Open Praxis, vol. 13 issue 1, January–March 2021, pp. 127–137 (ISSN 2304-070X)

Lessons learned developing a massive open online course in implementation research in infectious diseases of poverty in low- and middle-income countries

Pascale Allotey
United Nations University (Malaysia)
pascale.allotey@unu.edu

Daniel Reidpath
ICDDRB (Bangladesh)
dreidpath@icddrb.org

Edith Certain, Mahnaz Vahedi, Dermot Maher & Pascal Launois
WHO (Switzerland)
certaine52@gmail.com, vahedim@who.int, maherd@who.int & Launoisp@who.int

Bella Ross
Monash University (Australia)
bella.ross@monash.edu

Abstract

This study uses a case study approach to examine the development of a massive open online course (MOOC) on intervention and implementation research in infectious diseases of poverty for learners in low- and middle-income countries (LMICs). Implementation research (IR) seeks to understand and address barriers to effective implementation of health interventions, strategies, and policies. In recent years, IR has attracted increased interest, and corresponding demand for training, however, current training opportunities are not easily accessible to learners in LMICs. In 2017, the MOOC was introduced to a diverse range of learners to enhance access to training materials and has been offered yearly since. Findings are based on the experiences of the MOOC working group which included developers and facilitators, and on interpretations of data such as forum discussion activity and Facebook posts. The use of material from local contexts and in local languages, and professional facilitation of discussion forums was identified by the working group to be key considerations in developing the MOOC. Other findings include the importance of using clear instructions and preparing discussion questions to stimulate learner engagement. These findings add to the limited knowledge of MOOCs developed for LMICs and are of value to others developing professional development MOOCs in LMIC health contexts.

Keywords: MOOC, online learning, learning design challenges, professional development, learners from low- and middle-income countries, implementation research

Introduction

Implementation research (IR) develops strategies to improve access and uptake of health interventions by the populations in need and plays a critical role in improving the delivery of disease control interventions. Recent years have seen an increase in interest in IR and a corresponding increase in demand for IR education, resulting in the growth of training programs and university courses (Carlfjord et al., 2017; Chambers et al., 2016; WHO, 2019). Many of these programmes and courses,

Reception date: 6 October 2020 • Acceptance date: 9 March 2021
DOI: https://dx.doi.org/10.5944/openpraxis.13.1.1172

however, cannot be accessed by health professionals in low- and middle-income countries (LMICs). This is despite the finding that the need to address implementation bottlenecks is often greatest in LMICs, where the human resource for health research is weak or non-existent and health systems are underdeveloped (Sheikh et al., 2020).

To address the gap in IR education in LMICs, The Special Programme for Research and Training in Tropical Diseases (TDR) has developed training courses, including a Massive Open Online Course (MOOC) on IR on infectious diseases of poverty in LMICs (Launois et al., 2019). TDR focuses on intervention and IR to better understand and address barriers to effective implementation of health interventions, strategies, and policies. As MOOCs have been used for professional development purposes worldwide, including in LMICs (Czerniewicz et al., 2014; Deacon et al., 2017; Garrido et al., 2016; Hrdli ková & Dooley, 2017; Murugesan et al., 2017) where they can assist with the training needs of the health sector (Liyanagunawardena & Aboshady, 2017), they therefore seemed an obvious choice to provide flexible and free IR education to health professionals in LMICs.

In 2017, the TDR IR MOOC was introduced to a diverse range of learners in LMICs and has since been offered yearly. The IR MOOC has been disseminated through a network of Regional Training Centres (RTCs) supported by TDR (WHO, 2021). This paper outlines the process used to develop the MOOC and the considerations and challenges that were found to be relevant for a MOOC on IR aimed at professional learners in LMICs.

