MOOCs: The End of the World, or a Sustainable Means for Global Learning and Education?

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Abstract

A recent phenomenon in tertiary education is the proliferation of Massively Open Online Courses (MOOCs). While universities must constantly evolve to meet student needs, these courses have raised many questions regarding the future of university education as well as the meaning of a university degree. As student enrollment in MOOCs increases, universities are facing important decisions regarding MOOCS, including whether MOOCs should be allowed to be claimed by students as meeting a university's graduation requirements. The key issue appears to be for a university to decide what constitutes a degree from it, and whether a student can claim to have earned a degree from it if many courses were taken elsewhere as MOOCs. This paper discusses and provides insights into several key issues surrounding MOOCs, including sustainability and the eco-friendly delivery aspects of MOOCs.

Keywords: MOOC, sustainability, eco-friendly, distributed learning

1. Introduction

Many universities take pride in their ability to provide a timely and relevant educational experience for their students. However, the growth of online universities, degree programs, and course offerings pose rising difficulties to more traditional universities. Schonberg (2017) describes how new scientific discoveries (which can affect course content), embracing graduate – and not only undergraduate – education, adopting a research mission, and technology-based program delivery systems all provide opportunities for universities to grow and meet ever-changing student needs.

A recent phenomenon is the proliferation of MOOCs. McClure (2019) argues that these courses have raised a variety of questions regarding the future of university education as well as the meaning and value of a university degree. According to The Chronicle of Higher Education (2012), "MOOCs are classes that are taught online to large numbers of students, with little involvement by professors" so that "… a single instructor can teach a class with hundreds of thousands of students." However, unlike the Massachusetts Institute of Technology (MIT) OpenCourseWare project begun in the late 1990s, students enrolled in MOOCs, "…complete assignments that are graded either by machines or by other students." (Chronicle of Higher Education, 2012).

As part of its OpenCourseWare project, MIT made all its course materials available online for free. Since then, the number of colleges offering free online courses has steadily increased: the NYTimes named 2012 as "The Year of the MOOC." (Pappano, 2012) While enrollment in a MOOC can be several tens of thousands of students, Carter (2013) has shown that MOOC completion rates are around 7-10%. The reasons for such low completion rates are varied and include, among others, "course shopping" (i.e. signing up for many courses to see which of them might be preferred and dropping the others), "peer assessment trolls" (i.e., excessively rude reviews by students), and "the increased tedium that occurs from viewing recorded lectures" (as opposed to potentially more lively interactions expected to occur in "live" or "face-to-face" courses) (eCampus News, 2013).

There are several MOOC providers, but the three more popular ones appear to be edX, Coursera, and Udacity, each attempting to build its following and reputation.

(1) edX (www.edx.org), founded in May 2012 by MIT and Harvard, is a consortium of institutions of higher learning that includes well-known universities from around the world. It creates the MOOCs that it provides to its member institutions.

(2) Udacity (www.udacity.com) began by offering free computer science classes developed by Stanford University in 2011. When it began, only 2% of the professors who applied to develop MOOCs for Udacity were accepted (http://www.onlineschools.org/visual-academy/mooc-money/).

(3) Coursera (www.coursera.org) also began by offering free computer science courses from Stanford University, but now offers hundreds of courses in many different technical and non-technical areas. Coursera is now accepted to be the largest online learning platform in the world, partnering with more than 200 leading universities and companies to offer over 6,000 MOOCs to more than 82 million participants (McCormick, 2022).

Tsai and Wong (2013) provide additional insights into the origins of these MOOC providers and discusses the role played by the Khan Academy as another option for online learning. As the number of students taking MOOCs increases, universities are faced with making several important decisions, including whether they will accept MOOCs for credit, and if so, how. Some of the issues being debated include:

(1) Are MOOCs a threat? What is their business model? Can they undermine the existence of a traditional "bricks-and-mortar" university?

