

Massive Open Online Courses for lifelong learning: Towards Flexible and Individualized Education for Sustainability

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Abstract

Massive Open Online Courses (MOOCs) combine films, materials and activities that learners can access at any time and pace to learn within a flexible but supportive online learning community. Learners can explore MOOCs quickly or in depth and engage actively or more passively with the materials and other learners online. It is this flexibility that makes MOOCs particularly suited to addressing the needs of many lifelong learners and many learners who study while working full-time.

UNESCO has urged governments and policymakers to consider MOOCs as a key mechanism for lifelong learning. However, not all MOOCs are designed optimally for the context of lifelong learning, and thus evaluation of best practice is important. While flexibility is key to

enabling learning, pedagogic value is important for retention and influences the depth of learning.

This contribution explores the potential for MOOCs to meet the needs of lifelong learners in the context of higher education for sustainability. We review the experience from literature for the key factors that influence the uptake/retention/value for lifelong learners and the benefits and challenges of using MOOCs for lifelong learning, including the influence of MOOCs on other courses in higher education institutions. We critically reflect on the experience of designing and running five MOOCs at the IIIIEE, with a focus on available data from the lifelong learners, including the backgrounds of learners in the IIIIEE MOOCs. Lastly, we discuss this experience in the context of academic literature.

Introduction

Massive Open Online Courses (MOOCs) are now an established part of online education. Since 2007, there has continued to be a proliferation of MOOCs by universities around the world and, increasingly, other educational actors. MOOCs have emerged in two basic forms: cMOOCs, collaborative MOOCs based on a connectivist approach in which learners collect, connect and create knowledge on an online platform, and xMOOCs where an education provider such as a university curates and designs a course on an online platform. In 2014, Lund University also joined the MOOC trend, launching a three-year project to support the development and implementation of three MOOCs (xMOOCs). The intentions were to market the university, contribute to the development of e-learning, promote cooperation between faculties and provide worldwide access to research and education at Lund University (Leire et al., 2015).

Lund University wanted to introduce MOOCs gradually and began with a selection of 3 MOOCs based on applications from departments. The International Institute for Industrial Environmental Economics (IIIIEE) was one of the first to develop a MOOC in 2014 and has since developed and is running 5 MOOCs on interdisciplinary sustainability topics. Lund University currently offers more than 20 MOOCs, engaging

nearly 70 staff in teaching MOOCs. Coursera, one of the largest MOOC platforms, was started by Stanford University lecturers and now offers more than 5,000 courses from approximately 300 partners globally. Partners include academic institutions, starting with Stanford University and expanding to include universities throughout North America, Europe, Australia, Asia, South America and Africa. In addition to academic institutions, private corporations like Google and Microsoft, government agencies and NGOs are also using Coursera to offer courses either using their products or training employees.

MOOCs generally combine films, materials and activities that learners can access at any time and pace to learn within a flexible but supportive online learning community. Learners can explore MOOCs quickly or in depth and engage actively or more passively with the materials and other learners online. It is this flexibility that makes MOOCs particularly suited to addressing the needs of many lifelong learners, from learners exploring new topics for leisure to learners looking for professional development opportunities to apply in their current job or transition to new roles.

The Organization for Economic Co-operation and Development (OECD), in its report 'Lifelong Learning for All' (OECD, 2001) defines lifelong learning as learning that "occurs during the whole course of a person's life. Formal education contributes to learning as do the non-formal and informal settings of home, the workplace, the community, and society at large." Lee (2014) describes how the concept of lifelong learning has developed from lifelong education, continuing education and adult education eventually to lifelong learning, reflecting a shift from an emphasis on centralized and more formal education to more individualized learning.

In our review of the literature, there were many different interpretations of lifelong learning, with many emphasizing adult learners and professional development. In practice, lifelong learning is realized quite differently in different cultures and contexts. This is particularly the case in terms of policies, the degree of emphasis on professional/personal development, as well as cultural expectations (Farrow, 2018). In other words, lifelong learning remains a broad concept that covers many different types of

further education, learning and development, and therefore also different types of lifelong learner groups.