Methods

This study employs a case study approach to examine the process of developing the IR MOOC (Crowe et al., 2011). The case study approach allows for an in-depth exploration of an issue in its real-life context - in this case, the lessons learned during the development of the TDR MOOC in IR by those involved in the process. This article describes the three phases of the development of the MOOC and the challenges identified and lessons learned in each phase: 1) the planning phase; 2) the development phase; and 3) the implementation phase. Findings are based on the considerations, experiences and perceptions of the MOOC working group (which includes several of the authors of this article) both in preparation for, and during the development and implementation of the MOOC. Findings are also based on the working group's interpretation of MOOC data such as discussion forum activity and Facebook discussions. These findings were documented at the time of the planning, development and implementation of the MOOC as well as after completion of the MOOC, particularly in connection with the preparation of this article. These descriptions therefore provide valuable insights into the considerations that played a role in the development of the MOOC, the decision-making of the working group, and the lessons learned by the working group.

Lessons learned

The planning phase

The rationale for the MOOC

A MOOC is an online learning tool that delivers learning objectives through a series of short videos, formal presentations, recommended readings, discussion forums and automated assessments. With the absence of subscription fees, anyone with a reliable internet connection can enrol and access the course resources, interact, and share knowledge with the respective peers, making education more accessible to a massive audience. While some MOOCs charge fees for certificates or proof of enrolment, a MOOC is intended to be 'open' to anyone to enrol in and therefore free.

In 2019, it was estimated that 110 million learners participated in around 13500 MOOCs developed by over 900 universities (Shah, 2019). MOOCs were originally promoted as a means of enhancing social mobility and democratising education, making it available to anyone with a device and internet connection, yet the reality has not borne that prediction out (van de Oudeweetering & Agirdag, 2018). Instead, the majority of MOOC participants are well-educated, employed, male, middle class, and from high income countries (HICs) (Christensen et al., 2014; DeBoer et al., 2014; Escher et al., 2014; Liyanagunawardena et al., 2015; van de Oudeweetering & Agirdag, 2018).

Despite this, however, MOOCs have benefited learners in LMICs. Furthermore, completion rates are reported to be higher in professional development MOOCs in LMICs between approximately 30% and 68% (Garrido et al., 2016; Hone & El Said, 2016; Hrdličková & Dooley, 2017; Murugesan et al., 2017) than in MOOCs in general in HICs where retention rates sit at approximately 5–10% (Breslow et al., 2013; Hew & Cheung, 2014; Zhenghao et al., 2015).

TDR developed in 2016 and introduced in 2017 the IR MOOC to a wide range of learners to enhance access to IR training materials. By doing so, TDR aimed to improve access to its training courses from a centralised and localised RTC to a global and decentralised mode of delivery.

Identification of target audience

The first step was to define the target audience for the TDR MOOC on IR to accurately tailor the course content to meet the academic level and abilities of the participants.

Three main target audiences were considered for the MOOC:

1) Public health officers, such as policymakers, disease control programme managers.
2) Academic researchers from universities or medical research institutions; and
3) Students who received a scholarship through the Master of Public Health funded by seven universities supporting TDR postgraduate schemes, as well as students who participated in face-to-face short courses on IR at RTCs.

Defining the target audience was important to:

1) ensure the appropriate pitch of the academic level of the MOOC. The language used had to avoid any jargon and ensure consistency and comprehension by all audiences globally.
2) identify an appropriate length of the MOOC. For example, public health officers from LMICs could only access the MOOC periodically due to their pre-existing commitments and heavy workloads; and
3) decide on the language to be used. Many health professionals working in LMICs are non-English speakers.

The format of the MOOC

In preparation, the MOOC team participated in existing MOOCs, which allowed them to better understand the logistics, pedagogy and technical skills required to develop a MOOC.

TDR decided to spread the delivery of the content of the MOOC over five weeks with one module per week. Each module, in turn, comprised five chapters of ten minutes each. The length of these chapters was considered adequate for knowledge and skills transfer in a working environment where time is constrained.