(2) Is it possible to verify the identity of a student who claims to have completed a MOOC, and who is now asking for credit to be awarded for that effort?

(3) How do employers view MOOCs?

(4) What is the process to transfer one or more MOOC courses into a program of study at a "traditional" university? Should it be the same or any different from transfer course evaluation policies and processes that already exist at most universities?

At the heart of these discussions is the need for a university to decide what defines and constitutes a degree from it, and whether it makes sense for a student to claim to have earned a degree from it if many courses were taken elsewhere as MOOCs. Of course, it is today's interconnected society that continues to drive the use of technology in many sectors, including education at all levels.

In this regard, the United Nations Sustainable Development Group (UNSDG, 2023) has highlighted the pervasive nature of the advances in the use of technology and notes that technology in education can assist in enhancing accessibility to affordable, quality education opportunities in a sustainable manner. Online learning is viewed by many to be a more sustainable education model by virtue of i) reducing the need for transportation to and from school; ii) reducing or eliminating the use of paper; iii) reducing energy use as traditional schools use an inordinately high level of energy; and, iv) managing the use of other natural resources, such as water, more effectively (see, e.g., Cloke, 2022). According to S. Akay (2024), the "concept of a green digital campus promotes sustainability in online education through digital infrastructure, eco-friendly practices, and curriculum integration, reducing environmental impact while providing high-quality learning experiences."

In light of these considerations, this paper has two objectives: (1) to discuss these and other issues that have recently arisen as universities around the globe grapple with this ever-changing educational paradigm; and (2) to extend these discussions to include sustainability aspects of MOOCs, including the overall eco-friendly delivery processes associated with MOOCs. This paper concludes with the idea that MOOCs are a smart and environment-friendly means of delivering, at very low cost, information on sustainability to nations and individuals needing to be better informed about that topic as part of their personal and national growth.

2. Methodology

This study was performed using a narrative review methodology, that is, recent and current literature relevant to MOOCs was reviewed qualitatively with the goal of gathering and providing insights into the current state-of-affairs regarding MOOCs and their role in higher education. In this manner, this paper summarizes certain perspectives on MOOCs in higher education based on what has been presented at conferences, published in refereed journals, and written on (still accessible) websites. This paper can now serve as a springboard for more detailed investigations of the various perspectives on and topics related to MOCCs that are discussed herein.

3. The Business Aspects of MOOCs

The development and delivery of MOOCs naturally come at a cost. Udacity and Coursera initially raised over $20M and $15M, respectively, in venture capital to fund their MOOC programs, while investments upwards of $30M by Harvard and MIT (each) to develop and provide their MOOCs through edX (see again, e.g., (http://www.onlineschools.org/visual-academy/mooc-money/). The question arises, then, that if all these MOOCs are free, how are the investors going to see any returns on their investments? Although the details vary from provider to

provider, in some cases students can buy or receive certificates stating that, in the least, they have taken or completed a MOOC (Chronicle of Higher Education, 2012). Other approaches include offering students additional for-fee options, such as peer-to-peer or instructor tutoring, or contracting with universities to deliver MOOCs to their campuses (http://www.onlineschools.org/visual-academy/mooc-money/).

As MOOC providers and their investors seek to recoup financial investments, another option being explored is offering recorded courses for sale to universities under licensing agreements with the instructor and the sponsoring university. At first, everyone seems to profit – the instructor, the university, and the MOOC platform investors. Students at the "purchasing university" would appear to be unaffected by such arrangements, at least from a financial perspective, if such courses were made available to them at standard tuition costs. Even the university that "purchases" the MOOC stands to benefit, for such arrangements are likely, at least initially, to cost less than paying a faculty member to deliver the same course.

