1 Massive Open and Online Courses and Open Education Resources in Singapore

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Abstract

This paper looks at the increasing popularity of massive open and online courses (MOOCs) and open educational resources (OERs) offered in Singapore. Despite being a relatively new phenomenon, the Singapore government has collaborated with different organizations to improve the quality and accessibility of MOOCs, and many institutions of higher learning (IHLs) are spearheading efforts to improve OERs to facilitate greater public access to educational resources.

It will also explore the benefits and potential problems that MOOCs and OERs face. For example, both MOOCs and OERs are able to lower the costs of university-level education and increase public access to such courses. They also provide skills and job training for members of the public as well as encourage lifelong learning.

However, both MOOCs and OERs may not be sustainable in the long run, as the financial gains of both may not be able to cover the costs of mounting them. Each system also has its own set of problems. For example, formal structures to guarantee the quality of MOOCs offered remain lacking. MOOCs also tend to have low completion rates and there have been issues regarding plagiarism with the use of MOOCs as learning platforms. OERs pose challenges to traditional copyright policies while lack of sustainable funding prevents them from being adopted more widely. Even though both systems may potentially transform the traditional education system, a deeper understanding of MOOCs and OERs as well as their implications on learning will be useful.

Introduction

Recent developments in technology, the global ubiquity of devices, and the increase in number of Internet users worldwide have ushered in new educational phenomena in the form of MOOCs and OERs. They promise learners abundant, cheaper, and accessible opportunities to education with the existence of OERs and tools in the virtual world (Kim, 2015). They also offer innovative approaches to the development, dissemination, and utilization of knowledge in teaching, learning, and research. This article highlights some developments and applications of MOOCs and OERs in Singapore and discusses the promises and challenges that these new educational phenomena present.

Massive Open Online Courses

MOOCs, a recent development in distance education, were first introduced in 2008 and emerged as a popular mode of learning in 2012 (Kim, 2015). The development of MOOCs is rooted in the ideals of openness in education—that knowledge should be shared freely and the desire to learn should be met without demographic, economic, and geographical constraints.

MOOCs' potential to offer 24-hour access to information, self-paced learning, and cost-effectiveness have attracted millions of learners across the world. They can reach out to a massive group of participants online and allow for interaction among diverse learners across ages, cultures, and nationalities. As a result, MOOCs have received much attention from the media and gained significant interest from IHLs. At present, more than 4,200 MOOCs are being offered by more than 500 universities (Valenzuela, 2016).

In contrast to traditional university online courses, MOOCs differ in two key features, namely:

- **Open access:** Anyone can participate in an online course for free.

- **Scalability:** Courses are designed for a massive number of participants.

However, MOOC providers interpret these features in different ways and at varying degrees. Some MOOCs are massive but not open; some are open but not massive. Issues with regard to the licensing and permissions of current MOOC provision and how these are aligned with the OER community also exist.

MOOCs are not only extensions of existing online learning approaches, they also offer an opportunity to think afresh about new business models that include elements of open education (Li and Powell, 2013). MOOCs can potentially drive down the cost of university-level education and radically disrupt existing models of higher education. As a result, interest and significant enthusiasm for offering MOOCs from governments, institutions, and business associations have been growing. An increasing number of institutions have been involved in engaging and experimenting with MOOCs with the end goal of expanding access with greater potential to showcase and market them in order to grow new income streams. Many IHLs around the world have responded in varying degrees to MOOCs. IHLs have come together to make courses available online by setting up open-learning platforms such as Coursera and edX. These platforms have been launched in collaboration with Ivy League universities that offer online courses for free and a small fee for certification. Among all the MOOC providers around the world, Coursera leads in terms of enrolment (35%), followed by edX (18%) (Valenzuela, 2016). Multinational corporations (MNCs) such as Pearson and Google are also planning to adopt an MOOC-based approach as part of their foray into the higher education sector (Valenzuela, 2016).

MOOCs can generally be categorized into two distinct types—connectivist MOOC (cMOOC) and xMOOC. cMOOC emphasizes the development of understanding and knowledge through forum discussions and collaboration on joint projects guided by the connectivist theory. xMOOC, meanwhile, resembles teacher-centric lectures, which are guided by the behaviorist theory.

Motivations for learners to participate in MOOCs vary. While the participation rate in MOOCs remains high, the completion rate is low. The market value of certification, short of a credit as part of traditional institutional awards, has yet to be determined.