The course was developed in English, however, to ensure equity, subtitles were made available for non-English speaking participants, initially in French and Spanish. The MOOC was developed in

English due to it being the research language, while French and Spanish were used to reach more people and for equity purposes. For example, those in French-speaking countries, such as those in Sub-Saharan Africa, may not speak fluent English. Likewise, Spanish was used to ensure equity in Latin America. For quality assurance purposes, the subtitles were back-translated by native speakers, who were familiar with the domain language of IR. Due to increasing demand, the MOOC has since been made available with full translations in French, Spanish, Chinese, Arabic and Russian. This covers the six official languages of the WHO.

The development phase

Recruiting a team

A dedicated working group with clear roles and responsibilities was recruited. The team included technical professionals to write, review and present the materials and a support team composed of videographers, video editors, graphic artists, text editors and a communication officer.

One of the challenges identified by the working group was how to contextualise the course to the target audience in LMICs. The MOOC contents needed to be developed by and for LMICS, with relevant real-life examples. As findings reveal that MOOCs in LMIC contexts have been both relatively less researched and adopted than in other parts of the globe (Rasheed et al. 2019), this also led the team to initiate research regarding the development of the MOOC, how participants received the MOOC, and any changed behaviours and professional outcomes as a result of participating in the MOOC.

An extensive review of the literature on IR using PubMed revealed there to be few experts with IR capacity building in LMICs. Despite this, however, TDR identified members (scientists working on IR who were either researchers or implementers) to be a part of the MOOC working group and attend an initial workshop. In this workshop, members decided on the modular structure and the curriculum of the MOOC and assigned each module of the MOOC to a developer responsible for adapting the contents to a MOOC. Among the 16 experts who were invited to the first workshop, ten were from LMICs (Botswana, China, Colombia, Ghana, India, Indonesia, Kazakhstan, Kenya, Philippines and Tunisia) and six were from high-income countries, including Germany, Portugal, Switzerland, UK and USA and had relevant experience in IR in LMIC contexts. During the first workshop, the course structure and format were agreed upon, which included online video training for the five modules. A second workshop was organised for all the identified developers to review and harmonise the contents of each module and select presenters able to present authoritatively on camera while delivering the lectures and presentations.

With respect to the support team, TDR identified the Ecole Polytechnique de Lausanne (EPFL) in Switzerland, due to their extensive and wide experience in developing different MOOC platforms particularly for LMICs. The support team was coordinated by an administrator with proven high-level project management skills who ensured the timely execution of the project.

Developing the curriculum

As with any training course, a MOOC requires curricula with clear learning objectives and delivery timelines (Pickering et al., 2017; Zhu et al., 2018). A specific topic must be allocated for each week of the course following a logical pathway to optimise the learning experience. The development of realistic workloads and timeframes for completing the MOOC requirements is necessary. Subtitles were required to reach learners with disabilities (mainly hearing disabilities) and translated subtitles

were required for learners whose language of instruction is not English (see above in *The format of the MOOC*). The copyright agreement for using videos needed to be obtained.

The working group identified that it was crucial to use context-specific examples in the MOOC. Local and context-specific content has been found to be lacking in MOOCs in LMICs (Czerniewicz et al., 2014; King, Luan et al., 2018; King, Pegrum et al., 2018; Nkuyubwatsi, 2014), and this has been raised as a concern by learners (Launois et al., 2019). Contextualising content may benefit learners and may even increase retention rates (Castillo et al., 2015; Daniel et al., 2015; Nkuyubwatsi, 2014; Richter & McPherson, 2012). Indeed, MOOC completers cite interesting and appropriate content as one of the factors that contributed to their motivation to learn and engage with the course (Hone & El Said, 2016).