The concern here is that the cost savings enjoyed by a university that purchases a MOOC for delivery to its students may be short lived. As the costs of education program delivery decrease, it is possible that government funding entities would then decrease the funds provided to such universities rather than continue (or increase) funding levels that would allow these universities to re-allocate their savings to other projects or initiatives. This concern recently prompted a sociology professor at Princeton University and several philosophy professors at San Jose State University to stop offering their popular MOOCs through Coursera and edX, respectively (Perry, 2013).

Interestingly enough, there have only been a few new developments in how a MOOC provider can generate a sustainable revenue stream since MOOCs were first introduced approximately 15 years ago, According to Keramida (2021), there are eight basic means through which a MOOC provider can generate income from its MOOCs. These are described by Keramida (2021) as follows:

(1) Charging license fees – revenue would be generated from license fees that MOOC providers would charge universities or companies that would allow them to forego the creation their own content.

(2) Customization services – MOOC providers would prepare courses tailored to the specific needs or requirements of interested customers.

(3) Selling of upgrades – MOOC providers would propose to regularly upgrade their courses with new material and then charge universities or companies a fee to receive the latest version of their courses.

(4) Charging for extra MOOC courses beyond an initial free number – MOOC providers allow their customers to use their platforms for free for a few of their own courses (understandably, this would likely be a very small number), but then charge a fee for each additional course the university, for example, would like to offer using the MOOC provider's platform.

(5) Online ads and sponsorships – like other online advertisers, MOOC providers should be able to generate significant revenue from online ads from within the courses they provide.

(6) Headhunting services – although perhaps not immediately applicable to universities and other institutions of higher learning, MOOC providers could charge companies substantial fees for providing rosters of students that match the criteria or needs of the companies that pay for this service.

(7) Accreditation – according to Keramida (2021), at one point accreditation and certification services accounted for approx. 70% of all MOOC revenue produced (see also, edSurge, 2015).

(8) Live instructor support – as noted previously, live tutoring or instructor support during a MOOC course could allow providers to charge a nominal fee for the courses where this kind of service is offered, if selected by the courses' students.

4. Academic Integrity Issues

Several academic integrity issues have arisen as universities have begun to discuss whether to award credit for MOOCs. Although similar issues may occur in traditional campus settings, the concerns brought to the forefront by MOOCs mainly stem from an inability to confirm or verify student work. For example, how can universities be sure that the student seeking credit is the student who completed the course? Or that the student only used acceptable resources during tests? Or is the student who actually took the tests? Or that the evaluations were conducted by (qualified) faculty using appropriate performance metrics? With respect to the last question, because of the huge enrollments in MOOCs, instructors typically resort to peer grading, i.e., students grading each others' papers (Chronicle of Higher Education, 2012). Uniformity of grading practices and consistent application of performance criteria can be especially hard to maintain under such circumstances.

Even though MOOCs are not offered for credit, students have still engaged in dishonest behavior. In one instance, there were at least three cases of plagiarism identified in a humanities course offered by Coursera – in one of the cases, an entire essay had been copied verbatim from Wikipedia (Young, 2012a). The instructor used this as a "teachable moment," proceeding to enlighten students on what constitutes plagiarism, why it is wrong, and how to avoid it. Several students later wrote to the professor indicating that this was the first time they had heard plagiarism explained so thoughtfully and with such care (see again, Young, 2012a).

Of course, one of the more complicating aspects of fighting academic dishonesty is the ever-changing methods of cheating, whether in person or online. Numerous strategies continue to be developed and implemented to combat cheating in MOOCs, including monitoring and analyzing users' behaviors and noting any inconsistencies that might indicate dishonest behavior. Most recently, Valko et al (2026) describe a new approach to identify as well as prevent CAMEO-style cheating (Copying Answers using Multiple Existences Online). This approach has successfully demonstrated that odd patterns in normal exam-taking behaviors, such as excessive or exceedingly small amounts of time-on-task and an unusually high number of task repetitions resulted in usually high variabilities in test and other assignment scores relative to other students. In their study, Valko et all (2026) concluded that these odd patterns most often indicated dishonest behavior rather than a struggle to demonstrate mastery of course material on an examination.