Massive Open Online Courses in Asia

Instances where countries encourage the development and use of MOOCs within educational systems in Asia have been seen. While MOOCs have only been popularized fairly recently (in 2012), over 70 universities now offer MOOCs to adult learners in Asia. The more popular providers include Coursea, Udacity, and edX. Reports indicate that 30% of the Asian population has since registered for an MOOC (Valenzuela, 2016). Most Asian MOOC users see these courses as a way to help them gain specific job skills, prepare for future work, and obtain professional certification. Asian users who have completed an MOOC are generally educated learners with a professional degree.

Singapore

MOOCs play an important role in the next phase of education and skills development in Singapore. As part of encouraging Singaporeans to develop deep skills through lifelong learning, the Singaporean government implemented SkillsFuture, a nationwide movement, supporting the Continuing Education and Training (CET) Master Plan. Through SkillsFuture, Singaporeans over the age of 25 are given SkillsFuture credits worth SG$500 to use for any accredited training program. Midcareer enhancement provides citizens over 40 years of age subsidies amounting to 90% of their course fees (Valenzuela, 2016). These SkillsFuture credits can be used for selected MOOCs on platforms such as Coursera, Udemy, and SIM University (now known as the "Singapore University of Social Sciences [SUSS]"). Reports indicate that MOOCs comprise 12% of all SkillsFuture credit-eligible courses. Around 6% of Singaporeans have utilized their SkillsFuture credits on MOOCs, most of who are between 25 and 39 years old.

In addition, the Singapore Workforce Development Agency (WDA) and the Institute of Adult Learning (IAL) have been working closely with adult educators, business leaders, human resource (HR) developers and policy makers to transform the CET sector. In recent years, IAL partnered with Canvas and Udemy to create and deliver MOOC offerings. The European Union (EU) Center in Singapore also offers EU courses through MOOCs (Cheah, 2016). Since 2014, universities in Singapore such as the National University of Singapore and the Nanyang Technological University have been offering MOOCs on platforms such as Coursera as well. The credits gained can be used as part of a student's qualification for a degree.

Issues and Challenges Related to Massive Open Online Courses

MOOCs present many opportunities to disrupt traditional higher education modes of learning and facilitate lifelong learning for adults. However, issues and challenges such as the quality of courses and completion rate as well as the awarding and recognition of credits, pedagogy, and sustainability must be addressed.

Quality and Completion Rates

Critics have noted that MOOCs cater to a select group of participants who are already interested and motivated to learn via online platforms. MOOCs also demand a certain level of digital literacy from participants. These have led to concerns of inclusivity and equality in terms of access (Li and Powell, 2013).

Typically, MOOCs lack means of formal quality assurance. Crowdsourcing seems to be the preferred way to ascertain quality. Courses are often evaluated by participants, resulting in league tables that rank courses by their perceived quality (Li and Powell, 2013). As such, courses that rate poorly will either disappear due to lack of demand or survive by improving in response to poor ratings. Other ways by which courses are evaluated include soliciting informal feedback or comments from participants on social media.

The low rate of completion for MOOCs has been a point of controversy as well. Meyer (2012) reported that the dropout rates for MOOCs offered by Stanford, the Massachusetts Institute of Technology (MIT), and the University of California (UC), Berkeley were all between 80% and 95%. For example, only 7% of the 50,000 students who took the Coursera-UC Berkeley course in Software Engineering completed it. Cousera's Social Network Analysis class reported a similar dropout rate, as only 2% of the participants earned a basic certificate and 0.17% earned a higher-level programming with distinction certificate. However, some have argued that whether or not these rates matter depends on the purpose of the MOOCs in the first place. If the purpose was to provide access to free and high-quality courses from elite universities and professors to a wide range of learners, then high dropout rates may not be a primary concern (Li and Powell, 2013). However, it would still be useful to improve the retention rates of MOOCs. Studies have been conducted to find out why and at what stage students drop out of courses.

Awarding and Recognition of Credits

Most MOOCs use quizzes as their main instrument of assessment, typically short multiple-choice questions with automated answers for feedback. Some may offer other types of assessment that require open responses. However, due to limited resources, it is not realistic for thousands of essays to be graded by a lecturer. As a result, some MOOCs rely heavily on peer engagement and assessment to support an individual student's learning process. Coursera, for example, includes the submission of essay-style answers, which are graded through peer assessment.

