Journal of Learning for Development – JL4D

ISSN: 2311-1550

Vol. 3, No. 1, pp. 14-36

Positioning Extension Massive Open Online Courses (xMOOCs) Within the Open Access and the Lifelong Learning Agendas in a Developing Setting

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Abstract: Recent reports on xMOOCs indicate that underprivileged learners in need of higher education have minimally been reached by these courses. While the *open access* agenda is needed to reach such learners, most MOOCs have been developed in societies that have shifted toward the *lifelong learning* agenda. In this paper, xMOOCs are positioned in both the *open access* and the *lifelong learning* agendas in a developing country context. Findings from ten xMOOCs are presented and discussed. The findings suggest that two of the ten xMOOCs may be adapted for direct use in opening up higher education within the open access agenda, and two xMOOCs may contribute indirectly to the same agenda. Nine xMOOCs were found to have the potential to contribute to the lifelong learning agenda. These findings may inform policies and practices that underpin opening up higher education and open education in general.

Keywords: Open Access, Lifelong Learning, xMOOCs, Developing Countries, Open Scholarship

Introduction

MOOCs, which evolved from OER and the broader open education movement, rapidly developed to attract global attention. The potential reach, impact and benefit of these courses have raised controversies in academic literature and diverse media. Different MOOC players had advanced bringing high quality education to learners in the least developed countries as their main agenda. In her presentation that displays the slogan "The Online Evolution: Education for Everyone", Koller (2012, 3:40-3:48) states that Coursera's goal is "to take the best courses from the best instructors at the best universities and provide it [sic] to everyone around the world for free". She argued that providing top quality education to everyone around the world for free would enable the establishment of access to education as a fundamental human right, where everyone in the world who is motivated would get skills they need for their own, their family's and community's well-being. Similarly, Thrun (2012) argues that if education is made free everywhere, people in the developing world may become much better and much stronger.

Despite the proffered philanthropic contribution to opening access to education in developing countries, these countries benefited least from xMOOCs. Recent reports have tended to agree

on that MOOCs have been benefiting well-educated learners in developed countries (Alcorn, Christensen & Emanuel, 2014; EADTU, 2014; Guo & Reinecke, 2014; Grainger, 2013; Ostrow, 2013). Liyanagunawardena, Williams, and Adams (2013) outline challenges that inhibit learners in developing countries from benefiting from xMOOCs: unreliable electric power, difficulties in accessing computers and Internet connectivity, language barriers and digital illiteracy. The authors note that the quality of Internet access in many developing countries cannot enable streaming and downloading the video materials used in most xMOOCs.

With adaptation of MOOC content and creation of derivative learning materials that can be disseminated across alternative media, the MOOC impact may be expanded to underprivileged settings. The content in these courses may be adapted to fit with technologies most learners in the least resourced settings have access to or can afford. Nevertheless, the "*All-right-reserved*" copyright which prevails in most xMOOC content inhibits this adaptation. According to Liyanagunawardena et al. (2013), this copyright restricts the benefit of MOOCs to learners in developed societies and already-privileged learners in developing countries. Restrictive copyright also inhibits adaptation of the content to make it relevant across settings (Nkuyubwatsi, 2014a). These restrictions catalysed suspicion of hidden agendas in MOOC practices.

Weller (2011, p. 96) identifies two main agendas that have been promoted in open education: the *open access* agenda and the *lifelong learning* agenda. According to Weller (2011), the *open access* agenda, which is relevant in countries where access to higher education is low, may be no longer relevant in developed societies. As the access to higher education increased in these societies, priority shifted from the *open access* agenda to the *lifelong learning* agenda.

Recent discussions in open education tended to distinguish the *lifelong learning/ flexible learning* agenda from the *open access/ opening up education* agenda. Opening up education moves beyond access to and use of the openly licensed content for continuing professional development. It values services that enable assessment of open learning accomplished using open content for credit. Ouwehand (2012) notes the emergence of open educational services also referred to as "open learning services" (Mulder & Janssen, 2013, p. 36). These services may include, but are not limited to, assessment of open learning accomplishment, open certification and provision of credit to open learners who successfully demonstrate that they have developed competencies required for specific qualifications (Nkuyubwatsi, 2014b). Therefore, opening up higher education may use open education strategies with an agenda to achieve socioeconomic inclusion of underprivileged learners in higher education. Through opening up education, open learners who develop and show evidence of required competencies may enjoy privileges traditionally associated with formal higher education, such as credible qualification, job opportunities, further education opportunities, etc.

Mulder (2015) developed a framework (5COE Model) for opening up education. This framework (Figure 1) consists of five components: 1) Open Educational Resources (OER), 2) openness to learners' needs, 3) open learning services, 4) open teaching efforts and 5) openness to employability and capability development.