Steffens (2015) noted that there are different definitions for lifelong learning but chooses to focus on those that emphasize not only knowledge, but also values. Important background studies include Delors (1996) introducing the four pillars of lifelong learning (learning to know, learning to do, learning to live together and learning to be) and Erikson (1974) who emphasizes that care should be an important concept in lifelong development and lifelong learning, a virtue to be acquired. This deeper significance to lifelong learning is perhaps the most important when discussing MOOCs for sustainability, which must inevitably grapple with the roles and responsibilities of humans during profound environmental crises.

The teaching staff at IIIIEE working with the MOOCs has also found some evidence of its own MOOCs being used widely for professional development as well, but has not really examined this phenomenon. This led to an interest in understanding the potential of MOOCs for lifelong learning opportunities and how MOOCs can better support lifelong learning in the context of higher education for sustainability. In this contribution, we review the experience from literature of the potential for MOOCs to support lifelong learning. We include findings on learners in the IIIIEE's 5 MOOCs and critically reflect on the experience of designing and running these. Lastly, we discuss this experience in the context of best practice and challenges.

Understanding the Connection between Lifelong Learning and MOOCs

For this research we searched both Scopus and Google Scholar systematically for articles, book chapters, conference papers and literature from international or national organizations that explicitly addressed the links between MOOCs and lifelong learning. However, even amongst these, the extent to which lifelong learning was examined varied, with some focusing more on the potential of MOOCs rather than examining or critically

discussing this potential. In this section we present and discuss the literature, but also in relation to data from the IIIEE and experiences with MOOCs at the IIIEE, to fill this gap and more explicitly relate to lifelong learning potential and MOOCs.

Lifelong learning is often a stated goal for people to engage in MOOCs. In their survey of 158 MOOC learners and teachers, Yousef et al. (2015) found that approximately 30% considered lifelong learning as their main objective in engaging with MOOCs, which was the reason most often given¹. Representative answers were “self-improvement for career advancement”, “professional development” and “MOOCs open the mind to expand my horizon and ongoing learning for job requirements” (p. 86).

MOOCs have potential to contribute to lifelong learning through providing increased access to higher education courses by providing them for free and online (see e.g., UNESCO, 2016 and Ossianniilsson, 2021). This can be significant for students from disadvantaged backgrounds and from developing countries who do not have university degrees (UNESCO, 2016). However, UNESCO notes that while MOOCs have potential to reach disadvantaged populations, there remain barriers regarding language, adequate digital skills and recognition, or certification of the education. Their report notes that the majority of learners in MOOCs are those who already have access to higher education.

Furthermore, in a review of MOOCs and lifelong learning in the UK, Speight (2018) did not find much evidence for MOOCs increasing access for disadvantaged groups, but more serving as pathways to continued formal education and professional development by those already with postgraduate degrees and the motivation and skills to benefit most from MOOCs. From the data in our MOOCs, this also appears to be the case for MOOCs at the IIIEE. The following tables and figures give an overview of the learner backgrounds in the IIIEE MOOCs compared to the average of all courses on the Coursera platform.

¹ Other reasons were instructional design (17% – presumably primarily a teacher’s reason), high-quality content (13%), network learning (12%), flexibility (8%), openness (7%), blended learning (6%) and student-centred learning (4%). It can also be argued, however, that lifelong learning can be linked to other objectives and qualities of a MOOC, e.g. the flexibility and openness.

Table 1: Top 10 countries of learners for the IIIEE MOOCs

Learner location	Lessons from Scandinavia	Sustainable Cities	Circular Economy	Urban Nature	Cities and consumption	Coursera average
1	US	US	India	US	India	US
2	India	India	US	India	US	India
3	Brazil	Brazil	Saudi Arabia	Philippines	Philippines	Mexico
4	UK	UK	Singapore	UK	Turkey	Brazil
5	Germany	Canada	Germany	Canada	Germany	China
6	Canada	Germany	UK	Germany	UK	Canada
7	France	Philippines	Mexico	Brazil	Canada	UK
8	Sweden	Mexico	Brazil	Russia	Brazil	Russia
9	Spain	France	France	Mexico	Sweden	Colombia
10	Russia	Turkey	Italy	Netherlands	Bangladesh	Egypt

Table 1 shows the top ten countries of learners in each of the MOOCs at the IIIEE. The spread of countries highlights the truly global nature of participants. Compared to other courses on the Coursera platform, the IIIEE courses tend to attract a higher number of learners from the European context, which also relates to the nature of the framing and examples given in the course content. One challenge has been to include more examples, and enhance consideration, of non-OECD contexts in the course content, as most of the research and educational materials have been developed within Swedish and EU research and educational projects.