While even traditional universities struggle at times with academic dishonesty issues, whatever processes are in place on campuses to deal with such cases should also extend to online course offerings. It is also of note that several days after the above-referenced story appeared in the Chronicle of Higher Education, Coursera added the required certification shown in Figure 1 to all work submitted by students enrolled in its MOOCs.

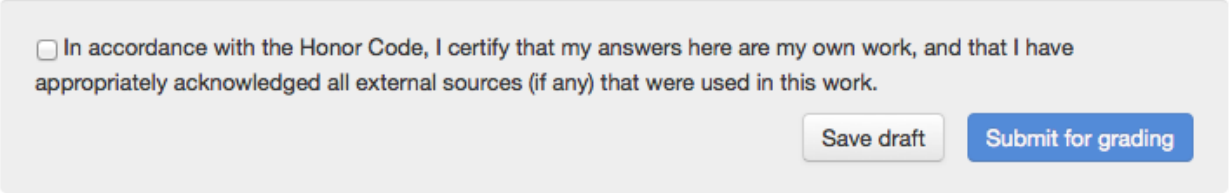

Figure 1. Certification Required of Students by Coursera to Curb Plagiarism (Young, 2012b)

5. Educator and Employer Perspectives

It is important to draw a distinction between "traditional" online or distance ed-based course offerings, and MOOCs. According to Deale (2015), it is because of these distinctions that educators as well as employers might regard MOOCs differently than other, perhaps more rigorous, online courses.

Initially, by taping lectures and sending them to off-campus students via regular mail, universities were able to reach students and employers at remote locations. Internet-based delivery followed quickly, and universities were able to deliver lectures using two-way real-time audio and video streaming. With this technology, students who could not attend class "in real time" because of, e.g., employer-imposed travel requirements, were able to access recorded lectures and view them while travelling. However, all of these "traditional" means of distance ed course delivery tend to adhere to the requirements of on-campus courses with respect to faculty availability, proctored exams, collected, graded, and returned homeworks, etc.

Overall, courses delivered using "traditional" distance ed means tend to be favored by employers and seen as being just as rigorous as on-campus courses. Except for some start-up companies, it appears that most employers might not feel comfortable trusting anything that does not end in a traditional degree (Ripley, 2012). As a work-around, Udacity initiated several programs that bypass universities and has made courses available directly to employers. Almost immediately, six companies teamed with Udacity to provide instruction to their employees in various subjects that they believed were critical to increasing their reach in their respective industries (Ripley, 2012).

Shortly after their initial surge in popularity, Radford, et al (2014) found that, of the employers surveyed, 73% viewed a history of potential employees having taken MOOCs favorably when making hiring decisions, 59% were using, had considered using, or could see using, MOOCs in recruiting, and 83% reported that using MOOCs for professional development as a positive option. However, a subsequent study by Egloffstein and Ifenthaler (2017) showed that employees were a bit more skeptical and reluctant to fully engage with MOOCs as a tool for workplace learning because of a perceived lack of consistency and acceptability of such professional development by employers.

Ultimately, Ucha (2023) was able to demonstrate that not only perceived usefulness and ease of use, but also content relevance and quality were all needed to increase student (and most likely employer) acceptance and use of MOOCs in their professional development.

6. Course Credit for MOOCs

Colleges whose faculty teach MOOCs typically do not offer any credit for those courses towards meeting graduation requirements. Kolowich (2013a) notes that, to address this seeming incongruity, the American Council on Education (ACE) was asked to review several MOOCs taught through Coursera, with the result that it eventually endorsed some of them for credit. The ACE is, "… an association that advises college presidents, operate[ing] a credit-recommendation service that evaluates individual courses. If a course passes muster, [the] ACE advises its 1,800 member colleges that they can be comfortable conferring credit on students who have passed that course." (see again, Kolowich, 2013a) Naturally, whether colleges accept an 'approved' MOOC for credit depends entirely on universities and their faculty.