In this paper, ten xMOOCs are mapped across the *open access/ opening up education* and the *lifelong learning/ flexible learning* agendas. Mapping the xMOOCs across the two agendas was based on findings that emerged within six analytical themes. These findings were placed in a specific developing setting. Rwanda was the focus context. In this country, access to electric power, computers and the Internet is 18 percent, 2 percent and 7 percent, respectively (National Institute of Statistics of Rwanda, 2014, pp. 87-100). According to the same source, the most ubiquitous technologies in Rwanda are radio, which is owned by 64 percent of households, and mobile phones, owned by 54 percent of households (p. 97). Conditions under which xMOOCs would contribute to opening up higher education in this country are also discussed.

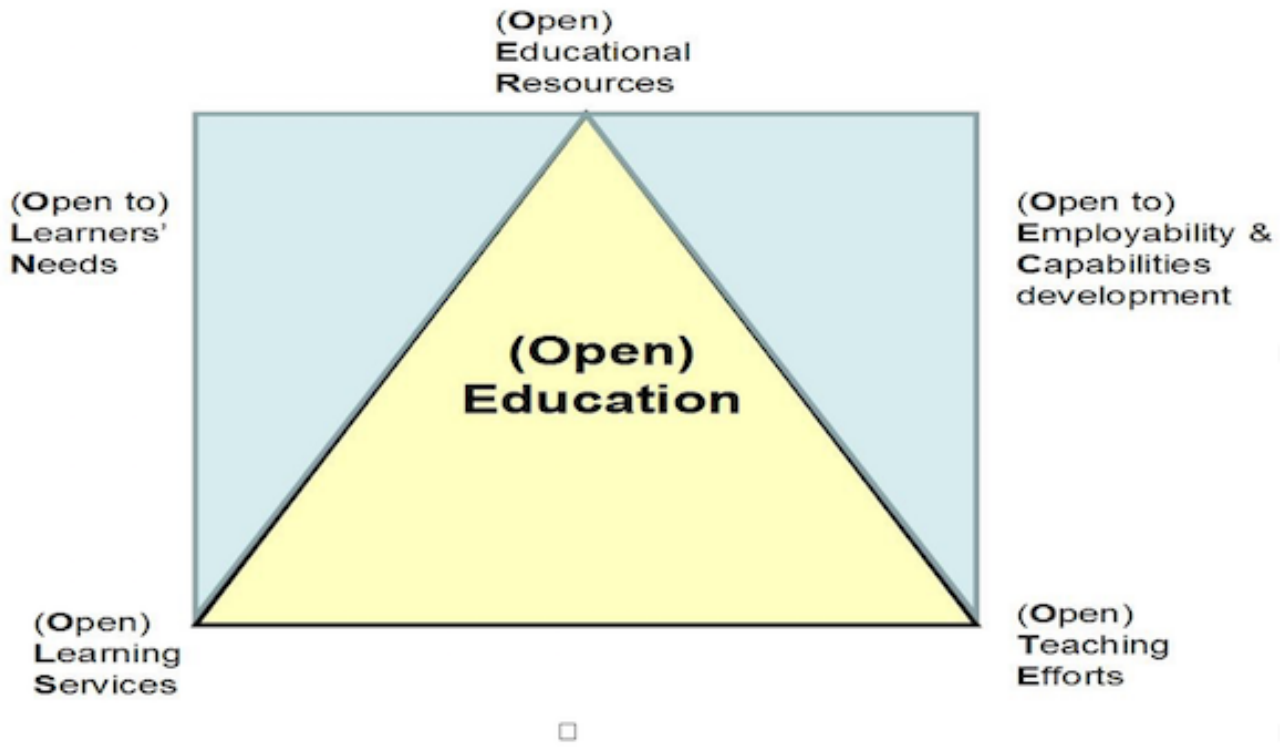

Figure 1: Five components of open education: The 5COE Model (Mulder, 2015)

Research Methods

The study was conducted on 10 xMOOCs which were offered via *Coursera* (nine MOOCs) and *FutureLearn* (one MOOC) platforms. They were offered by universities from different countries: United States of America (five), United Kingdom (two), Australia (two) and Germany (one). These xMOOCs were sampled purposively (Bouma & Ling, 2004) in that the researcher selected the MOOCs in the fields where he had the necessary prerequisites to engage meaningfully with the courses. In this study, the researcher played the role of participant investigator. He took various responsibilities as other MOOC students and was involved as an *all-rounder* (Anderson et al., 2014, p. 688) MOOC participant. Such a participant has a good balance between watching videos and submitting assignments and fully engages in MOOCs to get the most from them. Table 1 illustrates MOOCs that were used in the study. Name courses and offering institutions discussed in this study have been kept anonymous.