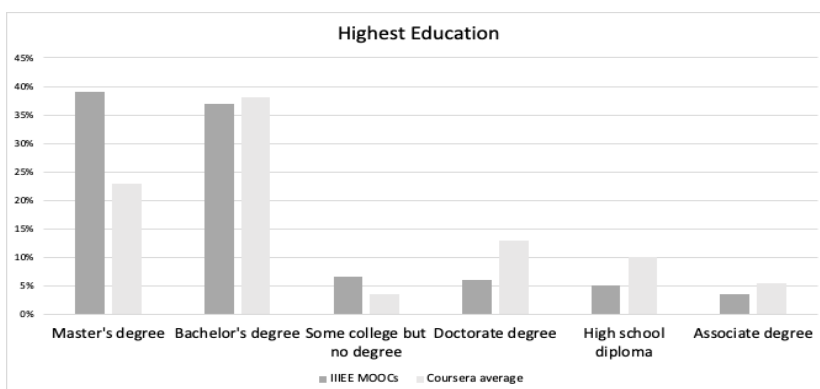


Figure 1: Education level of learners in IIIEE MOOCs vs all MOOCs on Coursera platform

Figure 1 shows the education level of learners in the MOOCs at the IIIIE in comparison to the Coursera platform. Clearly, the majority of participants in MOOCs have obtained Master’s degrees, Bachelor’s degrees and even doctorate degrees.

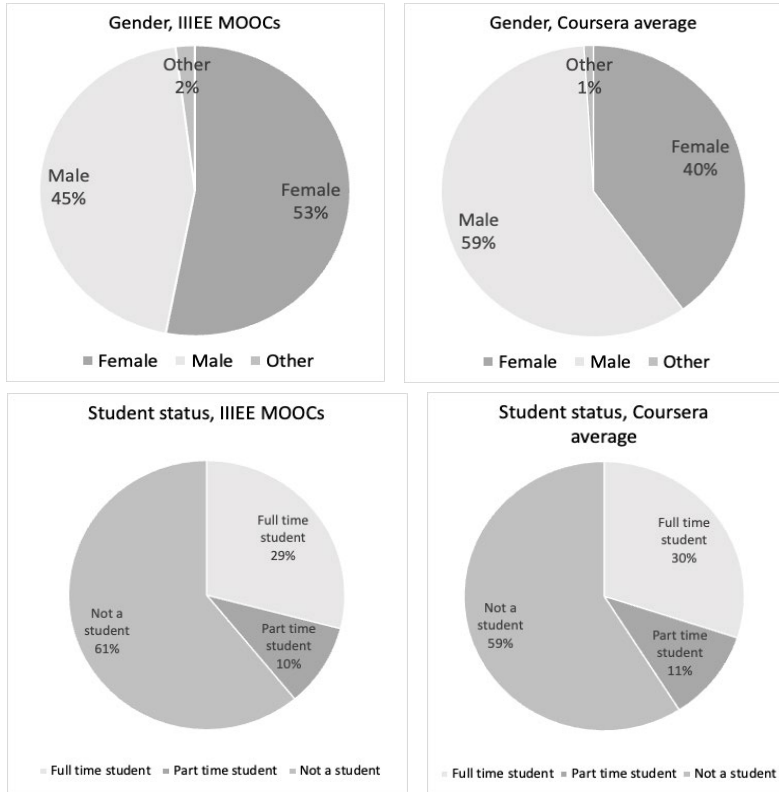


Figure 2: Gender and student status of learners in IIIIE MOOCs vs all MOOCs on Coursera platform

Figure 2 shows the gender and student status of learners in MOOCs at the IIIIE and on the Coursera platform. The Coursera platform attracts more male participants compared to the IIIIE, whereas the student status is similar.

