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Discussion Paper

Considerations and Challenges on the Development of Medical Massive Open Online Courses (MOOCs): A Promising Path Towards the Improvement and Widening of Medical Education

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Abstract

Massive open online courses (MOOCs) have seen remarkable rise in the last few years as a medium of delivering high quality course content to learners. MOOCs are a new type of online class with content delivered on line, that anyone, anywhere, can learn through video lectures, slideshows, computer graded tests, and discussion forums. The important is that these courses enable the free exploration. Everyone can take something, can learn something new. Learners also have the opportunity to get a meaningful credential at the end. The first online platforms offering multiple MOOCs emerged since 2012, with edX, Coursera and Udacity. Other platforms have since emerged, including Futurelearn, a UK-based Open University venture. These platforms have partnered with top universities and institutions, among them MIT, Stanford, Harvard, Berkeley, John Hopkins, Princeton, and others, to offer free courses online for anyone. Many newer MOOCs focusing on open-access delivery of specific subject content have expanded the number and variety of courses provided, offering courseware to millions of students worldwide. After MOOCs series, now there is a wave of MOOC offerings that include an option to earn credit towards specific degrees

(through programs such as edX's MicroMasters and Coursera's MasterTrack). Maybe the biggest change MOOCs will induce is a move towards a global system of education. The potential impact of MOOCs on healthcare education is worthy of attention.

Introduction

Of particular note are the great range of learners that can engage with and benefit from these online courses and the flexibility in terms of time and location (easily accessible, updatable and usually available at a lower fee than is associated with face-to-face courses). The shorter length of MOOCs can also facilitate engagement and completion, and thus learning. MOOCs are a group of online classes that have a potential value in transforming the way in which learning is enhanced and supported. There is a great influence of MOOCs on institutional strategies concerning higher education, on staff personnel and in general on the current higher education landscape. The "massive" nature of MOOCs results in new ideas for new projects due to the interaction among the learners which is very important. The great popularity of MOOCs has a great impact on education and many universities and institutes rethink the curriculum in an attempt to move to a more learner -focused approach with more open and flexible educational approaches. MOOCs offer an innovative educational approach to higher education with the transformational potential of technology-enhanced learning as shown in Figure 1 and are expected to provide tremendous opportunities for medical education [1].

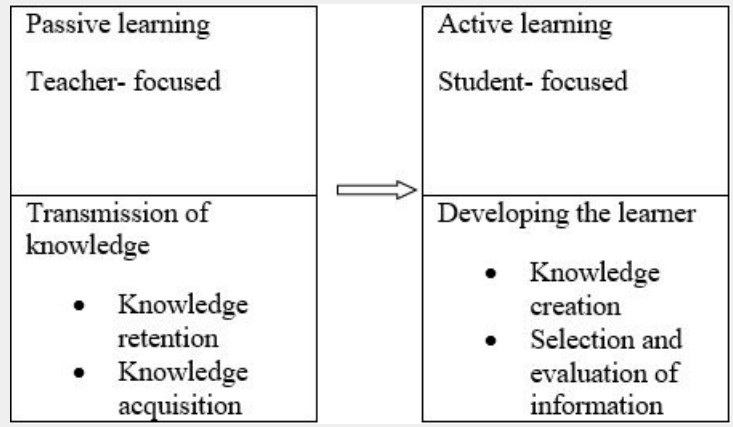

Figure 1: *Shifting emphasis in healthcare education with the technology*

These contribute in engaging learning of benefit to learners both inside and outside the classroom at all levels of medical and healthcare training and practice.

Of particular note are the potential applications of MOOCs in healthcare education beyond the conventional courses and for staff undertaking Continuing Professional Development (CPD) or as an alternative platform for Interprofessional Education (IPE) with the growing demand for IPE.

The use of MOOCs and other technology enhanced- learning, like simulation-based education (SBE) allows students at a relatively early stage of their medicine course to be better educated and to experience directly patient care.

Across medical education, there is the distinction between core knowledge, which is related to undergraduate students, and advanced knowledge, which is intended for specialist trainees and postgraduate students. Through MOOCs, future doctors deal with the educational material in an interactive mode and learn better the theoretical knowledge, enables them to apply these theoretical principles in a better way during the period of practicing in a laboratory or in hospital. Medical students have the opportunity to take the educational material in interactive mode that they need than sitting in the classroom for an hour lecture talk. Then, with a practicing physician they obtain the skills and practices necessary for their expertise. Thus with this "flipped classroom," students watch lectures outside of classroom and use class time for more engaged learning. MOOCs have the potential, when used effectively, to transform the delivery of learning, with the use of approaches such as flipped classroom, blended learning, or fully online courses [2]. In the field of health sciences and healthcare, MOOCs with the inherent potential of the Internet to transform health care are widely infiltrating into radiology learning [3], anatomy education [4], ophthalmology education [5], pharmacy education [6], parasitology education [7], nursing education [8] and even global health [9]. Additionally, MOOCs offer a flexible framework to facilitate widening access to postgraduate education particularly in genomic medicine although often at postgraduate educations a hands-on approach is required to acquire both the advanced knowledge and to develop the necessary skills. Associated with the ability to acquire or refresh knowledge, MOOCs provide a platform for collaboration amongst a diverse group of learners allowing the sharing of experiences and creation of ideas beyond the material provided. The potential for this exchange of ideas and opinions within MOOCs is necessary to medical education due to the constant need for healthcare professionals to develop and acquire new knowledge. Across undergraduate and postgraduate medical education, MOOCs have a rising presence as part of blended curriculum on campus-based medical course [10], ideas that they could be used as part of flipped classroom approaches [2,11].