Table 1: xMOOCs used in the Study

MOOC	Subject area	University location	Platform	Duration
CS	Business	Germany	Coursera	6 weeks
OGLNMN	Humanities	USA	Coursera	7 weeks
LE	Entrepreneurship	USA	Coursera	6 Weeks
EDC	Technology-enhanced learning	UK	Coursera	5 Weeks
ISRMC	Information and Communication Technology	USA	Coursera	10 weeks
SSY	Sustainable development	UK	FutureLearn	8 weeks
GGSGPB I	Business	USA	Coursera	5 weeks
G	Interdisciplinary	USA	Coursera	10 weeks
AT21CS	Education	Australia	Coursera	6 weeks
LTO	Technology-enhanced learning	Australia	Coursera	8 Weeks

MOOCs were evaluated for their potential to be adapted for use in opening up higher education and open education in a developing context using a rubric the researcher had developed for this purpose (Appendix 1). The MOOC rubric was developed in the light of Achieve's (2011) rubrics for OER content evaluation and the prevailing challenges in Rwanda discussed earlier. Along with this rubric, the researcher also collected data using the MOOC participation logs in which he maintained a regular record of his engagement with these courses (see a template in Appendix 2).

Prior to using the rubric, the researcher piloted it on five MOOCs from the Coursera platform. The rubric was also sent to experts to have their perspective on its validity. Having this research instrument checked by experts added *face validity* (Bryman, 2012, p. 171) to the

research. Bryman (2012) argues that face validity can be achieved by asking people who are experienced or have expertise in the field to judge if the measure appears to reflect the concept concerned or the focus of attention. One of the experts who made such judgment on the rubric had extended experience in open education across different generations of technologies: print-based, radio, TV and online. He also had experience in open and distance learning in developed and developing settings.

The collected data were organised, presented and analysis *by research question* and *by themes* (Cohen, Manion, and Morrison, 2011, pp. 551-552). Creswell's (2014, pp. 197-201) analytical framework that consists of six different stages also informed the analysis:

1) The researcher read through collected data that were recorded in the MOOC rubric and the MOOC participation logs.

2) Then, he wrote a comprehensive summary for each MOOC.

3) He reread the comprehensive summaries, highlighted and commented on MOOC features that can enable adaptation for use in opening up education or contribute to opening up higher education or open education in the specific developing setting of focus (Rwanda).

4) Then, he grouped the features in themes that emerged from the data.

5) After this categorisation, the researcher developed a storyline on MOOC attributes that would enable or inhibit the contribution of these courses to opening up higher education in the focus context.

6) Finally, he discussed the findings in the light of the literature on MOOCs and open education in general.

Results

Although the xMOOCs had common features, they were also different in some respects. The MOOC contents could be based on video materials and assigned readings. The video materials hosted on the Coursera platform were interactive. The students could adjust the speech rate, repeat the videos as much as they wanted and add captions in English. In some MOOCs, these captions were also available in many other languages. Discussion of the learning materials was mainly enabled by the course forum in all the nine MOOCs that were offered via the Coursera platform, and the web comments in SSY that was offered via the FutureLearn platform. In addition to the forum discussion or web comments, Google hangouts were hosted in some MOOCs. Equally, Twitter hashtags were created and shared with the course community in many MOOCs. In some MOOCs, assessment was only based on multiple-choice quizzes and

final exams that could be attempted multiple times. Assessment in other MOOCs could include peer-reviewed projects, peer-reviewed essays, production and submission of digital artifacts for peer review, and this could be in addition to quizzes and final exams. Participation in the forum discussion contributed to the final grade in some MOOCs. Four to seven hours per week were needed to engage with all learning activities and materials. The researcher's participation varied between 15 and 57 hours per MOOC.

Analysis

The investigation of MOOCs that could potentially be adapted for use in opening up higher education or contribute to opening up higher education or the *open access* agenda (Weller, 2011, p. 96) in Rwanda was guided by the research question "*Which MOOCs can be adapted for use in opening up higher education in Rwanda?"* Six analytical categories were identified: 1) *learning materials*, 2) *learning activities*, 3) *learning assessment*, 4) *convertibility into formal higher education credit system*, 5) *scalability,* and 6) *licensing and the legal framework*.

Learning Materials

The nature of learning materials could vary across MOOCs. In OGLNMN, MOOC students learned along with formal students enrolled at the offering university, using same reading materials and meeting in the forum and online game environment. In ISRMC and GGSGPB I, peer-reviewed learning materials and policy documents used by organisations, including governmental institutions, were assigned. Peer-reviewed journal articles, reports and policy documents were also suggested and provided in EDC, SSY, AT21CS and LTO. A diversity of learning materials increased the *content-base* (Lane, 2012) aspect of these MOOCs. In CS and G, similar materials were suggested but they were to be purchased by learners who wanted to have access to them.

Peer-reviewed learning materials and policy documents used by governmental institutions were also assigned in LE. Unlike in other MOOCs, however, the relevance of the materials assigned in this MOOC was limited to the USA and mostly the state of Illinois in which the offering university is based. This limitation could have been mitigated by assigning learners from other settings to find related materials that are relevant to their respective settings. Materials that are specifically relevant to each country exist and this is an opportunity that could have been exploited to make the course more relevant to learners across settings (Nkuyubwatsi, 2014a).