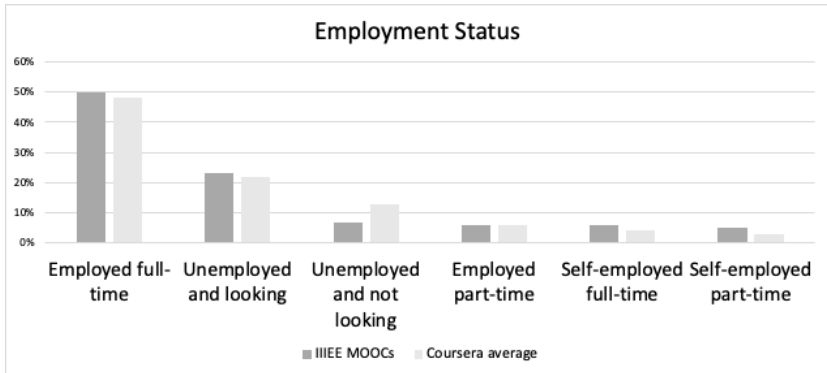


Figure 3: Employment status of learners in IIIIE MOOCs vs all MOOCs on Coursera

Figure 3 shows the employment status of learners in MOOCs at the IIIIE and on the Coursera platform. Most participants are employed, but there are also participants who are unemployed, which highlights that MOOCs are attractive to different audiences.

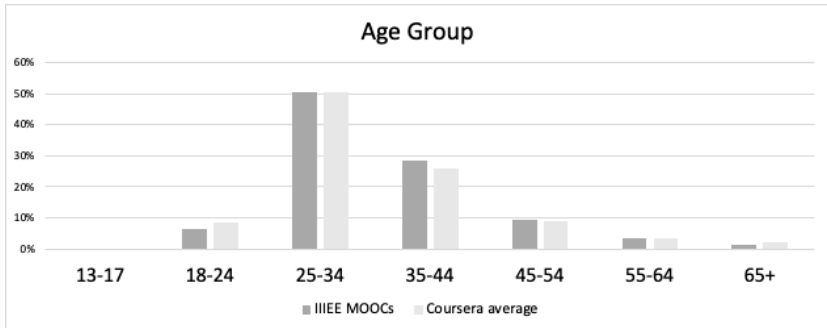


Figure 4: Age of learners in IIIIE MOOCs vs all MOOCs on Coursera platform

Figure 4 shows the age of learners in MOOCs at the IIIIE and on the Coursera platform. Clearly, the main age groups are 25-44, but there is some participation from across all age groups except 13-17.

Yousef et al. (2015) also find that most learners in MOOCs are adults over the age of 30 (and refer automatically to this group as “lifelong learners”). However, data from our courses shows most learners are between

25 and 45, employed and with a degree. This gives a bit more of an insight into what type of lifelong learners might be attracted to IIEEE MOOCs.

MOOCs as opportunities for professional development is an important aspect of their potential for lifelong learning. The response to jobs skills and professional development is evident from the courses on offer on the Coursera platform, many of which reflect IT skills (such as coding, particular software expertise, etc.) or topical knowledge, such as sustainability-focused topics. MOOCs are increasingly considered by both individuals and a variety of organizations as a way to fast-track learning and skills development in an on-demand fashion.

Lifelong learners who are using MOOCs for professional development tend to be those who already have university degrees and are working professionals. Isakson et al. (2015) write that students looking for professional development opportunities are likely to be employed and working full-time while taking the courses and rely heavily on the flexibility and self-pacing that MOOCs offer. The authors note that students “graduating today might have to look at several cycles of re-education and complementary education.” (p. 93).

Farrow (2018) warns: “Support for digital lifelong learning throughout a person’s life will be offered by those MOOCs which can most effectively take advantage of flexible and open delivery in a manner that can be suited to a range of learning scenarios. In this light, MOOCs have an obvious role in supporting digital lifelong learning, but it is important not to mistake MOOCs for a one-stop solution. It cannot be assumed that because some e-learning describes itself as a MOOC it is adequately flexible/open in its delivery.”

