There may be no problem if that is the intended constituency, but where the leap has been made to expecting MOOCs to provide a suitable learning platform for other groups (such as for remedial courses) the pedagogy has not followed. Some of these issues are explored further below.

7 MOOC issues

A number of issues form common topics of discussion in the MOOC debate. This section introduces some of the most prominent ones. In most of these areas, there is a good deal of discussion, debate and speculation (as evidenced by blogs, forums and press articles) but much less formal investigation or research.

7.1 Direction, difficulty and support

Many blogs point to difficulties in finding a learning path through a 'stuff swamp', not being able to understand the material and being unable to gain the necessary support to make progress when work becomes difficult (Kern, 2013; Chamberlin and Parish, 2011; Clow, 2013). One respondent in Mackness et al's study said: "The reason I stopped is because I cannot understand the issues being discussed any more" (Mackness et al., 2010). In most MOOCs, the very high number of students per instructor means that it is impractical for the necessary support to come from 'the centre', but peer support also founders when the material is hard: "the questions of the confused majority will not be answered quickly enough, and the faculty are too outnumbered by the 100,000 students to keep up" (Kern, 2013).

7.2 Attrition

MOOC drop-out rates are generally quoted as 90% or more (Daniel, 2012; Rivard, 2013a). However, there are different levels of MOOC engagement (Hill, 2013) and many users may be happy with less active participation. There is currently little information available on why so many people drop out or fail to engage. In particular, it is unclear how many students leave because of factors such as level of difficulty, time requirements or lack of support. Without such information, it seems unfair to castigate MOOCs for high attrition. However, it also seems misleading to claim that hundreds of thousands of people are 'participating' when this may be nothing more than an idle mouse click. McAuley et al point out that with a MOOC, "filtering of participants happens after the course starts, rather than before" (McAuley et al., 2010). It may be a point of principle for MOOCs to be open, but it might be useful for courses to provide better information on prerequisites to enable users to make an informed choice at an earlier stage.

7.3 Other people

Mak et al. (2010) found that 'bad behaviour' put many participants off using forums. One participant stated (p.278) that they were discouraged by 'X's appalling behaviour and XX's patronising and 'teachery' posts and actions'. Lack of moderation led to behaviour unacceptable to the majority which was reflected in participants abandoning the forums and which created barriers to connectedness and interactivity (Mackness et al., 2010). One xMOOC participant comments: "too many of the postings were at the dismal level of most anonymous internet comments: nasty, brutish, and long" (Kirschne, 2012). As in many online social forums, a minority do not observe etiquette which, if unchecked, can be a serious barrier to participation and learning for the majority.

7.4 Accreditation

Most MOOCs still offer no more than a badge, although some providers have given careful consideration to developing a system of badges which reflect participants achievements. Cross (2013) reports use of nine different badges covering different levels of participation and contribution. Numbers of badges awarded seem fairly low and of the seventeen responses to the final survey, eight were positive and five mixed or neutral.

Some MOOC users feel that badges are meaningless or childish, while others appreciate them as a mark of recognition or an element of fun.

Certificates are a more formal step-up from a badge system and systems for gaining one vary. Some may require users to undertake additional assessment. Payment may also be required to obtain a certificate. Recognised certificates seem to be proving a popular option and Coursera, for example, has announced its first profits based on certificate sales (Greenberg, 2013).

There is now increasing focus on awarding university credit for successful MOOC completion. In July 2012 the University of Washington became the first to announce 'for credit' MOOCs, for which payment is required. In February 2013 the American Council for Education passed five MOOCs as credit-worthy and, although the details of how exams will be taken have yet to be decided, it will involve payment (Lederman, 2013). It is also likely that for-credit courses will have capped numbers. It thus becomes difficult to see a distinction between this concept of 'MOOC' and other distance learning courses – except that the MOOC may come with fewer instructors and less support. Concern is already being expressed that California's proposal to encourage public higher education institutions to accept MOOCs for credit could be an excuse to hire fewer teachers (Fain and Rivard, 2013).

7.5 Plagiarism

Concerns have been raised over the level of plagiarism within MOOCs, although some point out that there is no evidence to indicate that it is any more of a problem than for traditional courses. When encountered within peer assessments, it is de-motivating for students who find it and who feel that the platform does not provide suitable mechanisms to deal with it (Gibbs, 2012). The major xMOOC platform providers are making provision for measures such as identity checking and examinations held at formal centres. This also relates to issues of accreditation and cost.