There have been concerns about cheating and plagiarism with online learning as well, particularly when courses are eligible for academic credits. Measures taken to avoid this include sit-down written examinations as part of an MOOC. For example, Coursera works with Pearson test centers to provide in-person examinations.

Pedagogy

Most available MOOCs are in the xMOOC format. However, xMOOCs have been criticized for adopting a knowledge transmission model of learning. They are considered a form of technology-enriched traditional teacher-centered instruction. Coursera gives the institution the freedom to design courses within broad guidelines. However, the institution may not have the necessary resources and manpower to design quality xMOOCs, as they are more time-consuming to produce and require much more planning and coordination.

cMOOCs, on the other hand, provide great opportunities for nontraditional forms of teaching approaches and learner-centered pedagogy where students learn from one another. Online communities crowd source answers to problems and create networks for learning in ways that seldom occur in traditional classrooms in universities. For example, institutions like MIT and the Edinburgh University use MOOCs as an experimental venture to participate in emerging pedagogical models, exploiting peer support and using peer-assessment techniques.

Sustainability

Organizations are still developing approaches to generate sustainable profits from MOOCs. Some common approaches to generate revenue include charging students a fee for certificates of participation or completion or transcripts; providing premium services such as recruiting tools that link employers with students who have shown ability in a given area; and philanthropic donations from individuals and companies.

However, it remains a challenge for partner universities to generate income in these ways. In established business models, universities have control over the customer value proposition in that they provide any recognition of learning and set tuition fees (Li and Powell, 2013). For MOOCs, most participating institutions may choose not to offer credits as part of traditional awards. This may be due to concerns about the quality of the courses and the downside risks posed to their branding. Some may also resist charging fees as doing so contradicts the ideals of MOOCs, which is to offer free education to all.

Open Educational Resources

OERs are teaching, learning, and research resources that reside in the public domain or have been released under an intellectual property (IP) license that permits their free use and repurposing by others such as the Creative Commons (CC) BY-SA license. The distinguishing characteristic of OERs is that they allow others to adapt resources freely with no copyright restrictions.

OERs' inherent value as reusable and remixable resources is to increase access, reduce costs, and enhance educational quality across populations, distances, or social statuses (Dhanarajan and Porter, 2013). OERs can also help address concrete problems such as the availability of print resources (the high costs or limited number of textbooks available), inadequate library and other learning facilities, and poor teacher training (Rossini, 2010).

The reported pedagogical and economic benefits of quality OERs include the fact that they enhance both the institution's reputation and the developer's reputation; improve performance; enable institutions to share best practices; reduce resource development costs and time; extend users' knowledge of a subject or course; support students with no access to higher education; support developing nations; and can lead to the development of communities of practice and social networks (Dhanarajan and Porter, 2013).

Open Education Resources in Asia

A scan of relevant literature revealed that the adoption of OERs in Asia is more widespread in IHLs than in K-12 educational institutions. Generally, governments have no fixed policies on OERs and efforts are mainly led by individual IHLs or nonprofit organizations.

In the case of IHLs, various open universities in Asia rely on OERs for course materials and/or development. For example, the University of the Philippines (UP) Open University (UPOU) and the Wawasan Open University (WOU) in Malaysia use OERs from various sources to form course packages or study materials (Palowski, 2010).

Singapore

A foray into OERs in Singapore is represented by the Open Source Physics in Singapore (OSP@SG) project. OSP@SG is a research project of the Educational Technology Division of the Ministry of Education (MoE) funded by a series of National Research Fund (NRF) eduLab funding initiatives since 2012. OSP@SG received the 2015 United Nations Educational, Scientific and Cultural Organization (UNESCO) King Hamad Bin Isa Al-Khalifa Prize for its pedagogical innovation in using information and communications technology (ICT) in teaching and learning.

OSP@SG helps teachers bring real-world physics concepts into and outside schools through OERs. It is a digital library containing Java, JavaScript, and Tracker resources. The program complements real-life experiments by providing interactive digital resources that run on computers and mobile devices. OSP@SG also created a mathematical modeling function where students' mathematical ideas can be compared with real-life and simulation data. As an OER, the resources developed by OSP@SG can be freely shared or adapted by teachers and students all over the world. It hopes to contribute to providing inclusive education and promote lifelong learning.

Building on the strengths of the Open Source Physics Project based in the U.S. and Spain, OSP@SG also contributes source codes to OERs (simulations and video

trackers) that allow teachers and students to edit and republish remixed resources under CC attribution, share-alike, and noncommercial licenses such as CC BY-SA-NC. This license gives the required permission ahead and makes it clear what others can and cannot do with OERs.