In addition to a series of short ten-minute long videos, clear instructions were provided on how to take quizzes and respond to the assignments that were relevant to each module. This was done to promote participants' engagement, illustrate the IR concepts and enhance context-specific learnings. For example, the TDR MOOC on IR consists of five modules delivered over a five-week period, with an extra 1–2 weeks provided for the final assignment. The MOOC was structured with the following contents offered in each module:

Module 1:	The definition of IR and the assessment of the appropriateness of existing disease control programmes
Module 2:	The identification of challenges of various health settings
Modules 2 & 3:	The development of new interventions and strategies by working with communities and stakeholders
Module 3:	The specification of implementation research questions and design of rigorous research projects
Module 4:	The identification of IR outcomes and evaluating effectiveness
Module 5:	Plans for scale-up implementation in real-life settings

Designing appropriate assessments

In general, MOOCs engage thousands of learners, and despite the inherent difficulties involved, it is important to provide all of them with timely feedback. Whether using quizzes or peer assessments, the assessments must align the intended learning objectives. For the IR MOOC, multi-choice automated quizzes were designed with detailed feedback for each of the responses at the end of each module. To monitor learners' progress, a short paragraph after each response was provided to explain why the learners' responses were correct or incorrect.

The final assignment included the development of a proposal that reflected the learning objectives of all the modules. This assessment task involved a peer assessment component. When using peer review, it can benefit learners to structure the task by introducing a standard and explicit template for the process which provides clear instructions on how to assess the peer work and on which components to focus (Boud et al., 2014). In the TDR MOOC, the working group identified that the process of how to peer review the final assignment needed to be clearly explained as evidenced by a high number of participant queries, as well as a number of complaints from participants that the instructions were not clear.

Ensuring a smooth video-recording process

Several rehearsal sessions were scheduled before the final video-recording of each module. The recording studio contained several cameras and an interactive desk and tele-scripter to ensure that

the presenter felt at ease when speaking in front of the cameras. To give confidence to the presenters, before the official recording, they were trained to be recorded in a similar studio environment. To maintain learner engagement and to distinguish each new module from the previous, the presenters were advised to change their outfits for each video-recording session.

Implementation Phase

Communication strategy

A clear communication and dissemination strategy, which included using short and straightforward messaging, was decided on by the team prior to the launch of the MOOC. This strategy included producing simple flyers –in different languages– to promote the course during networking events, scientific conferences as well as partners' websites. As an example, TDR produced two short trailers of three to five-minute length with an international expert and a TDR staff member. The trailers were disseminated through a Facebook page and are thought to have improved course participation considerably as indicated through the many interactive discussions that took place on Facebook. Each trailer described the reasons for developing the MOOC as a training tool, its duration and content, and the target audience. A podcast was also developed to promote the course free of charge and to encourage peers to connect through the course.

Management of the discussion forum

Discussion forums are an essential element of a MOOC for developing an online community and encouraging interaction amongst learners. However, the forum discussion needed to be carefully moderated by responding to the learners' queries. Indeed, learners' satisfaction with MOOCs generally is linked with the quality of interactions with facilitators (Khalil & Ebner, 2013; see also Goshtasbpour et al., 2020). Studies have shown that learners who disengage and do not complete a MOOC cite negative engagement from MOOC instructors (Hone & El Said, 2016). This negative engagement includes poor engagement from instructors in discussions; a lack of praise from instructors following assessments; poor communication with both instructors and peers; poor feedback from both instructors and peers; a lack of teamwork or group interaction. These behaviours lead to decreased motivation for learners and a higher likelihood of them not completing a MOOC (Hone & El Said, 2016).

A key issue identified in the discussion forums in the first MOOC sessions was a lack of active engagement. In this case, less than 5% of the participants were actively engaged in the TDR MOOC discussion forums. Based on the total number of visits on the discussion pages, it became clear that some learners were following the discussions but were not actively engaged by contributing to the discussions. Ensuring that discussion forums work as intended in MOOCs in general has been documented to be challenging (Breslow et al., 2013; Hew & Cheung, 2014; Li & Canelas, 2019; Watson et al., 2016). Issues include low participation rates, slow responses to posts and poor quality or superficial discussions.

Many MOOC participants are generally found to be passive participants or 'lurkers' (Milligan et al., 2013); Lurkers are participants who actively follow the course content by, for example watching videos, but who do not engage in the discussion forums (Milligan et al., 2013). Indeed, in the TDR MOOC, two thirds of the MOOC participants were found to be lurkers. To encourage forum discussions in subsequent MOOC sessions, TDR developed a range of questions and discussion points relevant to each module to stimulate discussion.