7.6 Sustainability

It is not yet clear how MOOCs and MOOC platforms will make money. In 2012, Coursera set out a list of eight possible sources of revenue which includes payment for certification and optional extras (Young, 2012; Daniel, 2012). By September 2013 they had announced that charging between $30 and $90 per certificate had already raised over $1 million (Greenberg, 2013). Universities are currently working "in the hope and expectation that we'll be able to build a financial model' (Lewin, 2012). Some are using MOOCs to recruit for traditional courses. Sustainability also relates to issues of staff input. Many staff have been giving large amounts of their own time to produce and run MOOCs and some are refusing to continue with MOOC involvement unless the time spent is reflected in their workload (Kolowich, 2013b).

7.7 The academic staff perspective

For many academic staff, the opportunity to disseminate a subject they love to a wider audience has been an exciting (if sometimes challenging) experience. However, even for a reasonably direct transfer of an existing course top MOOC format, a considerable

amount of effort is required. For example, Belanger and Thornton (2013) estimate a conservative 600 hours of staff time required to develop their bioelectricity MOOC with a reported eight to ten hours of academic time per week when the MOOC is running (Kolowich, 2013b). To further adapt courses to meet the learning needs and support requirements of different constituencies of learners would take longer.

As noted above, some academic staff feel that the extent of effort required is not being taken into account by their institution and report investing their own time in MOOC development or that other tasks (such as supervising postgraduate students) have suffered (Kolowich, 2013b). Of 103 MOOC developers who responded to this survey of 'early adopters', the majority became involved on their own initiative and for altruistic reasons. (Interestingly, despite being MOOC enthusiasts 72% did not believe that successful MOOC participants deserved formal credit from their institution.)

There are also widely-reported fears amongst faculty over the use of MOOCs. In many institutions, there has been little consultation with staff over how MOOCs should be developed and used, and staff are concerned that their roles may become undervalued (Kolowich, 2013c). This is sometimes received as narrow-minded protectionism and a desire to maintain elitism within a few top universities. However, that is to overlook the genuine fear that students will suffer with reduced pedagogic support (see Section 8).

7.8 Widening participation

One aim of MOOCs is to provide educational opportunities to learners who would not otherwise have access. Issues such as lack of support and the need to be a highly motivated, technically capable independent learner have been identified as limiting the constituency of beneficiaries in practice. Transcending geographical boundaries is another aspect of openness which MOOCs might be able to provide. For example, Devlin (2013) comments "those students around the world whose lives have already been changed by MOOCs (by having access to higher education that would otherwise be unavailable to them) provide reason enough to be pleased with what we have already achieved". However, those that benefit are still the 'lucky few' with the majority of MOOCs remaining highly Western-focused. The delivery language is predominantly English, although in some MOOCs the development of language-specific subgroups has been observed. Issues such as the ability to stream video may also affect accessibility. Although MOOCs are difficult to escape in Western higher education, they are not so widely known throughout the world. Initiatives such as generation Rwanda's MOOC-based programs (O'Neil, 2013) are bringing opportunities to many who could not afford to go to a traditional university but also face accusations of 'intellectual neo-colonialism'. There is also the fear that the adoption of top-down Western education can actually increase the divide between education producers and education consumers (Rivard, 2013b).

7.9 Ability to adapt

Although some suggest that MOOCs provide a flexible and adaptable means of delivering content, in practice the costs of producing good quality recording can be high. EdX expects development costs per course to reach $400,000, the University

of Edinburgh estimates costs of $45,000 for each of its Coursera courses and even locally-produced efforts using an open source platform are costly in terms of staff time (Dejong, 2013). Additional costs are incurred for each run of a course. This may therefore limit the amount of revision that takes place as the course ages. This is another noticeable difference between a recorded MOOC and a course taught in real time since teaching staff using the latter mode would not only be naturally reviewing and updating material but also adapting the presentation for the current class and to include areas of topical interest.

8 A 'MOOC backlash'?

From early 2013, a number of press articles started to report failed MOOCs and staff disagreements (Kolowich, 2012a, 2013a). While this may be no worse than for any other type of course it perhaps heralded a more critical consideration of MOOCs. Two incidents in particular sparked comment of 'a huge MOOC backlash' (Wiley, 2013). In California, Senate Bill 520 (controversial legislation which included provision to allow partially-outsourced online education to be incorporated in for-credit courses) was postponed. Secondly, a joint program between San Jose State University and Udacity to run MOOCs for remedial courses ended with failure rates as high as 71% (Devlin, 2013).