Isaksson et al. (2015) note that it is not only in the students’ interest to continuously educate themselves, but also for the companies to ensure their employees have upgraded their skills and knowledge. While early MOOC partners were primarily universities offering courses on different topics, courses are now increasingly offered by non-academic partners, primarily large businesses like Microsoft, Google, IPM, Intel, Meta, etc., providing free professional development courses (using their tools) through the platform.

Lastly, MOOCs on sustainability also offer learners the ability to connect with other learners and high-quality content to understand topical issues for thinking about their own values and roles in society (e.g. akin to Steffens’ argument of an additional society and value-driven goal of lifelong learning). In their research of MOOCs in Norway, Langseth et al. (2021) argued that governmental bodies and institutional stakeholders should give more attention to MOOC initiatives to develop sustainability in flexible and lifelong learning in higher education institutions. MOOCs have been found to play a role in the context of sustainability especially for their possibility to enable the sharing of ideas, confirm principles and build networks and contacts. This has been noted in the case of social and sustainable entrepreneurship (Calvo et al., 2020).

Table 2: Learner Reviews and Stories from IIIIEE MOOCs

Learner feedback	Lifelong learning potential
<p>“It inspired me to apply for a Master’s by research in circular economy.” “I now got a passion to learn more and hopefully pursue this as further studies or as a job”.</p>	<p>Taster before deciding what formal education to pursue</p>
<p>“The course has given me bonus on my CV.” “I’m a PM based in Toronto who is trying to steer their career into sustainability. The course was extremely informative and easy to follow. I really appreciate the amount of viewpoints around CE were covered (from mining to policy to sociology). Thank you so much for all the efforts placed into making this course publicly accessible for all.”</p>	<p>Demonstration of knowledge/skill for job-seeking or transitioning to new field</p>
<p>“Thank you very much for the course, issues and lectures I could read, listen and see. I hope this course helps me for my future professional activities. I work in solid waste management in National Government in Argentina, and I am participating on the OECD Working Group on Resource Efficiency, Circular Economy and Waste.” “It provided me with some very useful additional background to my current task as financial advisor for the transition of SMEs toward circular business models for the ministry of Economic Affairs and Climate...”</p>	<p>Professional development in current job roles</p>
<p>“It has developed a curiosity in me to know the Thought-process and Institutionalisation of this Sustainable Way of Living.” “In the current scenario, this is must to know and to implement by all”</p>	<p>Knowledge and values for understanding and engagement with societal challenges</p>

In Table 2 we give examples of feedback from learners in the MOOCs at the IIIEE and what kind of lifelong learning objectives they could potentially be ascribed. There are four key lifelong learning potentials. First, a taster before deciding what formal education to pursue. Second, demonstration of knowledge/skill for job-seeking or transitioning to a new field. Third, professional development in current job roles. Fourth, knowledge and values for understanding and engagement with societal challenges.

Evaluating the Quality of MOOCs for Lifelong Learning

So far, we have demonstrated the extent to which MOOCs are potentially used by lifelong learners. UNESCO (2016) also noted that though MOOCs have great potential to meet the demand for lifelong learning, there is a need to ensure the quality of the education offered.

Steffens (2015) writes: “From an educational point of view, I do not see the added value of massive participation in online courses, but there are certainly other standpoints from which MOOCs may seem a worthwhile adventure. I do believe that a MOOC of good quality will help people who are already experienced learners to improve their knowledge and skills in a specific area. Therefore, MOOCs are likely to play a role in lifelong learning.”

Assessing how well learner models and designs of MOOCs meet the needs of lifelong learning is difficult in the first instance as there are different definitions of lifelong learning that can have a different emphasis in interpreting quality. There is also little explicit consideration of lifelong learning so far in studies of MOOCs (Luelmo et al., 2020). One of the few studies is Farrow (2018), who proposes a framework of 7 Cs as best practice for MOOCs from a lifelong learning perspective. Table 3 describes the key elements of content, context, curation and co-creation, communication, collaboration, competition and certification.