Another challenge faced by TDR in relation to the discussion forums was that discussions were often fragmented. In the forums, learners tended to start new discussions rather than respond to already initiated topics even when these related to their specific query. One solution to this issue was to ask the learners to respond to the posts rather than create new ones. The MOOC facilitators found that closing discussions that had a high number of posts by summarising the ideas allowed participants to quickly gain an overview of the main issues discussed. The use of prepared questions as examples to start discussion was also found to be a solution to this issue as, once these were implemented, it was found to increase discussion activity by encouraging participants to engage with the discussion.

To further address these issues, TDR developed a facilitator guide and decided to regionalise the management of the MOOC to institutions in which TDR has already developed partnerships in IR capacity building. These include the RTCs which are supported by TDR to disseminate IR relevant training courses.

The quality improvement process

To ensure continuous improvement in the course content and delivery, the MOOC team used two approaches: 1) Piloting and 2) Monitoring and evaluation. These are described below in detail.

Piloting the MOOC

As part of quality improvement, it is advised to pilot a MOOC with a smaller cohort of learners and obtain their feedback before launching. This iterative process will enhance uptake and adherence to the course. For these reasons, TDR first piloted its MOOC amongst 110 learners across the globe. Based on their feedback, TDR refined some of the quizzes, relevant assignment tasks and timeframes required to complete the assignments. For further details, see Launois et al. (2019).

Monitoring and Evaluation Framework

The Kirkpatrick Model is used as a basis to evaluate training programmes and includes evaluations at four levels: 1) Reaction – the way learners react to the experience of the course; 2) Learning – the new knowledge, skills and attitudes they gained during the course; 3) Behaviour – how the latest knowledge, skills and attitudes are applied and 4) Results – improved job and organisational performance.

Therefore, to evaluate the learners' reactions to the MOOC and the knowledge and skills they gained, a survey was sent to all learners who completed the course. One of the main improvements to the MOOC based on the responses from this survey was to translate the course into other languages. Indeed, although the platform provided information on the number of registrants, the number of completers and the number of certified (TDR gave a certificate of completion), to analyse step 1 and 2 of the Kirkpatrick Model, TDR sent a survey at the end of the course to all registrants (those who received a certificate and those who did not). The aim of the survey was to explore participants':

1) Reactions – positive and negative – to each module and its contents (videos, presentations, forum discussion, quizzes, and assessment). For example, as feedback, it was clear that the use of English was a challenge for learners from some language backgrounds, for example Spanish, French, Vietnamese and Indonesian). To respond to this issue, TDR is currently developing the MOOC in the six official UN languages.

2) Motivations to engage in the MOOC and the benefits gained by participants in terms of improving their knowledge of the topic of IR. This step is essential as it helps TDR to refine and identify topics that are challenging for participants to understand and to ensure that the MOOC covers the competencies needed for developing an IR project.

The next phases of evaluation examined how participants of the IR MOOC have used the skills they gained from the course in their daily professional lives – i.e. how the MOOC has affected their professional behaviour (Launois et al., 2021), and improved their job and organisational performance (Launois et al., under review). This evaluation is based on data that includes online anonymous survey responses and semi-structured interviews.

Conclusion

The TDR MOOC was developed to provide flexible and free IR education for health professionals in LMICs where there is currently a lack of education and training opportunities in IR. Using case study methodology allowed the authors to explore and present the holistic experiences and learnings of the MOOC team during the three phases of the MOOC. During the planning, development and implementation phases of the MOOC, the working group learned a wide range of lessons specific to a professional development MOOC for learners in LMICs and which can form the basis of recommendations for others developing similar MOOCs. These learnings were diverse and included how best to design and develop an appropriate curriculum (including assessments), how to communicate and advertise such a MOOC to the wider community, how to identify and prepare suitable presenters for video recordings, and how to monitor and evaluate such a training course.