Learning Activities

There was also a cross-MOOC variety in learning activities. Activities in some MOOCs, mainly, CS, LE and ISRMC consisted of watching lecture videos, reading assigned materials

and participation in the forum. SSY and GGSGPB I also included self-assessment and reflection on practices related to the course and sharing these reflections on the course website as comments, or in the forum, respectively. Reflection was also a critical component in OGLNMN, AT21CS and LTO. In OGLNMN, reflection was based on the students' experience in a virtual game environment. In AT21CS, students were given recordings of learners who were involved in a collaborative project. Then, they evaluated the level of development of collaborative problem solving competencies using the rubric provided by instructors. Finally, they could reflect on the evaluation process and share this reflection with their peers. As for LTO, reflection was embedded in the course assignment, which required designing projects based on the concepts covered in the course. In these projects, the designer's and other stakeholders' roles had to be explicit. In short, OGLNMN, SSY, G, AT21CS and LTO were richer in the *task-based* aspect (Lane, 2012) thanks to the diversity of activities assigned in these courses.

In some MOOCs, social media played a significant role in learning and supporting learning practices. Twitter hashtags were created and shared with participants in EDC, SSY, G, AT21CS and LTO. In addition, Facebook communities were created in EDC, AT21CS and LTO. These social media are often not formally controlled by instructors, which arguably contributed to the learning autonomy (Conole, 2013, 2014) and flexibility. These social media also increased the *network-based* (Lane, 2012) aspect of these xMOOCs.

Learning Assessment in MOOCs

With the exception of ISRMC in which assessment consisted only of in-video quizzes, assessment in other MOOCs was broadly classified in two categories. In the first category, learning could be assessed via automated quizzes or exams. In this study, this type of assessment is referred to as *retention assessment*. This category of assessment also includes forum posts (with exception of elaborate posts written in the light of specific guidelines) or votes and computer-graded work that contributed to the final grade. In the second category, assessment was based on work submitted by students for peer grading. This type of assessment is referred to as *product assessment* in this study. It includes forum entries that were elaborate and written in the light of specified guidelines and posted for constructive feedback, projects, essays, digital artefacts and any other work submitted for peer-review.

Learning assessment in three Coursera MOOCs exclusively fell in the *retention assessment* category: CS, GGSGPB I and LE. Assessment in OGLNMN, G, AT21CS and LTO overlapped between *retention assessment* and *product assessment*. It consisted of automated quizzes and final exams as well as peer-graded work. As for assessment in EDC, it exclusively fell in the *product*

assessment category. Learning in this MOOC was only assessed via a digital artefact submitted for peer grading.

Convertibility into a Formal Higher Education Credit

A credit in Rwandan higher education institutions is equivalent to "ten hours of notional student learning effort" (The University of Rwanda, 2014, p. 13). A module weight normally varies between 5 and 20 credits. However, a module may be longer in some circumstances. Most modules consist of several units that may have different credit points, mostly three or four credits per unit.

With exception of LE whose materials had limited cross-setting relevance, all the other MOOCs could be convertible into the credit system used in Rwandan higher education. Based on the time invested in these MOOCs as regularly recorded in the researcher's participation logs, CS, EDC and GGSGPB I were found to be convertible into three credit units in a module. AT21CS was convertible into a four-credit unit. G and OGLNMN were found to be equivalent to five credit units or stand-alone modules of five credits. LTO and SSY were found to be convertible into a six-credit unit and an eight-credit unit respectively. As for ISRMC, it was estimated to be equivalent to a ten-credit unit in a module of 20 or 30 credits or an independent ten-credit module. Table 2 illustrates the basis on which this convertibility was estimated.

Table 2: The Convertibility of xMOOCs into Rwandan Higher Education Credit System

MOOC	Hours the researcher invested	Estimate number of credits
CS	29	3
OGLNMN	46	5
LE	15	NA
EDC	27	3
ISRMC	44 (Readings in week 1 required more than 6 hours per week. Reading in other weeks were skipped)	Estimate of 10 credits (with readings)
SSY	53 (on 70% of activities)	8
GGSGPB I	26	3
G	44	5
AT21CS	38	4
LTO	57	6

The Scalability of MOOCs

The number of course participants was shared in six of the ten xMOOCs: CS, OGLNMN, EDC, G, AT21CS and LTO. As indicated in Table 3, the number of participants who enrolled in the

six MOOCs varied from about 16,000 to over 70,000 students. It is worth noting that these figures included all individuals who enrolled in the courses regardless of their intentions: *viewers*, *all-rounders*, *collectors*, *bystanders*, etc. (Anderson et al., 2014). The exact numbers of *all-rounders* who invested seriously in learning activities and assessment and their completion rates were not available.