Table 3: The 7 Cs for MOOCs and Lifelong Learning

7 Cs	Positive factors for success	Responsible
Content	Current and relevant content Adds value to existing knowledge and expertise Trusted instructors	University
Context	Learning content can be applied	Learners
Curation	Co-creation of content Social construction of knowledge Collective working	Learners
Communication	Consistent instructor presence Effective and concise messaging Timely reminders Clarity of expectations	University (in design) MOOC platform (in delivery)
Collaboration	Reality-based learning activities Teams working together Working offline with colleagues	Learners Professional organization
Competition	Score-keeping of progress	Platform
Certification	Appropriate certification of learning	Platform

Source: Based on Farrow (2018, p.144) with responsibilities added by authors.

Table 3 outlines the 7 Cs for MOOCs and lifelong learning, highlights positive factors for success, and indicates responsibility.

Apparently, the framework could be used for evaluating any lifelong learning course, not just MOOCs. At its core, a good MOOC has a strong pedagogical focus and robust course design, i.e. good consideration of the 7 Cs. However, some of the Cs can be more or less facilitated by offering a MOOC to meet lifelong learning needs. Like any course, it is difficult to cater for all learner needs and there are some further constraints when the responsibility for the course is divided between the university partners (which mainly design the learning content) and the learning platform (which is mainly responsible for delivering the course).

Steffens (2015) does not see that MOOCs differ in any significant way from online learning technologies, such as conventional online courses using learning management platforms with enrolled students. However, what sets apart MOOCs from traditional onsite or online courses is the scale. This scale justifies investments in platforms like Coursera, which in turn significantly enhance the pedagogy through establishing cohorts,

forums, time management reminders and progress tracking, and arranging peer reviews and prompts for both learners and teachers for best practice (e.g. essential components for course design and feedback from learners regarding different components). It is typically not individual teachers interacting or facilitating peer interaction in the course, but the platform itself. It is also not the university instructors who facilitate collaboration, competition or certification in practice (only setting some parameters in the course design), but the platform that does this.

Even though the majority of learners using the platform may not pay for the courses they access, the large number of learners means that even a small proportion paying for certificates, or companies paying for subscriptions, make a business case for continued support and development of the MOOC platforms, which is both an advantage and disadvantage: There is free access to content, but more limited access to certificates of completion, which typically require payment.

However, while the quality of the course materials and design can be assured by the university offering the course, the quality of learning is more difficult to ensure for thousands of learners. As much of the course is dependent on the motivation and commitment of learners, the quality of the actual learning is dependent on the students in the course and their own objectives for the education.

The framework by Farrow (2018) also emphasizes co-creation and collaboration as key to lifelong learning. The degree to which these are facilitated in a MOOC largely depends on the design of the MOOC itself. cMOOCs are intentionally designed to be collaborative. However, these are not the types of MOOCs offered on the most popular platforms, which are termed xMOOCs with their emphasis on content that is curated by a university partner. This distinction between cMOOCs and xMOOCs is quite significant.

Dealing with Key Issues for Lifelong Learning and MOOCs

Learner Engagement

In terms of how course design can influence learners to finish the course, Rafiq (2019, p.2) states that “learners’ dropout rates from MOOCs can be reduced when the content of a particular course is not too lengthy, as voluntary learners are focusing on learning independently”. This shows that learners who use MOOCs for their own personal gain are more prone to complete a shorter and relevant course because they are learning at their own pace. Concurrently, another study (Karnouskos, 2017) argued that MOOCs are indeed the best platform for self-paced learning, but it will not be successful if learners are not committed to completing a course.

A MOOC fulfils different purposes. The success can therefore be measured with a number of different parameters. Completion is not always the goal for learning, particularly in a lifelong learning context where the goal may be personal development or exploration. Many learners explore portions of a MOOC with a specific interest in a subtopic and are satisfied with their learning even when they do not complete all the course requirements (Henderikx et al., 2017).

Prior studies have shown that students take MOOCs for a variety of reasons and engage with the coursework in different ways, some more active and others more passive. Kahan et al. (2017) identify several types of learners in a typical MOOC: *Tasters*, *Downloaders*, *Disengagers*, *Offline Engagers*, *Online Engagers*, *Moderately Social Engagers* and *Social Engagers*. They note that most of the learners in the course they examined were tasters.