The Challenges of MOOCs

The number of available MOOCs has grown dramatically in the last few years according to a recent report from Class Central as shown in Figure 2 [12].

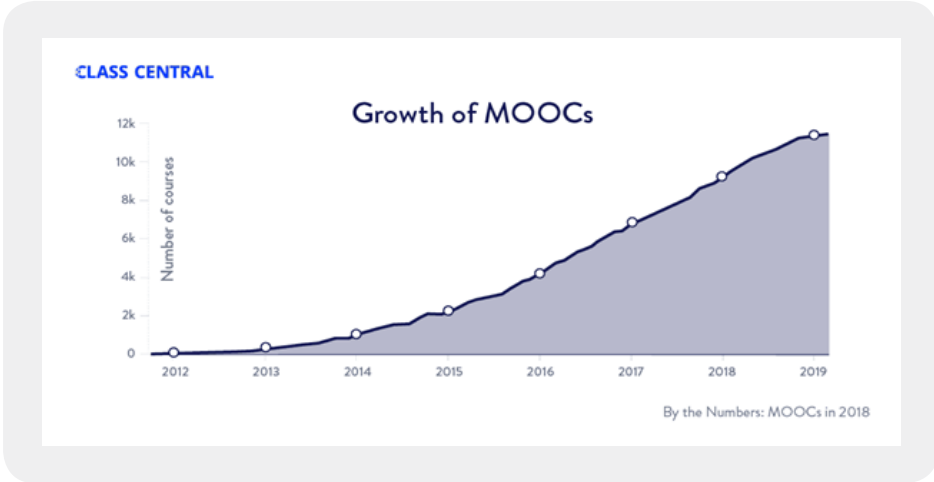

Figure 2: *Shah, D. (2019).Year of MOOC-based Degrees: A Review of MOOC Stats and Trends in 2018 Retrieved from https://www.classcentral.com/report/moocs-stats-and-trends-2018/(Image reproduced with permission.)*

*MOOC(Massive Open Online Course)

The challenges of «*Massive*» in MOOCs has many implications to the whole landscape of education.

It is well known that powerful new technologies are transforming the way we deliver healthcare because of faster and cheaper generation of genomic data. This is very supporting for rapid diagnosis and personalised treatment of disease. Many postgraduate programs exist in genomic medicine. The development of genomics educational resources with MOOCs in postgraduate education helps preparing the healthcare workforce for a genomics-based healthcare system [13].

Educational innovation is a motivation for universities to implement MOOCs in medicine. The construction of an on line platform allows measuring everything during online learning. There is the possibility to identify student's difficulties in a particular concept immediately, keeping track of the class. Because of this technology, everything is instrumented. *Learning analytics* can improve learning practice by transforming the ways that support learning processes which is very important. This way, the instructor can improve his teaching in this online class.

In an era of increasingly virtual education delivery, MOOCs offer the great opportunity for providing practicing doctors with high quality *continuing medical education* (CME) and continuing professional, interprofessional, education resources and maintaining their credentials sharpened. With the advancements of Medicine, CME is a necessity for most doctors and the opportunity of being able to participate in online courses easily at their convenience seems to be appealing because of restrictions related to the budget to travel and participation fee. MOOCs could be a replacement for in-person CME courses. Coursera (http://www.coursera.org) offers courses (paying a modest fee) that can be counted as CME.

The access to medical educational material is broad and covers all levels of medical education. There are premedical courses, courses delivered to medical students and courses on the continuing medical education.

This is a good opportunity for people even more in the developed world to find this educational material because of the cost issues and to make progress at this discipline.

The more advanced platform of MOOCs is characterized by a social structure, the *social learning*. The students belong to an entire community of learners interacting around the delivered content of the online course. This is particularly valuable in the context of medical education and health care because there is the necessity of connection among different types of medical professions and specialties (doctors, nurses, practitioners and so on). Also through MOOCs there is a great contribution to developing countries teaching medicine and health care. Another area of medicine that this powerful technology can radically change is *patient education*. Watching online videos prior to their appointments with physicians this helps to a better understanding of the disease, clarifying the questions and making decisions [14]. Also patients are able to interact with other patients and learn from each other and receive social support through a community. MOOCs are also able to improve public *health literacy* [15].