Table 3: Gross Enrolment in Six xMOOCs

MOOC	Enrollment
CS	About 70,000
OGLNMN	Over 44,000
EDC	20,232
G	Over 70,000
AT21CS	About 16,000
LTO	About 16,000

Licensing and the Legal Framework

The content in eight MOOCs was copyrighted under *All rights reserved*. The reuse of this content requires written permission from Coursera, which apparently held the copyright for the content of MOOCs provided via this platform. In this way, the use of the content beyond the individual level is as restricted as any other materials copyrighted under *All rights reserved*. In LTO, 85 of 93 videos were copyrighted under Creative Commons licences. These included 63 videos, 67.74 percent of all videos, copyrighted under Creative Commons Attribution Non-Commercial (CC BY-NC) and 22 videos, 23.65 percent of all videos, copyrighted under Creative Commons Attribution Non-Commercial No Derivative CC BY-NC-ND. That makes a proportion of more than 91 percent of open licensing on the course lecture videos. In addition to these video materials, the learning content presented in textual format, either as web materials or PowerPoint slides saved in PDF files was copyrighted under CC BY-NC as highlighted on the *Course Design and FAQs* course web page. Learning materials in SSY were also openly licensed: they were released under the Creative Commons Attribution Non-Commercial Share Alike licence (CC BY-NC-SA UK 2.0). Table 4 summarises results across the six analytical categories.

Table 4: Summary of Results

Analytical Category	Findings
Learning materials	*Lecture videos*: all MOOCs *Reading materials (free of charge)*: OGLNMN, ISRMC, GGSGPB I, EDC, SSY, AT21CS and LTO. *Optional reading materials (to be purchased)*: CS and G. *Reading materials with limited cross-setting relevance*: LE.
Learning activities	*Watching lecture videos, reading assigned materials and participation in the forum*: all MOOCs *Self-assessment*: SSY and GGSGPB I. *Reflection:* SSY, GGSGPB I, OGLNMN, AT21CS and LTO. *Participation in learning communities mediated via social media*: EDC, SSY, G, AT21CS and LTO.
Learning assessment	*Retention assessment*: CS, GGSGPB I and LE.
	Product assessment: EDC
	*Hybrid assessment (*both *retention assessment* and *product assessment*): OGLNMN, G, AT21CS and LTO.
Convertibility into credit system	3 to 10 credits
Scalability	16,000-70,000 students
Licensing and legal framework	*Open licence*: SSY (100%) and LTO (over 90%) *All right reserved*: CS, ISRMC, G, GGSGPB I, OGLNMN, AT21CS, EDC, LE

Conditions for xMOOCs to Contribute to Opening up Higher Education in Rwanda

The study moved beyond the identification of xMOOCs that could potentially contribute to opening up higher education to the discussion of conditions for this contribution to occur. In the light of the research question "*How can these courses be used in Rwanda to open up higher education?*", findings in the six analytical categories were contrasted to the technological challenges in Rwanda earlier discussed. The discussion overlaps between two themes: *policy environment* and *open scholarship* (Weller, 2014; Veletsianos & Kimmons, 2012; Nkuyubwatsi et al., 2015). An extensive investigation on policy environment and the willingness to engage in open scholarship in Rwanda has already been conducted, and some of the results were published in Nkuyubwatsi et al. (2015). However, in the current study, it was also worth exploring briefly the enabling policy environment and open scholarship practices that would enable MOOCs' contribution to opening up higher education (the *open access* agenda) and open education (the *lifelong learning* agenda) in under-resourced settings.

On *policy environment*, the *open access* agenda may need to be championed, with the explicit goal of cutting down the cost of higher education and reaching underprivileged learners. Accessibility of openly licensed content may not contribute to opening up education if there is no strategy to use those resources to offer cost-effective education. This *open access* agenda may be coupled with open education policies that spur innovations in using limited resources

available in Rwanda to scale up higher education opportunities. A participatory approach that engages all stakeholders concerned, including potential open learners, academics, institutional leaders and policy makers is most preferred. To trigger academics' engagement in adaptation and enhancement of the MOOC content and MOOC-based open learning assessment, the policy would recognise and validate these open educational practices. Equally, the policy would need to envisage strategies for assessing open learning for credit to catalyse open learners' engagement in open learning practices based on the xMOOC content.

With regard to *open scholarship*, learners and academics would need to embrace practices that revolve around open learning and supporting open learning based on openly licensed content. For their part, learners would need to develop self-determined open learning practices and attitudes. Nkuyubwatsi (2015) outlines such practices and attitudes. Self-determined open learning practices may include independent use of openly licensed content in personal learning, decision making on personal learning, setting learning goals, planning personal learning processes, focusing, managing and controlling personal learning, prioritising as well as continuing assessment of personal learning progress. Self-determined open learning attitudes include independence, passion, dedication, perseverance and management of failure as a learning tool that does not inhibit moving on. Learners may also need to engage in open learning networks supported by social media, especially the ones that are enabled by mobile applications. As for academics, they would engage in finding and adaptation of open learning materials and using these materials to enhance MOOC content. They would also engage in lifelong learning that would take place in different MOOCs that relate to open, digital, virtual and distance education as well as local and global networks that may be created and run via social media. Academics may also use social media to support open learning practices.