Even before these incidents, university staff were raising concerns over the consequences of having the use of MOOCs forced on them by institutions keen to cut costs. Philosophy staff at San Jose State University refused to use an edX course seeing it as a move to "replace professors, dismantle departments, and provide a diminished education for students in public universities" (Kolowich, 2013c). This echoes concerns expressed by Vardi that, with scant thought to pedagogy and their emphasis on monologues to massive audiences MOOCs are unable to provide a solution to current educational needs (Vardi, 2012). Commenting on the 'backlash', Devlin says "last year's naïve predictions of an imminent revolution are being replaced by a more sane attitude, including a recognition that the current higher education faculty have valuable expertise that cannot be ignored or overridden roughshod" (Devlin, 2013) It remains to be seen whether this is really the case. Many staff actively involved in MOOC development (such as Devlin) have concerns about the way their courses are being used. Mitchell Duneier is no longer willing to teach his well-received Coursera Sociology MOOC "because I think that it's an excuse for state legislatures to cut funding to state universities" (Parry, 2013).

It is not just staff who have raised concerns. Wiley poses the question as to why the public might be more critical of MOOCs than of initiatives such as MIT's OCW (open course ware which looks very similar to many MOOCs) (Wiley, 2013). Wiley answer points to expectations: MOOCs have been billed as providing 'student-facing' teaching and learning opportunities whereas in fact most are of the 'transfer MOOC' variety which independent learners may be able to take advantage of if they happen to have the right prerequisites and motivation.

9 Discussion

In contrast to the burgeoning number of MOOCs and press articles, there is a still a striking lack of formal published research, and currently the answer to many questions regarding MOOCs is "we just don't know". This points to the need for more research and evaluation, and this is gradually starting to emerge. MOOCs are already providing exciting opportunities for some learners, but many of the current expectations are speculative at best. As demographic information from previous courses indicates, the promise of opening up opportunities to new constituencies of learners is not yet being realised. It would of course take time and it may be said that it is too early to see the true effects of MOOC openness. The co-founder of Coursera, Daphne Koller states: "What we're doing is one instructor, 50,000 students. This is the way to bend the cost curves" (Young, 2012). This may be a good way to provide information for those capable of absorbing it, and may be just what budget-holders want to hear, but there is no evidence that it is suitable for all (or even many) learners. Martin asks "how can we intentionally direct ourselves toward learning something new, when we necessarily do not yet understand – nor are we even able to perceive – the very thing that we seek to know?" (Martin, 2012). Beginners often need a good deal of support and those with lower levels of motivation, confidence and skills are likely to require even more. However, in some areas, lower-level courses are being targeted as particularly appropriate for MOOC delivery: the proposed solution to overcrowding in Californian community colleges "would only include popular, introductory courses, which are often overbooked" (Fain and Rivard, 2013).

Current MOOC models have been criticised for not addressing individual learning needs. In order to reach wider demographics, pedagogy is required which encompasses individual styles and preferences and which can provide targeted support for specific needs. One possible avenue is building greater adaptivity into xMOOCs. However, building adaptive courses is generally acknowledged to be a very difficult enterprise and does not replace personal support and feedback. While peer support can be very effective, the expectations currently placed on it seem to be too high. A lack of participants who themselves understand the material and can give time to help others has been identified as a significant problem and cause of dropping out even amongst motivated, experienced learners. While 'one instructor, 50,000 students' may mean that materials produced by a single instructor can be seen by 50,000 students, it does not mean that those 50,000 are receiving appropriate instruction. Another way of putting this is that the majority of MOOCs are successful on an open courseware level of providing access to materials for many who would otherwise not have that opportunity. However, the step from this to claiming that MOOCs can achieve a democratisation of education or that they can save money by rendering instructors redundant is a big one for which very little evidence exists. More work is needed along the lines of those who are exploring and analysing different ways of using the concept, investigating specific objectives rather than overblown generalisations, and providing even-handed, evidence-based evaluation of the results, be it positive or negative.