It would appear reasonable that in considering whether to accept a MOOC for credit, a university may wish to determine if it is already accepted for credit by the university that created the MOOC. Of course, universities reserve the right to consider source of MOOC, whether the MOOC's home university is accredited, etc., to ensure the quality of instruction and course content. Individual departments can also require that a student must "test out" of a course for which credit is being sought based on completion of a MOOC. These tests can either be standardized tests offered nationally (e.g., the CLEP tests administered by the College Board in the United States), or can be in-house tests, such as final exams, which are administered in a controlled testing environment.

However, it is important to note that the decision regarding whether to award academic credit for a completed MOOC could be made for faculty by others, and quite possibly without faculty participation in the debate leading up to such a decision. For example, in 2013 the State of California was set to vote on a bill that would require its state-funded colleges and universities to grant credit for MOOCs. The bill was put on hold when the state's three publicly-funded university systems all agreed to expand their online offerings and relax their restrictions on what online courses would be accepted for credit (Kolowich, 2013b). The State of Florida also considered (and ultimately enacted) similar legislation.

Some years later, in 2016, the Open University announced that its students would be able to use its MOOCs to earn a portion of the total academic course credits required for graduation for several of its degree programs, including its MBA program (Open University, 2016). However, in all cases, students were required to purchase certificates of completion and successfully complete assessments for such courses through the university's assessment module. KU Leuven has a dedicated website (https://www.kuleuven.be/mooc/moocs-for-credit-ku-leuven) that students can use to decide whether or not they would like to take a MOOC for credit, and if so, what conditions must be met in order for that form to be awarded.

A study by Sullivan (2019) showed that while the Open University program had been successful in that students completed MOOCs that were subsequently used for credit more consistently than MOOCs which were not, the use of MOOCs for credit did create some internal tensions that needed to be resolved in real time to ensure the program's continuing effectiveness. Not too surprisingly, the most common tension appeared to be the result of introducing the idea of credit for a non-traditional course into a system heavily vested in granting credit, until that time, to only courses offered in a more traditional fashion.

Finally, there is the interesting case of the Colorado State University Global Campus. In the fall of 2012, it was the first college in the United States to offer credit to students who passed a MOOC offered through Udacity (although several universities in Austria and Germany were already doing so) (Mangan, 2012). The offer applied to only a single MOOC in computer science, and the credit would be useful only to students who finished their degrees at the Global Campus. Students were required to pay $89 to cover the cost of a proctored examination rather than more than $1,000 for an in-person version of the same course (Rhoads et al., 2013). However, according to Kolowich (2013c), no student had taken advantage of this offer, even after a year of its availability.

7. The Meaning of a Degree

It is common for four-year universities to partner with two-year colleges to create a pathway where students can start their educational degree programs at a two-year school, then complete it at a four-year college. These are often referred to as '2+2' programs, or '2+3' programs, where a student is given credit at a four-year institution for courses completed at a partner two-year school. Most four-year universities also have "residency requirements," which are often phrased so that, for example, the last two years' of courses be taken "on campus."

These types of requirements effectively preclude the possibility that a student can arrive on a university campus with applicable or transferable "MOOC credits" for all but one semester of coursework and then request the conferring of a degree from that university. In this fashion, universities would be treating MOOCs the same as any other courses brought in for transfer credit evaluation. By imposing the same limits on MOOCs as they do on other courses, a university would be able to preserve the educational experience it provides for its students.