One of the main challenges encountered by the working group during the implementation of the MOOC was to ensure that participants understood the requirements of the peer review assessment task, and that discussion forums were engaging for participants. Facilitating discussion forums in MOOCs is known to be challenging due to, for example, low participation rates, slow responses to posts and poor quality discussions, yet carefully facilitated discussion forums can lead to increased learner satisfaction, engagement and retention rates. These issues are of particular concern for a MOOC aimed at health professionals where time limitations and motivation to complete are key considerations. Solutions to these issues included using clear instructions, summarising popular discussion forum topics, using prepared questions, developing a MOOC-specific facilitator guide, and regionalising the management of the MOOC to partner institutions. In particular, preparing questions in advance to improve the discussion as well as training the MOOC facilitators in this area was beneficial in increasing forum discussion activity.

Another key challenge identified by the working group was to ensure that the MOOC content was context-specific and appropriate for the participants targeted for the MOOC and used relevant and real-life examples from LMICs. This in itself was a challenge due to the wide reach of the IR MOOC which targeted participants from LMICs worldwide. A solution was to identify and recruit experts with relevant context-specific knowledge to assist in the development of the MOOC. Providing context-specific learning may motivate and engage learners – particularly in LMICs – and potentially lead to higher retention rates overall, and this was therefore an important consideration for the working group. Subsequent feedback from MOOC participants suggests that they want context-specific content and are somewhat dissatisfied with the content when it is lacking altogether.

Linked to the importance of providing learners with context-specific and appropriate content was the issue of language of instruction, both in relation to the academic level and the choice of language. For example, the use of English as the sole language of instruction was found to be a challenge for

some participants who were non-English speakers. This was therefore an important consideration for the development of subsequent MOOC iterations which will be offered in the six official WHO languages.

The lessons described in this paper will be of value to others developing professional development MOOCs in health and particularly in diverse LMIC contexts. Such guidance is valuable given the paucity of professional development MOOCs aimed at learners in LMIC contexts. A limitation of this study is that the case study approach used relies on the MOOC team's unique experiences in planning, developing and implementing the IR MOOC. These experiences and lessons may therefore not be generalisable to other MOOCs for different audiences and in different contexts.

References

Boud, D., Cohen, R., & Sampson, J. (Eds.). (2014). *Peer learning in higher education: Learning from and with each other*. Routledge.

Breslow, L., Pritchard, D. E., DeBoer, J., Stump, G. S., Ho, A. D., & Seaton, D. T. (2013). Studying learning in the worldwide classroom: Research into edX's first MOOC. *Research & Practice in Assessment, 8*, 13–25. https://doi.org/10.19173/irrodl.v18i5.3080

Carlfjord, S., Roback, K., & Nilsen, P. (2017). Five years' experience of an annual course on implementation science: An evaluation among course participants. *Implementation Science, 12*(1), 101. https://doi.org/10.1186/s13012-017-0618-4

Castillo, N. M., Lee, J., Zahra, F. T., & Wagner, D. A. (2015). MOOCS for development: Trends, challenges, and opportunities. *International Technologies & International Development, 11*(2), 35–42. https://itidjournal.org/index.php/itid/article/view/1396/517

Chambers, D. A., Proctor, E. K., Brownson, R. C., & Straus, S. E. (2016). Mapping training needs for dissemination and implementation research: Lessons from a synthesis of existing D&I research training programs. *Translational Behavioral Medicine, 7*(3), 593–601. https://doi.org/10.1007/s13142-016-0399-3

Christensen, G., Steinmetz, A., Alcorn, B., Bennett, A., Woods, D., & Emanuel, E. J. (2014, April 18). The MOOC phenomenon: Who takes massive open online courses and why? *SSRN*. https://doi.org/10.2139/ssrn.2350964

Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. *BMC Medical Research Methodology, 11*(1), 1–9.