The large number of participants registering for MOOCs means that there are huge amounts of data being generated about learners, their demographics, behaviour and achievements. As expressed by Kernohan (2013), "MOOC content is content that reports back". There are exciting opportunities here for the application of learning analytics with analysts of some courses already able to predict accurately, for example, when learners

are about to drop out. However, the difficulty of using the large amounts of data for meaningful analysis still remains. Breslow et al. (2013) note that "the challenge for the research and assessment communities is to determine which questions should be asked and in what priority". There is currently no real understanding of what constitutes a 'successful' MOOC and consequently there is little coherence or comparability between the evaluations which are provided. Indeed, since for many MOOCs the students are so diverse and their learning needs so different it is not a simple matter to decide how a course as a whole might reasonably be judged. If the objective is for a high proportion of enrolled students to pass an end of course test then most MOOCs now would not meet it. But if the MOOC is a 'transfer MOOC' aimed at allowing the outside world a window into course materials from a highly ranked institution then it may be achieving its objectives. On the other hand, a similar 'success rate' amongst paying students on a basic remedial course could be viewed as completely unacceptable. Some of the methodological challenges of evaluation are noted by Cross (2013). A better framework is needed, not just for classifying MOOCs, but also to evaluate and assess them. 'Success' on an individual level is a relationship between course and participant and better understanding is needed of users' expectations. Not all will be ones that a MOOC can meet, but for others it may be possible to provide support.

10 Conclusions

MOOCs (c, x and other) are already opening up opportunities of which many learners are taking advantage. Just like any other course, a MOOC might be 'good' or 'bad' not because of the platform itself but because of the set-up, the skill of the facilitators, the suitability of the pedagogy and the objectives and capabilities of the learner. To evaluate whether an endeavour is achieving its aims there needs to be a clear idea of what those actually are. This is likely to differ for different roles and individuals involved, and at the moment, is often very unfocused at all levels. Some institutions and staff do not appear to know why they are engaged in MOOC activity apart from a fear of being left behind or that they have been told to do it.

Even for MOOCs which are not intended to be expert-centric, the structure, support and direction provided by those who set up and facilitate the course can be crucial to successful learning. Providing (or pointing the way) to good quality, open learning materials is a first step and may for some be the key needed to unlock the educational door. However, for many, the leap to joining the learning ladder may currently be too great. There is a danger that the 'openness' on offer hugely privileges those who already have the skills and the 'right' approach to learning rather than representing a true democratisation of education. An additional concern of a 'digital divide' also arises relating to skills in using and access to digital technologies.

Frequently, learners' comment about the need for support, and staff note the large amount of time and effort required to provide even the current levels on offer. There seems to be a discrepancy between this and the expressions of hope that MOOCs can meet the need for mass education and solve cost problems at the same time. There is little hard evidence to be found of the predicted cost savings to institutions or individuals, partly perhaps because it is not possible to compare like for like. There is some suggestion that, when all the hidden costs are taken into account, MOOCs might prove more costly to institutions and that cost savings to learners are also not

yet realised since employers do not take their MOOC achievements seriously enough. While the financial debate continues, we should be cautious about regarding MOOCs as a 'cheap option'. There is a danger that MOOC-learning may not be viable for all and yet resources are being channelled towards them, and this is likely to be at the expense of investment in other areas. MOOCs are also not a cheap option in terms of learners' time and, although the opportunity and flexibility offered is to be welcomed, learners need to have realistic expectations of commitment.

While (many) MOOCs are free and open for participants to register, in the case of the current main platform providers, the materials produced are not available as open educational resources. This means that they remain under copyright which does not allow students and instructors freedom to download, reuse and re-purpose them. Such materials are therefore of limited use to instructors looking for an open-licenced resources. Further, MOOCs are provided as whole course structures with materials having little independent identity or information. This restricts learners who may want to choose parts of of courses suitable for them or to mix and match in order to meet their specific learning needs.

The rush into MOOC provision means that much activity has gone ahead without due attention to appropriate pedagogy and little or no attempt at evaluation. Obviously it is still early days, but the speed with which institutions have joined the MOOC rush has been in stark contrast to the lack of evidence of their effectiveness, or even a real understanding of how that is to be judged. Pedagogy is needed to organise effective learning for possibly thousands of students with a single facilitator. As argued by Hill (2012a), the current xMOOC can be seen as challenging the status quo but the format for transformation of higher education may have yet to emerge. The floodgates of MOOC research are now beginning to open and as further research appears it is hoped that a deeper understanding and conceptual scaffolding will emerge.

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