Issues and Challenges Related to Open Education Resources

While OERs are valuable in improving the overall access to education, barriers to their widespread adoption exist at both the government and institution levels as well as the individual level. These challenges include issues on IP, commercialization interest, and sustainability.

Intellectual Property Rights

Existing policies and practices at the government or institution level could be contrary to the spirit of OERs. One example is the IP rights issues that stem from the development of OERs by users. An OER, by definition, would require a specific copyright clause, which may differ from existing institutional policies where resources created would belong expressly to the institution with no derivatives or sharing allowed. When OERs licensed as CC share-alikes are adapted to create new resources, the resources remixed by a user have to be licensed as CC share-alikes as well. However, if a CC no-rights-reserved license was used, the user is not required to license adapted resources as OERs. With OERs and the increasing popularity of CC licensing, institutions would need to strengthen their understanding of IP rights and related issues.

Commercialization Interest

The model of education based on commercialization in a particular country can also be detrimental to the widespread adoption of OERs. If the higher education system is highly commercialized, it may discourage OER creation and use in IHLs. Profit-driven business entities may be reluctant to offer free public access to their materials.

Sustainability

Funding policies could present another issue to the development and sustainability of OERs. Project-based funding, if used to develop OERs, may lead to resource obsolescence when the funding duration runs out. In that case, the sustainability of OERs after the funding duration would depend on the educator community continuing to develop them through voluntary and autonomous activities.

Conclusion

In promising accessible, inclusive, massive, and free offerings, both MOOCs and OERs usher in a new paradigm to education. The popularity of MOOCs has drawn attention from institutions, governments, and private investors around the globe who are trying to build their brands and enter the education and training market. The draw of OERs is evident from the emergence of a ground-up community of passionate developers, educators, and users in Singapore and around the world.

While the possibilities offered by MOOCs and OERs can be attractive, it is important to remain cognizant of the implications and limitations that these new phenomena also bring. As emerging trends that have the potential to radically shape the educational landscape, a deeper study on MOOCs and OERs in Singapore as well as their impact on policies and legislations in specific societal and national contexts can be illuminating.

References

1.   Apple Inc. (2016). *iTunes Preview.* "Ezzy Chan." Last accessed on 31 March 2017, https://itunes.apple.com/us/developer/ezzy-chan/id1161971940.

2.   Bowon Kim, Wang Ying, Karanam Pushpanadham, Tsuneo Yamada, Taerim Lee, Mansor Fadzil, Latifah Abdol Latif, Tengku Amina Munira, Norazah Nordin, Mohamed Amin Embi, Helmi Norman, Juvy Lizette M. Gervacio, Jaitip Nasongkhla, Thapanee Thammetar, Shu-Hsiang (Ava) Chen, Mie Buhl, Lars Birch Andreasan, Henrik Jensen Mondrup, Rita Birzina, Alena Ilavska–Pistovcakova, and Inés Gil-Jaurena. (2015). "MOOCs and Educational Challenges Around Asia and Europe." Last accessed on 31 March 2017, http://asemlllhub.org/fileadmin/www.asem.au.dk/publications/MOOCs_and_Educational_Challenges_around_Asia_and_Europe_FINAL.pdf.

3.   Carolina Rossini. (July/August 2010). "The Open World: Access to Knowledge as a Foundation for an Open World." Last accessed on 31 March 2017, http://net.educause.edu/ir/library/pdf/ERM1045.pdf.

4. EDUCAUSE. (2017). *EDUCAUSE Library.* "Massive Open Online Course (MOOC)." Last accessed on 31 March 2017, https://library.educause.edu/topics/teaching-and-learning/massive-open-online-course-mooc.

5. Ethel Agnes P. Valenzuela. (13−14 December 2016). "ICT MOOCS in Southeast Asia: Trends and Challenges." Last accessed on 31 March 2017, http://belmawa.ristekdikti.go.id/wp-content/uploads/2016/12/3.SEA-MOOCS-Meeting-Jakarta-DDPD-final.pdf.

6. "Frequently Asked Questions: OER for K-12 Educators." Last accessed on 31 March 2017, https://www.oercommons.org/static/staticpages/documents/FAQ-OER-K-12.pdf.