Discussion

MOOCs offer access to learning opportunities and a plethora of learning resources to students who are enrolled in these courses. This access is offered for free, which would constitute an opportunity for learners in under-resourced settings such as Rwanda. OGLNMN was also taught to students at the offering university and MOOC students were assigned the same materials as students at the university. In this case, self-determined learners (Hase & Kanyon, 2001; Anderson, 2010; Canning, 2010; Canning & Callan, 2010; Blaschke, 2012) could possibly benefit from these resources in a similar or comparable way as on-campus students. Materials assigned in many MOOCs include peer-reviewed academic articles, policy documents used by high profile organisations, book chapters and other credible resources. Access to these resources may be a privilege which most learners in under-resourced settings do not have.

The use of social media in MOOCs challenges common knowledge and assumptions about these courses. In this regard, the most familiar classification that compares xMOOCs to cMOOCs (Rodriguez, 2012) does not seem to delineate accurately the boundaries between the two types of MOOCs. This classification has already been criticised as simplistic (Conole, 2013, 2014). EDC harnesses features of both xMOOCs and cMOOCs and learning in LTO was significantly enabled by social media. Blom et al. (2013) argue that MOOCs can enable both individual and social learning. This diversity in learning was especially enabled by the use of social media in many MOOCs.

Assessment in some MOOCs moved beyond the automated multiple-choice questions (MCQs). OGLNMN, EDC, G, AT21CS and LTO assessed more complex skills beyond the basic knowledge assessed via MCQ quizzes, which may have dominated early xMOOCs (Daniel, 2012). In these MOOCs, assessment included projects, assignments or digital artefacts that were submitted for constructive feedback. Provision of constructive feedback to peers, and receiving constructive feedback from peers, are important practices in a professional world. OGLNMN, EDC, G, AT21CS and LTO offered learners an opportunity to develop related competences.

This improvement in MOOC assessment may, however, still not be enough to catalyse recognition and credit to learning accomplished via these courses. Invigilated examination for assessing learning accomplished via MOOCs has been recommended as a precondition for awarding credit to successful learners (Cisel, n.d.; Kopp, Ebner, & Dofer-Novak, 2014; Verstelle, Schreuder & Jelgerhuis, 2014; Iversity, 2013). For administration of this examination, learners who are not formally enrolled in higher education institutions may be required to pay an examination processing fee (Iversity, 2013) or certification fee (Harishankar, 2012). With an agenda to open up higher education, this fee may be a fraction of the tuition fee in institutions located in the context of application. Such a trusted assessment could possibly be used to recognise accomplishment from open learning practices. Many authors argue that such recognition can lead to learners' engagement in open learning practices (Lane & Van Dorp, 2011; Yuan & Powell, 2013; Kopp et al., 2014; Mulder, 2015).

Recognition of learning accomplished via MOOCs can be challenging to MOOC providers who champion attracting MOOC students to campus-based fee-bearing courses as their main agenda. However, those whose achievement of equity, inclusion, social justice, quality, diversity and social mobility (EADTU, 2014; Home, 2014) may see value in the recognition of learning accomplished via MOOCs and other open learning practices. Equally, recognition of accomplishment from open learning via MOOCs can create value for stakeholders who have a tradition of offering higher education free of charge (Heller & Rogers, 2006; Kopp et al., 2014;

Andrei, 2014) or at a low price (Spinu, 2013). Credit on learning accomplished via MOOCs and measures to ensure quality learning from these courses have already been recommended in different countries (Kopp et al., 2014; Kjeldstad et al., 2014). Some institutions have also started exploring this opportunity (Blom, et al., 2013; Iversity, 2013; University of Nicosia, 2014). For MOOCs and their model to be adopted into mainstream education, their fit within the existing system may need to be established. In this study, the fit of MOOCs within the higher education credit system in Rwanda could be estimated based on the amount of time spent on course activities, which was recorded in the researcher's MOOC participation logs.

MOOCs are highly scalable and their model has the potential to contribute to opening up education to more people. The scalability in MOOCs is seemingly enabled by the electronic nature of the resources in these courses. According to Weller (2011), learning resources that are available in electronic format are *non-rivalrous* in that access to them and their use do not happen at the expense of other users. The non-rivalrousness of electronic resources is increased by open licences (Nkuyubwatsi, 2015). In this study, only SSY and LTO had learning materials that were openly licensed. In addition to the permission to download the resources for personal use granted in other MOOCs, SSY and LTO offered the permission to reuse, revise, remix and redistribute the content.