The experience from the IIIIEE MOOCs is similar. We also know from experience that there are some “tasters” of MOOCs who go on to enrol in courses to further study the topic. We know this from applicants to the IIIIEE Master’s program who mention taking at least one MOOC as part of their motivation for then applying. As can be seen from Table 4, an average of 14% of the approximately 150 applicants to the Master’s program each year have claimed that the IIIIEE MOOCs have had a high and positive

impact when deciding to apply for this program. (Note, this refers to applicants who had selected the IIIIEE Master’s program as priority 1, 2 or 3).

Table 4. Percentage of applicants who claimed the IIIIEE MOOCs had a positive impact on applying for the Master’s program.

2019	2020	2021	2022
17%	15%	16%	8%

Table 4 shows the percentage of applications to the Master’s program at the IIIIEE who claimed a positive impact from the IIIIEE MOOCs.

Table 5: Statements from Master’s applicants indicating MOOCs were influential for applying

“The MOOCs that I have taken gave me a really good idea of what to expect from the program and the instructors.” “I did go through the ”Greening the economy - lessons from Scandinavia” MOOC to get a glimpse of the programme and for continuous learning Purposes and I did learn a lot from it.”
“The MOOC given by IIIIEE is one of the sources that greatly influence my decision to apply for the EMP Programme. I am so excited to have learned from key professionals from IIIIEE during my on-line study in Greening the Economy-Lessons from Scandinavia.”
“I was specifically looking for a research- and practice-based MSc programme in Scandinavia that trains professionals both in environmental management and environmental policy. ”
“My interest then in the circular economy and its policy background lead me to Lund University’s MOOC. After its completion, I had no doubt that the EMP programme with the excellent IIIIEE staff is the right choice.”

Table 5 shows some representative statements from the applicants, describing the role that the MOOCs have played in the decision to apply. Here the MOOCs do not seem to be a channel for potential applicants to find the university program, but rather as a tool to confirm the suitability of the program for their future aspirations. In a sense then, the MOOCs seemed to have served as a taster for students before committing to a two-year study program.

Professional Development

Isakson et al. (2015) look at the potential of MOOCs for professional development compared to traditional and online education opportunities in Sweden. Interestingly, despite the great potential, they found that MOOCs were not being used this way by the universities. They noted the

reluctance of universities to go over the quota of students for which they are paid to offer MOOCs. At the same time, the number of online courses being offered was decreasing, even as demand for such courses was increasing – a bottleneck for professional development.

As noted by the UNESCO report, certification can be an issue as it is difficult to ensure the quality for so many students without financing and incentives to cover teacher time. Thus, platforms enable peer assessment, but the quality is highly dependent on the ability and effort of the peers. For this reason, it still may be appropriate to tie MOOC content to for-credit university courses and it is difficult to offer this for free.

As an elective for fee-paying students, a MOOC can enable a flipped classroom course with an emphasis on assessment and engagement that is more difficult to ensure in a pure MOOC setting. This has been the experience from turning two MOOCs at the IIEE into special area electives. One of the courses had a high number of professional learners and the decision was taken to keep the course entirely online, using a mix of MOOC lectures, readings, online seminars with teachers, and a graded course project. The course then sought to balance the flexibility of the MOOC with the quality assurance and staff time that a university-credited course could ensure.

Conclusion

In practice, MOOCs are catering to many different types of learners, but the flexibility can be of particular interest in satisfying diverse needs for lifelong learners. Both the literature and our own experience point to distinctly different learner groups, all with their own reasons to enrol in a MOOC. However, this diversity also leads to tensions in how MOOCs should be optimized – which learners should take priority? Added to this complexity is the fact that like learners, developers of MOOCs also have multiple purposes aside from education. MOOCs are also vehicles for communicating research and marketing education. Are other factors for the success pertaining to e.g. the more outreach-oriented purpose of MOOCs equally important, and can there be situations involving conflicting aims/success factors? Finally, it appears that MOOCs are

supporting teaching enhancement and innovation as universities enable greater use of digital learning. This has also been the IIEEE experience, with the development of MOOCs contributing to the institute being well positioned to continue to build upon e-learning expertise.

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