7. Gajaraj Dhanarajan and David Porter (Editors). (2013). "Open Educational Resources: An Asian Perspective." Last accessed on 31 March 2017, https://oerknowledgecloud.org/sites/oerknowledgecloud.org/files/pub_PS_OER_Asia_web.pdf.

8. Google. (2017). "OpenSourcePhysicsatSingapore." Last accessed on 31 March 2017, https://play.google.com/store/apps/dev?id=7915608832562607433.

9. Government of Singapore. (25 October 2016). *Ministry of Manpower.* "Refreshed Continuing Education and Training (CET) Master Plan." Last accessed on 31 March 2017, http://www.mom.gov.sg/employment-practices/skills-training-and-development/refreshed-cet-masterplan.

10. Horn Mun Cheah. (10 October 2016). "Making MOOCs Work—Some Thoughts." Last accessed on 31 March 2017, http://www.unescobkk.org/fileadmin/user_upload/apeid/HigherEdu/MOOCsOct16/3-Horn_Mun_Cheah-.pdf.

11. Jan Hylén. "Open Educational Resources: Opportunities and Challenges." Last accessed on 31 March 2017, http://www.oecd.org/edu/ceri/37351085.pdf.

12. Jing Yng Ng. (17 November 2015). *Channel News Asia.* "After Successful Run of Its Online Courses, NTU Will Offer More Next Year." Last accessed on 31 March 2017, http://www.channelnewsasia.com/news/singapore/after-successful-run-of/2267868.html.

13.   Li Yuan and Stephen Powell. "MOOCs and Open Education: Implications for Higher Education." Last accessed on 31 March 2017, http://publications.cetis.org.uk/wp-content/uploads/2013/03/MOOCs-and-Open-Education.pdf.

14.   Mario B. Casayuran. (27 September 2010). *HighBeam Research.* "DepEd Eyes Textbook-Free Education." Last accessed on 31 March 2017, https://www.highbeam.com/doc/1G1-238084705.html.

15.   MoE Singapore. (17 March 2016). *eduLab.* "Existing Projects." Last accessed on 31 March 2017, https://edulab.moe.edu.sg/edulab-programmes/existing-projects.

16.   *Open Source Physics.* (2003−2017). Last accessed on 31 March 2017, http://www.opensourcephysics.org/.

17.   Shahrin Sahib and Siti Hamisah Tapsir. "Regional Expert Meeting on Massive Open Online Courses: MOOCs for Higher Education in Asia and the Pacific." Last accessed on 31 March 2017, http://www.unescobkk.org/fileadmin/user_upload/apeid/HigherEdu/MOOCsHE15/MHEM_Malaysia.pdf.

18.   SkillsFuture Singapore and Workforce Singapore. (8 January 2017). *Skills Future SG | Workforce Singapore.* "Steady Progress in Implementation of SkillsFuture Credit." Last accessed on 31 March 2017, http://www.ssg-wsg.gov.sg/new-and-announcements/08_Jan_2017.html.

19.   Stephen Downes. (2007). "Models for Sustainable Open Educational Resources." Last accessed on 31 March 2017, http://ijello.org/Volume3/IJKLOv3p029-044Downes.pdf.

20.   Tsuneo Yamada, Insung Jung, Taerim Lee, Mansor Fadzil, Jan M. Pawlowski, Henri Pirkkalainen, Juvy Lizette Gervacio, Nozarah Nordin, Mohamed Amin Embi, Jaitip Nasongkhla, Shu-Hsiang Ava Chen, Rita Birzina, Karanam Pushpanadham, Anjali Khirwadkar, Jaroslava Kovacova, Gabor Szudi, Alena Pistovcakova, and Lina Wang. (2014). "Open Educational Resources in Lifelong Learning." Last accessed on 31 March 2017, http://asemlllhub.org/fileadmin/www.asem.au.dk/publications/e-ASEM_OER_2014.pdf.

21. Udemy, Inc. (2017). *Udemy.* "IAL (Institute for Adult Learning) Singapore Sg." Last accessed on 31 March 2017, https://www.udemy.com/user/ialsg/.

22. UNESCO. (2017). *ICT in Education.* "2015—'Pedagogical Innovation in the Use of ICTs in Teaching and Learning.'" Last accessed on 31 March 2017, http://www.unesco.org/new/index.php?id=129455.

23. Vietnam Foundation. *Introduction to Vietnam Open Educational Resources Program.* Last accessed 31 March 2017, http://voer.edu.vn/Content/About-Us/.