The potential direct contribution of xMOOCs to opening up higher education in Rwanda: The open access agenda

Two xMOOCs, SSY and LTO, were found to have the potential to be adapted for direct use in opening up higher education in Rwanda. The content in SSY and LTO was openly licensed, which enables legal adaptation, revision, and enhancement in a way that is responsive to the learning setting circumstances. For instance, audio files can be created from the video contents that allow derivative work. The derivative audio files can be redistributed to reach learners who do not have access to the good quality Internet access needed to stream and download video MOOC materials, and those who do not have access to the Internet at all. Rwanda has a low level of Internet access (Matherly, 2014; National Institute of Statistics of Rwanda, 2014). Audio recordings can be stored on memory cards, and exchanged from memory card to memory card to be played via learners' mobile phones. Audio recording can also be played via radio devices that have audio recording players. Such devices are affordable in Rwanda. As for textual content, it can be legally printed out and duplicated to reach similar learners.

Tutorial support around the content could possibly be organised with a combination of technologies: broadcasting, mobile phones and social media. Such support would be responding to students/ learners' needs rather than presenting the content through lectures. In addition to tutorial support, learners would need to be assessed to determine whether they meet standards required for credit. Such an assessment is one of the open educational services

(Jacobi & Woert, 2012; Woert, 2012; Ouwehand, 2012; Valkenburg, 2012). These services may be critical to enhancing learners' engagement with the open content from SSY and LTO.

The potential indirect contribution of xMOOCs to opening up higher education in Rwanda: The open access agenda

EDC can contribute indirectly to opening up higher education in Rwanda which would still serve the *open access* agenda (Weller, 2011). This MOOC can be beneficial to stakeholders in Rwandan higher education who want to develop their familiarity with concepts and practices related to opening up higher education. LTO is also well suited for such contribution, which is additional to its possible direct contribution enabled by open licences on most of its content. For such contribution to occur, those who want to hone their competencies in practices that contribute to opening up higher education would enrol in the courses and participate as *all-rounders* (Anderson et al., 2014) who want to take most from the courses.

The potential direct contribution of xMOOCs to open education in Rwanda: The lifelong learning agenda

With the exception of LE in which the relevance of most content was limited to the state and country of the offering university, other MOOCs may be beneficial to Rwandan lifelong learners. These learners may participate in these courses and related global learning communities and/or create and participate in local learning networks (Nkuyubwatsi, 2014a). It is worth noting that the contribution of MOOCs to the *lifelong learning* agenda is more likely to be directly beneficial to those who are already educated or have means for further education or professional development. MOOCs have already been reaching such learners (Alcorn, Christensen & Emanuel, 2014; EADTU, 2014; Guo & Reinecke, 2014; Grainger, 2013; Ostrow, 2013). This should not be surprising, since most MOOCs were designed in societies that may have shifted attention from the *open access* agenda to the *lifelong learning* agenda (Weller, 2011). If Rwandan lifelong learners who would benefit from MOOCs enhance their professionalism and improve service delivery thanks to MOOC participation, underprivileged people they serve may also benefit indirectly.

Conclusion

The low level of reach and impact of xMOOCs in developing settings is mainly associated with the nature of these courses, which is not compatible with the technological infrastructure available in those settings. This challenge may possibly be overcome if the MOOC content is openly licensed to enable the creation of derivative work that can be disseminated in a way that is responsive to contextual challenges. In this study, only two out of ten xMOOCs had content that was openly licensed and most of this content legally allowed derivative work.

Innovations in reuse, remix, repurposing and redistribution of the openly licensed xMOOC content that allow derivative work in a way that responds to challenges in under-resourced context may increase the reach and impact of these courses. MOOCs that have openly licensed content may be adapted for direct use in opening up higher education in underprivileged settings, within the *open access* agenda. For this to occur, this agenda many need to be established among priorities in those settings. Using openly licensed MOOC content in opening up higher education in underprivileged settings may also depend on effective policies that encourage open scholarship. By adopting open scholarship, learners would engage in self-determined open learning practices. As for academics, they may participate in adaptation and enhancement of MOOC content, assessment of open learning accomplishment for credit and continuing professional development via local and global networks.

Educators and other lifelong learners in underprivileged settings may also directly benefit from xMOOCs that are not openly licensed within the *lifelong learning* agenda. Nine of the ten MOOCs investigated were found to have the potential to offer that benefit. These MOOCs would mainly be beneficial to those who are already privileged, as it has been argued in a diversity of MOOC literature. Yet, taking some MOOCs within the *lifelong learning* agenda may indirectly contribute to the *open access* agenda if the MOOCs taken help the lifelong learners develop competencies needed for opening up higher education. In the current study, two MOOCs were found to have the potential to make such an indirect contribution.

Acknowledgment: The researcher is deeply indebted to Professor Gráinne Conole and Professor David Hawkridge for a review of versions of the rubric used in this study and the constructive comments they provided. The researcher would also like to express his gratitude to Dr. Evode Mukama, Dr. Pamela Rogerson-Revell and the anonymous reviewers for their constructive comments on drafts of this article.