In January 2014, The Georgia institute of Technology began offering a MS degree program in computer science completely online and solely based on MOOCs (Lewin, 2013). The cost for the program (offered through Udacity), was expected to be a fraction (~15%) of what a comparable on-campus degree would cost. Courses would be, "online and free for those not seeking a degree" (i.e., the traditional mode of a MOOC), while those enrolled, "… in the degree program will take proctored exams and have access to tutoring, online office hours and other support services." (see again, Lewin, 2013)

According to S. James Gates Jr., then a physics professor at the University of Maryland, "… [t]his [was] the first deliberate and thoughtful attempt to apply education technology to bringing instruction to scale. It could be epoch-making. If it really works, it could begin the process of lowering the cost of education, and lowering barriers for millions of Americans." Such a program would also lower barriers for international students. According to Zvi Galil, then-Dean of Georgia Tech's College of Computing, "… this program could attract over 10,000 students each year, many from outside the United States … Online, there's no visa problem." (Lewin, 2013)

Other universities, such as Bath University for example, are providing technical and pedagogical support for those faculty who wish to develop MOOCs to enhance their more traditional courses (see, e.g., Bath University, 2023). In these cases, MOOCs are short, pre-recorded videos that faculty use to supplement their own lectures, or to provide background information that might be lacking in their students' academic preparation. As a result, these kinds of MOOCs would not be expected to significantly alter the meaning of the degree from universities that choose to use them in this fashion.

8. Sustainability Aspects of MOOCs

By their nature, MOOCs are offered over the internet. They can reach their student audiences regardless of where they live– MOOCs can reach people globally with information on any number of topics, including sustainability, resilience, climate change (see, e.g., https://www.futurelearn.com/courses/sustainability-society-and-you), and advanced engineering topics (see, e.g., Martin et al., 2024). This is especially beneficial to small countries that may not have local resident experts in these topical areas, and which otherwise may not be able to receive necessary training or education. In an early study of sustainability education delivered via MOOCs, Zhan et al. (2015) found that, at least initially, American and European countries outperformed other English-speaking countries in the frequency of sustainability education courses delivered using MOOCs, and that most MOOCs on sustainability-related topics were introductory-level courses without prerequisites.

More recently, the United Nations Environment Programme was developed to provide and support MOOCs related to the environment and sustainability (https://www.unep.org/explore-topics/education-environment/what-we-do/massive-open-online-courses). In this fashion, it contributes to meeting the UN's Sustainable Development Goal (SDG) #4 – Quality Education. Islam et al. (2019) provide a detailed discussion on how MOOCs help achieve SDG #4 and demonstrate that, since MOOCS can connect the peoples of the entire world, they actually support all 17 UN SDGs. In fact, MOOCs have been also found to inspire real-world action, galvanize behavioral changes, and support the development of global social networks, according to Lohr et al. (2024) who found that their MOOC on marine litter, "… inspired [course] participants to take informed action, engage others, expand their networks, and create real change."

Furthermore, because MOOCs are offered online, they are sustainable from an environmental perspective. The carbon footprint of a MOOC is much less than what a traditional on-campus offering of the same course would create if its students all had to travel to a central location to enroll in it. Roy et al. (2005) found that, "… the production and provision of the distance learning courses consumed nearly 90% less energy and produced 85% fewer CO2 emissions than the conventional campus-based university courses." These reductions appear to be, "… mainly due to a major reduction in the amount of student travel, economies of scale in utilization of the campus site, and the elimination of much of the energy consumption of students' housing." In other words, enrolling in a MOOC to learn about sustainable practices is itself a sustainable practice!

9. Concluding Comments

There is a difference between "access to knowledge" and "an education." The latter comes from the former, and MOOCs make the former more readily available for more people. Even if a MOOC is never awarded college credit, the material learned in a MOOC can still be useful, e.g., at a job interview, or for deepening (or refreshing) a student's knowledge of pre-requisite material. MOOCS also provide, using low cost, eco-friendly delivery processes, important information on sustainability to nations and individuals as they make decisions about their own personal and national development and growth. It is unlikely that MOOCs will cease to exist. If universities are to stay relevant in the digital age, it is imperative for them and their faculty to determine how best to take advantage of that access and to make it a part of the educational programs that they deliver.

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