Czerniewicz, L., Deacon, A., Small, J., & Walji, S. (2014). Developing world MOOCs: A curriculum view of the MOOC landscape. *Journal of Global Literacies, Technologies, and Emerging Pedagogies, 2*(3), 122–139. http://hdl.handle.net/11427/19562

Daniel, J., Cano, E. V., & Cervera, M. G. (2015). The future of MOOCs: Adaptive learning or business model? *International Journal of Educational Technology in Higher Education, 12*(1), 64–73. https://doi.org/10.7238/rusc.v12i1.2475

Deacon, A., Jawitz, J., Small, J., & Walji, S. (2017). MOOCs and transitions: Pathways in and out of learning and work. *Proceedings of the 4th Biennial Conference of the South African Society for Engineering Education*, 60–69.

DeBoer, J., Ho, A. D., Stump, G. S., & Breslow, L. (2014). Changing "course": Reconceptualizing educational variables for massive open online courses. *Educational Researcher, 43*(2), 74–84. https://doi.org/10.3102/0013189X14523038

Escher, G., Noukakis, D., & Aebischer, P. (2014). Boosting higher education in Africa through shared massive open online courses (MOOCs). *Education, learning, training: Critical issues for development, 195*. https://doi.org/10.1163/9789004281158

Garrido, M., Koepke, L., Andersen, S., Mena, A., Macapagal, M., & Dalvit, L. (2016). *An examination of MOOC usage for professional workforce development outcomes in Colombia, the Philippines*

& South Africa. Seattle: Technology & Social Change Group, University of Washington Information School. https://tascha.uw.edu/publications/an-examination-of-mooc-usage-for-professional-workforce-development-outcomes

Goshtasbpour, F., Swinnerton, B., & Morris, N. P. (2020). Look who's talking: Exploring instructors' contributions to Massive Open Online Courses. *British Journal of Educational Technology, 51*(1), 228–244. https://doi.org/10.1111/bjet.12787

Hew, K. F., & Cheung, W. S. (2014). Students' and instructors' use of massive open online courses (MOOCs): Motivations and challenges. *Educational Research Review, 12*, 45–58. https://doi.org/10.1016/j.edurev.2014.05.001

Hone, K. S., & El Said, G. R. (2016). Exploring the factors affecting MOOC retention: A survey study. *Computers & Education, 98*, 157–168. https://doi.org/10.1016/j.compedu.2016.03.016

Hrdličková, Z., & Dooley, G. (2017). *AuthorAID capacity development impact study 2017* (Summary Report). https://www.inasp.info/AuthorAIDstudy

Khalil, H., & Ebner, M. (2013, June). "How satisfied are you with your MOOC?" A research study on interaction in huge online courses. In *EdMedia+ Innovate Learning* (pp. 830–839). Association for the Advancement of Computing in Education (AACE). https://www.learntechlib.org/primary/p/112057/

King, M., Luan, B., & Lopes, E. (2018). Experiences of Timorese language teachers in a blended massive open online course (MOOC) for continuing professional development (CPD). *Open Praxis, 10*(3), 279–287. https://doi.org/10.5944/openpraxis.10.3.840

King, M., Pegrum, M., & Forsey, M. (2018). MOOCs and OER in the Global South: Problems and potential. *The International Review of Research in Open and Distributed Learning, 19*(5). https://doi.org/10.19173/irrodl.v19i5.3742

Launois, P., Allotey, P., Reidpath, D., Maher, D., Certain, E. & Ross, B. (2019). Lessons learnt from a professional development MOOC: Engaging culturally and linguistically diverse learners from low- and middle-income countries. *The European Journal of Open, Distance and E-Learning*. https://old.eurodl.org/?p=archives&sp=brief&year=2019&halfyear=&article=809

Launois, P., Maher, D., Certain, E., Ross, B., & Penkunas, M. J. (2021). Implementation research training for learners in low-and middle-income countries: evaluating behaviour change after participating in a massive open online course. *Health Research Policy and Systems, 19*(1), 1–12. https://doi.org/10.1186/s12961021007033

Li, K., & Canelas, D. (2019). Learners' perceptions and experiences of two chemistry MOOCs: Implications for teaching and design, *American Journal of Distance Education, 33*(4), 245–261. https://doi.org/10.1080/08923647.2019.1639469