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Appendix 1: MOOC Evaluation Rubric

This rubric was adopted from Achieve (2011). It is used to evaluate MOOCs in their nine facets: learner orientation, the quality of explanation, the utility of the material to support learning and teaching, the degree of openness and accessibility, the form of assessment, the level of interactivity, the type of instructional and practical exercises, the opportunities for deeper learning and a cross-cultural relevance (appropriateness within Rwandan higher education in this study). It can be adapted for reuse in different settings or to evaluate online courses of different type. Prior to the use of the rubric, it was reviewed by experts in online education. Then it was tested on five MOOCs from the Coursera platform.

MOOC:
The delivery period:

5 = Positive (The statement very much reflects the reality)
1 = Negative (The statement does not at all reflect the reality)

Major areas	Aspects evaluated	1	2	3	4	5	NA	Comments
Student Orientation	The MOOC provides accurate (heuristic) information about the scope it covers and the workload to enable students to make the right choice.							
	The MOOC provides information about recommended prerequisite for maximizing benefits from it							
	The MOOC includes a study guide							

Quality of Explanation of the Subject Matter	The MOOC provides comprehensive information so effectively that the target audience should be able to understand the subject matter							
	The MOOC connects important associated concepts within the subject matter							
	The MOOC does not need to be augmented with additional explanation or materials							
	The main ideas of the subject matter addressed in the MOOC are clearly identified for the learner.							
Utility of Materials Designed to Support learning and Teaching	The MOOC provides materials that are comprehensive and easy to understand and use.							
	The MOOC includes suggestions for ways to use the materials with a variety of learners.							
	The MOOC and all its components are provided and function as intended and described. For example, materials lists are complete, and explanations make sense.							
	The materials in the MOOC facilitate the use of a mix of instructional approaches (direct instruction, group work, investigations, etc.).							
Type of MOOCs based on Lane (2012) and Conole (2013)	The MOOC is content-based							
	The MOOC is task-based							
	The MOOC is network-based							
	The MOOC is quality assured							
	The MOOC encourages reflection on learning							
	The MOOC enable learning autonomy							
	The MOOC is part of formal learning (credit offered)							
	Certificate of accomplishment is offered							
	The MOOC align with the concept of diversity							
Openness and accessibility	The MOOC materials are copyrighted under an open license							
	The MOOC provides alternative for access to materials for people with low Internet access							
	MOOCs are accessible to students with disabilities							

Quality of Assessments	All of the skills and knowledge assessed align clearly to the content and performance expectations intended, as stated or implied in the MOOC.							
	The most important aspects of the expectations are targeted and are given appropriate weight/attention in the assessment.							
	The assessment modes used in the MOOC, such as Multiple Choice Questions (MCQs), true/false format questions, questions that demand short and long constructed response, or group work require the student to demonstrate proficiency in the intended concept/skill.							
	The level of difficulty is a result of the complexity of the subject-area content and performance expectations and of the degree of cognitive demand, rather than a result of unrelated issues (e.g. The lack of cultural translation enablers).							
Quality of Technological Interactivity	The MOOC is responsive to student input in a way that creates an individualized learning experience. This means the MOOC adapts to the user based on what s/ he does, or the MOOC allows the user some flexibility or individual control during the learning experience.							
	The interactive element is purposeful and directly related to learning.							
	The MOOC is well-designed and easy to use/learn, encouraging learner use and engagement.							
	The MOOC appears to function flawlessly on the intended platform.							
Quality of Instructional and Practice Exercises	The MOOC offers more exercises than needed for the average student to facilitate mastery of the targeted skills, as stated or implied in the course syllabus. For complex tasks, one or two rich practice exercises may be considered more than enough.							
	The exercises are clearly written and supported by accurate answer keys or scoring guidelines as applicable.							
	There are a variety of exercise types and/or the exercises are available in a variety of formats, as appropriate to the targeted concepts and skills. For more complex practice exercises the formats used provide an opportunity for the learner to integrate a variety of skills.							

Opportunities for Deeper Learning	At least three of the deeper learning skills from the list identified at the bottom of this rubric are required in the MOOC.							
	The MOOC offers a range of cognitive demand that is appropriate and supportive of the material.							
	Appropriate scaffolding and direction are provided.							
	The MOOC includes appropriate and timely formative feedback							
Fit in the Rwandan higher education system	The MOOC would fit within levels of higher education in Rwanda							
	The MOOC would fit within the credit system in Rwandan higher education							
	The MOOC would fit within the fields of study ranked as priority in Rwanda							

Deeper Learning Skills:

- Think critically and solve complex problems.
- Work collaboratively.
- Communicate effectively.
- Learn how to learn.
- Reason abstractly.
- Construct viable arguments and critique the reasoning of others.
- Apply discrete knowledge and skills to real-world situations.
- Construct, use, or analyze models.

Adapted from Achieve (2011) *Rubrics for Evaluating Open Educational Resource (OER) Objects*, available from http://www.achieve.org/files/AchieveOERRubrics.pdf (accessed 26 December 2012).

Appendix 2: MOOC Participation log

Week	date	Activities	Time	Total	Observation
1					
2					

3					
4					