Limitations

There has been a long discussion and different views about how effectively MOOCs can supply what is needed to clinical workforce in the field of medicine and healthcare [16].

Issues concerning *learner assessment* and their impact on learners, as well as the long existing tradition with face to face teaching, pose a dilemma to their acceptance [17].

With the advancements of medicine, there is a growing global skills gap, thus MOOCs have to play a key role as a tool fulfilling the needs of workplace. Often universities are criticized by the inefficiency to meet the needs of the workplace. Already, MOOCs have shown their value in addressing a training problem in the response to the 2014-15 Ebola epidemic [13,18]. In general, implementing MOOC to medical education poses certain challenges. Teaching theoretical concepts traditionally delivered through lectures in classrooms can lead to the creation of MOOC. Designing a MOOC on a medical subject in the discipline of health and medicine also requires attention to the assessment method. The *accreditation* of these courses is another cause of concern. MOOCs can supplement traditional medical education or can possibly be considered as a "flipped-classroom" experience where the MOOC replaces the theoretical lecture and the face-to face contact with the instructor is used for a more meaningful interaction and discussion of important topics [2].

Conclusions

MOOCs can play an important role in undergraduate and postgraduate medical education. Additionally, they provide continuing professional education and contribute to the development of innovative teaching models for student technology- enhanced learning.

In the era of big data, MOOC has shown its own advantages in education [19]. More and more academic unions, institutions and commercial firms are providing a lot of medical MOOCs for higher education. There are many benefits to medical MOOCs, but they cannot take place of the traditional medical education in hospital. Questions raised, are about the effectiveness of MOOCs with the current technology-based teaching style in covering the different parts of medical education, including its clinical part, which requires

student-patient interaction. According to Davies E [16] 'content delivery,' in the parlance of the web - are just one part of the overall learning experience in medicine. Medicine is relating to patients and teaching the necessary skills with video lectures and discussion forums would be difficult. However, in the new and evolving era of online learning, it is not necessary to waste precious class time on a lecture, students can get the instructor's lecture through the online platform in their homes.

The current trend is the adoption of a hybrid model. In this blending learning approach students get a lot of their theoretical content in this online framework that's more engaging and then they come to classroom to be really inspired, discuss more advanced topics and learn clinical skills. So, we should take advantage of its benefits and combine MOOC and traditional classroom closely, with emphasis to *active learning* in order to improve the education quality of medical courses.

The great popularity and attraction of MOOCs stems from convenience and easy accessibility. Adapting MOOC for medical and health sciences seems to be a pathway to progress for expanding medical education delivery. While some theoretical content of medical education can be easily adapted to MOOC platform, other skill-based one may be more difficult to be implemented. More efforts are required to create and successfully implement MOOC courses related to the medical field [17].

MOOCs have a wide range of capabilities, not only about opening resources, but about the transformational potential of educational process. Thus, these courses offer interesting learning and provide professional training opportunities, and can even be beneficial for use in flipped classroom experiences [20]. The *adaptation* of MOOCs, as a component of flipped classrooms holds more long-term prospects for success. Additionally, there are so many other capabilities that one would like to have as a part of educational offering and that can include simulators that take students through perhaps a complex decision making process. The development of simulation-based education (SBE) within the context of interprofessional education maximizes the affordances of virtual learning environments [21]. Certain limitations should also be considered. One concern is their lack of retention or the low completion rates in these courses. It is important to realize that only a very small fraction of the students entering these courses actually ever plan to complete it and intend to only watch lecture videos without participating in the assessment components of the course. According to Daphne Koller, co-founder of Coursera, many of these students are treating this like a library book you browse in the library to find something that looks interesting you take out that book you bring it at home you read three four chapters when the loan period expires you bring it back without reading the book cover to cover [21]. It is known that the small fraction of students actually intending to take the course to completion but with the commitment to complete the class, results in completion rate 70 to 80 %. Interpretation of completion rates is difficult without knowing the motivations of the individual learners because every one of these individual learners will have their own specific goals. MOOCs are a promising path towards the improvement and widening of online learning in medical education. There is great promise and potential impact in MOOCs as a new way to offer quality medical educational opportunities to a massive global audience. However, work is needed to improve the teaching, knowledge assessment, and measurement of learning progress in MOOCs. It is important to measure the validity of reliability of MOOC knowledge assessments. The development of methods of increasing and sustaining learner engagement in addition with the measurement of the progress toward learning objectives during the participation is very important [22]. As we explore innovative pedagogical practices with the optimizing of the advantages offered by carefully

designed, well-structured, and outcomes-based, learning outside the classroom through MOOCs is very challenging. Despite their limitations and concerns, MOOCs have the potential to be a very promising medium for medical education.

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