Liyanagunawardena, T. R., & Aboshady, O. A. (2017). Massive open online courses: a resource for health education in developing countries. *Global Health Promotion*, *25*(3), 74–76. https://doi.org/10.1177/1757975916680970

Liyanagunawardena, T. R., Lundqvist, K. Ø., & Williams, S. A. (2015). Who are with us: MOOC learners on a FutureLearn course. *British Journal of Educational Technology, 46*(3), 557–569. https://doi.org/10.1111/bjet.12261

Milligan, C., Littlejohn, A., & Margaryan, A. (2013). Patterns of engagement in connectivist MOOCs. *Journal of Online Learning and Teaching/MERLOT, 9*(2), 149. http://jolt.merlot.org/vol9no2/milligan_0613.pdf

Murugesan, R., Nobes, A., & Wild, J. (2017). A MOOC approach for training researchers in developing countries. *Open Praxis, 9*(1), 45–57. http://dx.doi.org/10.5944/openpraxis.9.1.476

Nkuyubwatsi, B. (2014). Cultural translation in massive open online courses (MOOCs). *eLearning Papers, 37*(March), 1–10. https://oerknowledgecloud.org/content/cultural-translation-massive-open-online-courses-moocs

Pickering, J. D., Henningsohn, L., DeRuiter, M. C., de Jong, P. G., & Reinders, M. E. (2017). Twelve tips for developing and delivering a massive open online course in medical education. *Medical Teacher, 39*(7), 691–696. https://doi.org/10.1080/0142159X.2017.1322189

Rasheed, R. A., Kamsin, A., Abdullah, N. A., Zakari, A., & Haruna, K. (2019). A systematic mapping study of the empirical MOOC literature. *IEEE Access, 7*, 124809–124827. https://doi.org/10.1109/ACCESS.2019.2938561

Richter, T., & McPherson, M. (2012). Open educational resources: Education for the world? *Distance Education, 33*(2), 201–219. https://doi.org/10.1080/01587919.2012.692068

Shah, D. (2019, Dec 2). By the numbers: MOOCs in 2019. *Class Central*. https://www.class-central.com/report/mooc-stats-2019/

Sheikh, K., Agyepong, I., Jhalani, M., Ammar, W., Hafeez, A., Pyakuryal, S., Abimbola, S., Ghaffar, A., & Swaminathan, S. (2020). Learning health systems: An empowering agenda for low-income and middle-income countries. *Lancet, 395*(10223), 476. https://doi.org/10.1016/S0140-6736(19)33134-4

van de Oudeweetering, K., & Agirdag, O. (2018). MOOCS as accelerators of social mobility? A systematic review. *Journal of Educational Technology & Society, 21*(1), 1–11. https://www.jstor.org/stable/26273863

Watson, S. L., Loizzo, J., Watson, W. R., Mueller, C., Lim, J., & Ertmer, P. A. (2016). Instructional design, facilitation, and perceived learning outcomes: An exploratory case study of a human trafficking MOOC for attitudinal change. *Educational Technology Research and Development, 64*(6), 1273–1300. https://doi.org/10.1007/s11423-016-9457-2

World Health Organization (2021). *Special Programme for Research and Training in Tropical Diseases (TDR): Regional Training Centres*. https://www.who.int/tdr/capacity/strengthening/regional/en/

Zhenghao, C., Alcorn, B., Christensen, G., Eriksson, N., Koller, D., & Emanuel, E. (2015, September 22). Who's benefiting from MOOCs, and why. *Harvard Business Review* [Blog post]. https://hbr.org/2015/09/whos-benefiting-from-moocs-and-why

Zhu, M., Bonk, C. J., & Sari, A. R. (2018). Instructor experiences designing MOOCs in higher education: Pedagogical, resource, and logistical considerations and challenges. *Online Learning, 22*(4), 203–241. https://doi.org/10.24059/olj.v22i4.1495